Power IQ

User Guide
Release 4.1.0

FCC Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential environment may cause harmful interference.

VCCI Information (Japan)

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Raritan is not responsible for damage to this product resulting from accident, disaster, misuse, abuse, non-Raritan modification of the product, or other events outside of Raritan's reasonable control or not arising under normal operating conditions.

If a power cable is included with this product, it must be used exclusively for this product.

Contents

Chapter 5   User Configuration   67

Chapter 6   Dashboard   79

Chapter 7   Security and Encryption   102

Chapter 8   Data Management   109

Chapter 9   PDUs   135

Chapter 10   Facilities Objects   158

Chapter 11   Sensors   180

Chapter 15   Maintenance Tasks   214

Chapter 16   Appliance Administration   217

Chapter 17   Upgrading Dominion PX PDUs   269

Chapter 18   Support and Licensing   274

Appendix A   ODBC Access   278

Appendix B Frequently Asked Questions   354

Index   357

What's New in the Power IQ Help

The following sections have changed or information has been added to the Power IQ User Guide based on enhancements and changes to the software and/or user documentation.

- *The Term "PDU" in Power IQ* (on page xiii)
- *Set Polling Intervals and Sample Rates at Even Multiples* (on page 12)
- *Adding PDUs with Custom Dynamic Plugins* (on page 28)
- *Bulk Change PDU IP Addresses* (on page 37)
- *Configuring LDAP Authentication* (on page 69)
- *Finding and Adding LDAP Users* (on page 70)
- *Permissions for Power Control on a Device Group* (on page 78)
- *Device Chart Widget* (on page 83)
- *Device Chart Settings* (on page 203)
- *PUE Trend Chart Widget* (on page 96)
- *Latest PUE Reading Gauge Widget* (on page 97)
- *Facilities Chart Widget* (on page 99)
- *Encrypting Data Backup Files* (on page 105)
- *Decrypt Backup Files Before Restoring* (on page 112)
- *Enterprise Relationships and the EDM* (on page 114)
- *Creating Your EDM* (on page 117)
- *Icons for EDM Objects* (on page 121)
- *Associate a Circuit or Outlet with an IT Device* (on page 130)
- *Viewing a PDU* (on page 136)
- *Facilities Objects* (on page 158)
- *Sensors* (on page 180)
- *PUE - Power Usage Effectiveness* (on page 210)
- *Dynamic Plugins* (on page 219)
- *Types of Dynamic Plugins: Structured and Custom* (on page 221)
- *License Count Rules for Rack PDUs and Facilities Objects* (on page 277)
- *Power IQ ODBC Schema* (on page 282)
- *IT Device Readings Rollups* (on page 332)

Please see the Release Notes for a more detailed explanation of the changes applied to this version of the Power IQ.

The Term "PDU" in Power IQ

For simplicity in the GUI, Power IQ uses the term PDU to encompass any device that Power IQ polls to gather power or sensor data.

When you see the term PDU in the product interface, remember that it includes every polled object: rack PDUs, CRACs, floor PDUs, floor UPSs, power panels, standalone meters, and environmental sensor aggregators.

In this guide, the following terms are also used:

- Rack PDU
- Facilities Objects: CRAC, floor PDU, floor UPS, power panel, and standalone meter.

Chapter 1   Installing the Power IQ Application

If you obtained Power IQ as a VMware application, you must install it on a VMware ESX/ESXi Server.

In This Chapter

Virtual Machine Requirements

Minimum Configuration (Number of PDUs)	RAM (GB)	Datastore (GB)	CPU (GHz)	OS	VMware
1-49	2	160 or more	1	CentOS 64-Bit	ESX/ESXi
50-199	3	160 or more	2	CentOS 64-Bit	ESX/ESXi
200 or more	4	160 or more	4	CentOS 64-Bit	ESX/ESXi

Preparing to Install Power IQ

- Verify that you have the DVD containing the Power IQ .ISO file.

- Verify the datastore has at least 160GB free for a new virtual machine.

- If you plan to install the virtual machine from the datastore, verify that there is also 1.4GB free for the installation ISO file, and copy the file from the DVD to the datastore.

- If you plan to install from a remote server, copy the ISO file from the DVD to the server.

Note: The instructions in this guide refer to the vSphere client, which is compatible with ESX/ESXi 4.0 and higher.

Creating the Power IQ Virtual Machine

1. Connect to the VMware server using vSphere client. Log in as a user that has permission to create, start, and stop virtual machines.

2. In the Summary tab, click New Virtual Machine in the Command box.

3. Choose Custom. Click Next.

4. Enter a name for the virtual machine. Click Next.

5. Choose a Datastore with at least 160GB of free space available. Click Next.

6. You may need to select the Virtual Machine Version, depending on your host. Select the version. Click Next.

7. Select Linux for the Guest Operating System, then select CentOS 64-bit, if available, from the Version drop-down. If CentOS 64-bit is not available, select Other Linux (64-bit). Click Next.

8. Set the number of virtual processors to 1, 2 or 4, depending on the size of your configuration. See *Virtual Machine Requirements* (on page 1). Click Next.

9. Adjust the amount of memory allocated for the virtual machine, depending on the size of your configuration. See *Virtual Machine Requirements* (on page 1). Click Next.

10. Set the number of NICs to one or two. If there are two NICs, one can be used for external access to the web interface and the other can be used as a private LAN for communication with the PDUs and other data center devices.

    In either case, make sure Connect at Power On is checked, and leave all other settings at default. Click Next.

11. Select LSI Logic for the SCSI Controller. Click Next.

12. Select "Create a new virtual disk." Click Next.

13. Set the Disk Capacity to 160GB minimum. Select a disk provisioning option. Select "Store with the virtual machine". Click Next.

14. Leave all advanced options at default. Click Next.

15. Select the "Edit virtual machine settings before completion" checkbox, then click Continue. Select New CD/DVD, then select a Device Type option to map the CD/DVD drive on the virtual machine. Click Finish to save the drive and return to the main dialog.

16. Click Finish to create the virtual machine.

Loading Power IQ onto the Virtual Machine

1. From the tree in the left pane, select the Power IQ Virtual Machine.

2. Select the Console tab. Click ▯ to power up the virtual machine. After a few moments, the Power IQ kickstart page opens.
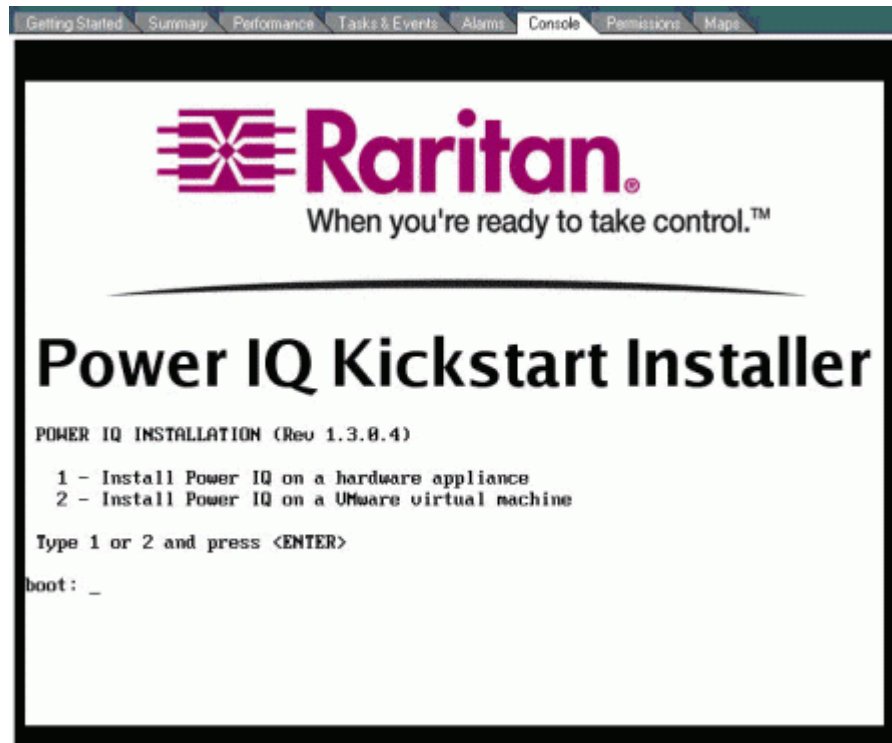
3. Type *2* for a VMware installation and press Enter to begin installation. Installation takes 20 minutes. When it completes, press Enter to reboot the Power IQ virtual machine.

4. The virtual machine reboots and displays a console prompt.

Chapter 2   Initial Configuration of Power IQ

After installing Power IQ®, you must configure the system for access over the network.

Note: Hardware versions only: Connect a keyboard, mouse, and monitor to the Power IQ device.

In This Chapter

Configuring Power IQ for Access over Network

▶ **To configure Power IQ for access over network:**

1. Power on Power IQ.

2. When prompted to log in, use the username *config* and the password *raritan*. The Power IQ configuration page opens.
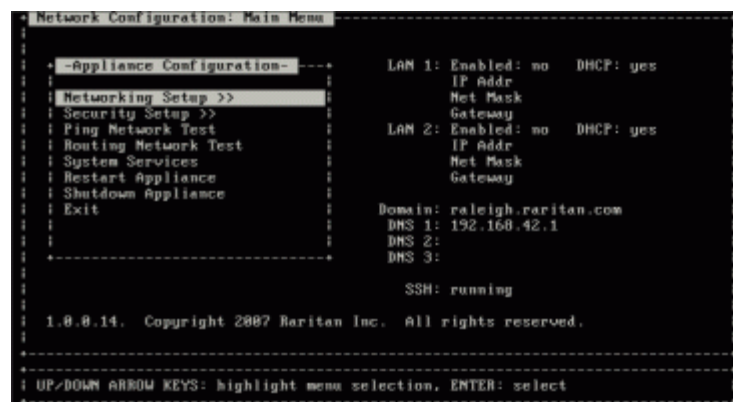
3. Select Networking Setup, then select Setup LAN 1 to configure the primary Ethernet port.

4. Press the Space bar to select Enable this LAN Port.

5. To manually assign the network settings to Power IQ, leave Use DHCP deselected. Type the IP address, network masks, and gateway into the appropriate fields.

6. Select Accept to reset the network interface with the new values.

7. If you are using a second network interface, select Setup LAN 2 from the Network Configuration menu and configure the secondary Ethernet port in the same manner as the first. **Optional.**

8. Select Ping Network Test to ensure that Power IQ can communicate over the network. **Optional.**

9. To disable SSH remote access to Power IQ, select System Services. Then deselect Enable SSH. By default, the config account has access to Power IQ. SSH is re-enabled if a support connection is created. **Optional.**

10. Select Exit from the main menu. You can now access Power IQ from any client on the network.

Open Port Requirements

You must ensure that certain ports are open for Power IQ to work.

See *Support Connections* (on page 274) for details about open port requirements for support connections to Raritan Technical Support.

Ports Open Between Power IQ and PDUs

- Port 161 (UDP): Required for all PDUs
- Port 162 (UDP): Required for Dominion PX PDU traps to be sent to Power IQ
- Port 443 (TCP): Required for Dominion PX PDU firmware upgrades performed through Power IQ
- Port 623 (UDP): Required for Dominion PX PDUs. Standard IPMI communication port.

Ports Open Between Clients and Power IQ

- Port 443 (TCP): allows the web interface
- Port 5432 (TCP): allows ODBC access. **Optional.**
- Port 22 (SSH): allows Raritan technical support to log into the shell
- 80 (HTTP): insecure connection to the web UI that immediately forwards to 443 (HTTPS)
- 111 (rpcbind):

Chapter 3 Connecting to Power IQ

1. Connect to Power IQ using a web browser on any machine on the network.

2. In the browser's address bar, enter the IP address or hostname assigned to Power IQ. For example: *https://192.168.1.10*

   Answer yes to any security alerts and accept all certificates. If this is your first time connecting to Power IQ, you must upload your license and accept the End User Licensing Agreement before logging in. If this is not your first time connecting to Power IQ, skip to step 4.

   Licenses are .LIC files. Repeat this step to add incremental licenses if needed.

   Note: Your license file can be retrieved from the Raritan web site after you have activated your registration. To activate your registration, click the link in the "Thank you for registering" email from Raritan and create your user account. Once you create your account, look for a "Your Raritan software license key is available" email containing a link to your license file download page.

3. Log in with the default username *admin* and password *raritan*.

The Power IQ dashboard opens.

Chapter 4   Additional Configuration Tasks

In This Chapter

Configuring Logging through Syslog

External Syslog servers can be used to record events occurring on Power IQ. Using a Syslog provides a separate external log of events.

All servers listed under Current Syslog Destinations record events on Power IQ. Recorded events include new users, configuration changes, and failed login attempts.

▶ **To configure logging through Syslog:**

1. In the Settings tab, click Server Settings in the Appliance Administration section.

2. In the Syslog Destinations box, click Add, then type the IP address of a Syslog server in the "Syslog server address" field. This must be in the form of a numeric address.

3. Click OK. The server appears on the list of Current Syslog Destinations.

▶ **To stop a syslog server from recording events:**

- Select the checkbox next to the server you want to remove then click Remove.

Configuring Polling Intervals

At each polling interval Power IQ collects data from PDUs under its management.

▶ **To configure the polling interval:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.

2. In the Polling Settings box, select a time period from the "Polling interval" drop-down list. The time period indicates how much time passes before Power IQ starts a new polling cycle

3. Click Save Poller Settings.

Note: When managing a large number of PDUs you may need to configure a longer time period for the polling interval. Setting a longer time period helps ensure that all PDUs are polled within a given cycle. A warning message appears if Power IQ is unable to poll all PDUs within the configured time period. See **Recommended Polling Intervals** *(on page 9)for details on settings that help Power IQ poll faster.*

Recommended Polling Intervals

The optimal polling interval depends on your business needs, the number of PDUs you have deployed, their types and the platform you are running Power IQ on. Outlet metered PDUs are a larger system load than unit-level metered PDUs. Raritan PDUs have a unique feature to store readings. Storing readings gives you the added flexibility to set a poll rate and a sample rate. See **Buffered Data Retrieval** (on page 12) for more detail.

Start with a longer polling and sample interval to ensure system operation. Gradually shorten the polling and sample interval as business needs require.

For Raritan PX2 PDU deployments with Raritan's E1-2 hardware appliance, you can generally collect 5 minute samples per 2,100 outlet metered PDUs, or 5 minute samples per 3,200 unit-level metered PDUs with a 30 minute poll interval. Your actual results may vary based upon local conditions. PDUs that provide less data than the Raritan PDU have a lower system load. You can therefore likely poll those PDUs at the stated sample rate for a given configuration.

To allow faster polling, disable the storage of raw sensor readings in CSV files to the Power IQ disk. Disabling this setting allows Power IQ to poll more devices at a faster polling interval, but you won't have access to raw readings in CSV format. See **Configure Raw Sensor Readings Storage** (on page 10) for details.

See **Configuring Polling Intervals** (on page 8) for details on changing these settings.

▶ **Example PX2 with buffered data retrieval:**

- 2,100 outlet metered PDUs
- 5 minute sample rate
- 30 minute polling interval

  Or

- 3,200 unit metered PDUs
- 5 minute sample rate
- 30 minute polling interval

▶ **Example Non-Raritan PDU without buffered data retrieval:**

- 3,200 unit metered PDUs
- 5 minute poll rate

Configure Raw Sensor Readings Storage

In Power IQ releases before 4.0.0, raw sensor readings collected by Power IQ are automatically stored in daily CSV files which are compressed into ZIP files at the end of each day. Power IQ retains a maximum of eight full days of compressed CSV files depending on available disk space.

Power IQ 4.0.0 is capable of polling at faster rates than older Power IQ releases. The more sensor readings that Power IQ collects, the more likely it becomes that the disk partition where these CSV files are stored will run out of space. This could prevent the Power IQ poller from functioning properly.

In Power IQ 4.0.0, if you require access to the raw sensor readings in CSV format, you must enable this feature. Depending on your Power IQ polling configuration, such as number of managed PDUs, polling interval, sample rate, Power IQ may not be able to store eight full days of readings. In some configurations, it may not be possible to write sensor readings to CSV because the number of raw sensor readings in a day will consume too much disk space.

If you do not require access to raw sensor readings in CSV format, the feature should remain disabled. Disabling this feature will improve the performance of the Power IQ poller and will free system resources for other tasks.

When the feature is disabled, you can still access two hours of raw sensor data stored in the database before values are rolled up, and the raw data deleted from the database. This raw sensor data can be retrieved using ODBC access and reporting tools. See ***ODBC Access*** (on page 278).

See ***Data Storage Configuration Calculator*** (on page 10) for details on a tool you can use to determine if your system configuration is compatible with writing raw sensor readings to CSV.

See ***Enable or Disable Storing Raw Readings in CSV Files on Disk*** (on page 11) for instructions on changing the setting.

Data Storage Configuration Calculator

The Data Storage Configuration Calculator is a tool that can help you determine if storing raw readings in CSV files is supported for your configuration.

You can download the Power IQ 4.0.0 version from the Raritan website.

http://www.raritan.com/support/power-iq/v4.0.0/data-storage-configurator/

Enable or Disable Storing Raw Readings in CSV Files on Disk

Depending on your configuration, storage of raw sensor readings in CSV files may not be supported, and could lead to performance issues with the Power IQ poller.

Use the Power IQ data storage configuration calculator tool to determine if storage of raw sensor readings is supported with your configuration.

Power IQ Data Storage Configuration Calculator: http://www.raritan.com/support/power-iq/v4.0.0/data-storage-configurator /

▶ **To enable or disable storing raw readings in CSV files on disk:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.

   ▪ To enable storage of daily sensor readings, select the "Store raw readings in CSV files on disk" checkbox. This option enables raw readings to be stored in CSV files on disk.

   ▪ To disable storage of daily sensor readings, deselect the "Store raw readings in CSV files on disk" checkbox. This option will not store raw readings on disk, and frees up resources for faster polling.

2. Click Save Poller Settings.

Buffered Data Retrieval

Raritan PX PDUs version 1.2.5 and higher have the ability to temporarily buffer power measurements. This allows Power IQ to receive more data with less frequent polling. Enabling buffered data retrieval instructs Power IQ to retrieve these buffered measurements instead of collecting a single point of data at the time of polling. This results in increased efficiency when gathering data from Raritan PX PDUs.

See **Enabling Buffered Data Retrieval from Raritan PX 1.2.5 or Higher** (on page 13) for instruction on enabling the feature.

You must set a Sample Interval when using buffered data retrieval. The polling interval controls how often Power IQ requests buffered data from Raritan PX PDUs, the sample interval controls how granular the buffered data is.

For example: With a polling interval of 1 hour, and a sample interval of 1 minute, Raritan PX PDUs under Power IQ management collect measurements each minute and store the data in the Raritan PX's data buffer. Every hour, Power IQ then retrieves the data buffer with the last hour's measurements from each Raritan PX.

Shorter sample intervals cause Raritan PX PDUs to fill their buffers more quickly. As a result, Power IQ may limit the polling interval to prevent data loss due to filled buffers.

When buffered data retrieval is in use, Power IQ polls other PDUs that do not support this feature at the Sample Interval. This helps maintain a consistent granularity of measurements across all readings.

The Buffered Data Retrieval feature may consume the space available for data storage rapidly since it allows Power IQ to retrieve a great deal of data at once.

Note: To configure Raritan PX sampling rates, Power IQ must have SNMP write access to those PDUs. First make sure the Raritan PX SNMP agents are enabled. Then ensure that they have been added to Power IQ management using an SNMP community string that has write access.

Set Polling Intervals and Sample Rates at Even Multiples

Set your sample rate at even multiple of your polling interval, when data buffering is enabled. This enables Power IQ to collect an even number of data points.

Enabling Buffered Data Retrieval from Raritan PX 1.2.5 or Higher

Note: All Power IQ's using buffered data retrieval that are polling the same PDU must use the same Sample Interval setting to prevent each instance of Power IQ from attempting to change the sample interval to its own setting.

See **Buffered Data Retrieval** (on page 12) for more details.

▶ **To retrieve buffered data from Raritan PX 1.2.5 or higher:**

Make sure that Raritan PX PDUs have been added to Power IQ with a Write Community String, or buffered data retrieval will not work. See **Editing PDUs under Power IQ Management** (on page 22) for details on editing PDU credentials.

1. In the Settings tab, click Power IQ Settings.

2. In the Polling Settings section, select the "Enable buffered data retrieval on Raritan PDUs" checkbox.

3. Select a sample period from the Sample Interval drop-down list. This configures the sample interval that Raritan PX PDUs use to buffer power measurements.

   For example: If 1 minute is selected, every minute, Raritan PX PDUs takes a power measurement and stores it in its internal buffer for retrieval.

   Note: The polling interval and sample interval should not be set to the same time period. Set the polling interval to a longer time period than the sample interval. For example: 30 minute polling interval with a 10 minute sample interval. See **Configuring Polling Intervals** *(on page 8).*

4. Click Save Poller Settings.

External Sensor Data from Raritan PX

Raritan PX model PDUs version 1.6 and higher support buffered data for external sensors.

For Raritan PX model PDU versions earlier than 1.6, external sensor data is not recorded at the sample interval when Buffered Data Retrieval is enabled. The external sensor data is recorded at the polling interval.

See **Buffered Data Retrieval** (on page 12).

Use NTP Servers with Buffered Data Retrieval

If you enable Buffered Data Retrieval, Raritan strongly suggests enabling NTP and configuring Power IQ and your Raritan PX PDUs to use the same NTP servers. This ensures that all recorded data is in sync, whether generated by Power IQ or Raritan PX.

Difference in time between Power IQ and PDUs can cause incorrect values on the capacity gauges on the dashboard.

Advanced Polling Settings

WARNING: Advanced Polling Settings, including Advanced SNMP Settings and Advanced Thread Pooling Settings, should only be used with Raritan Technical Support guidance, or by expert users. Changes to these values can negatively affect Power IQ performance, or result in loss of data.

If you have PDUs in the Lost Comm state, changing the default SNMP settings may help. Do not proceed without Raritan Technical Support guidance. See *Troubleshooting Lost Communication Status in PDUs* (on page 16) for details on possible causes. See *Advanced SNMP Settings* (on page 15) for details on the settings.

Advanced SNMP Settings

Changing the SNMP settings may help if you have too many PDUs in Lost Communication (LostComm) state.

See *Troubleshooting Lost Communication Status in PDUs* (on page 16) for details on possible causes and other solutions.

> Warning: You should only change these settings if you are an expert SNMP user, or with Raritan Technical Support's help. Changes to these values can negatively affect Power IQ performance, or result in loss of data.

▶ **Recommended changes:**

Increase how many times Power IQ will attempt an individual SNMP request and how long Power IQ will wait for an individual SNMP request. A poll of a PDU can potentially involve hundreds of individual SNMP requests. It is recommended to gradually increase the "Read timeout" and Retries settings and allow several poll intervals to pass to gauge the impact of the change before making additional changes.

If you see a large number of unexplained outages for Raritan PX1 or PX2 PDUs, it may also be necessary to decrease the "Maximum rows per request (PX)" setting. In a small number of cases the default value of 10 may result in SNMP response packets that are too large for customer networks to handle correctly due to packet fragmentation. This is related to PDUs being managed remotely over a WAN. Decreasing this value results in some loss of efficiency because Power IQ has to send more SNMP requests to the target PDU, given that a smaller set of data is sent back in each SNMP response.

By default, Power IQ uses the following default SNMP settings:

- Read timeout: 5000 milliseconds
- Write timeout: 5000 milliseconds
- SNMPv3 timeout: 20000 milliseconds
- Retries: 2
    - Total number of attempts= retries + 1. The default number of attempts is 3.
- Maximum rows per request (default): 1
    - This value is used for non-Raritan PDUs
- Maximum columns per request (default): 5=
    - This value is used for non-Raritan PDUs
- Maximum rows per request (PX): 10
    - This value is used for Raritan PDUs

- Maximum columns per request (PX): 15
  - This value is used for Raritan PDUs

Troubleshooting Lost Communication Status in PDUs

A PDU in "LostComm" state usually has one of these problems.

1. The user has configured Power IQ with the wrong community string for the PDU.

2. There is a network connectivity issue between Power IQ and the PDU.

3. The PDU is powered off or not connected to the network.

If you have checked and corrected these problems, and the status does not change, there may be an SNMP setting that is causing the problem. These problems are much less common. These problems may be solved by changing the SNMP settings, but you should only change these settings if you are an expert SNMP user, or with Raritan Technical Support's help. See ***Advanced SNMP Settings*** (on page 15)

1. The configured SNMP timeout and retry value are insufficient for your use case. For example, you need to manage remote PDUs over a WAN. Network latency or bandwidth do not work well with the default SNMP settings, resulting in a large number of SNMP timeouts that show up as LostComm state PDUs.

2. The SNMP agent on the PDU is not responding to requests. The PDU's processor may be busy handling other tasks and is temporarily unable to respond to SNMP requests.

Advanced Thread Pooling Settings

> Warning! The configured thread pool settings determine how many
> Power IQ resources are allocated to polling PDUs. The default
> settings are designed to work for most use cases and should not need
> to be changed. If you are experiencing performance issues related to
> polling, Raritan Technical support can work with you to determine if
> changing the thread pool settings will be beneficial.
>
> Warning! Do not change these settings without the guidance of
> Raritan Technical Support.

- Enable dynamic thread pool sizing: Determines if dynamic thread pool sizing is enabled (default: true)

- Threads per core: If dynamic sizing is disabled, this value will be used to calculate thread pool size. (default value: 10) This parameter affects poller operation when dynamic thread pool sizing is enabled or disabled.

- Dynamic thread pool size: Dynamically calculated ideal thread pool size (default: 0)

- Maximum CPU utilization: Target CPU utilization for polling PDUs. (default: .80)

- Maximum number of database connections: Upper limit on number of database connections that may be used by the poller thread pool. (default: 225) This parameter effects poller operation when dynamic thread pool sizing is enabled or disabled.

- Dynamic restart threshold: Defines how large the delta between the configured max pool size and the calculated ideal pool size must be before a Poller JVM restart is justified. (default: 5)

- Minimum time between restarts (in minutes): Defines minimum time between Poller restarts due to thread pool resizing (default: 1440, that is, only allow Poller to restart once every 24 hours to adjust thread pool size)

- Interval between thread pool evaluations (in minutes): Defines how frequently the Poller service will evaluate the thread pool size to determine if resizing is needed. (default: 60)

- Low water mark: Thread pool scheduler low water mark. Low water mark controls how aggressively threads are removed from the thread pool. This water mark represents the ratio of threads to items in the queue. The higher the value the more likely a thread will be removed from the pool. (default: .01)

- High water mark: Thread pool scheduler high water mark. High water mark controls how aggressively threads are added to the thread pool. This water mark represents the ratio of threads to items in the queue. The smaller the value the more likely a thread will be added to the pool. (default: .10)

Setting the Default SNMP Version for PDUs

▶ **To set the default SNMP version for PDUs:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.

2. In the Polling Settings box, select 1/2c or 3 as the default SNMP version for new PDUs added to Power IQ.

3. Click Save Poller Settings.

   You can change the default value when you add the PDU.

Setting Default Estimated Voltages

Power IQ can estimate active power for PDUs that do not directly provide Active Power measurements.

If a PDU does not provide one of the following values, the default estimated voltage will be applied.

- Inlet Voltage
- Outlet Voltage
- Active Power

This default value can be changed per PDU, in the Edit PDU page. These voltage values are only editable when they are NOT coming from the PDU. See **Configure Estimated Voltages** (on page 24).

▶ **To set the default estimated voltages:**

1. In the Settings tab, click Power IQ Settings.

2. In the Polling Settings box, enter a default estimated voltage for single phase PDUs and a default estimated inlet and outlet voltage for three phase PDUs. **Optional.**

3. Click Save Poller Settings.

Support for IPv6

You can assign Power IQ an IPv6 address.

Power IQ supports IPv6 communication for the following functions.

- Add PDUs with IPv6 addresses
- Add PDUs with IPv6 addresses using CSV import
- Add IT devices with IPv6 addresses
- Enable access controls using IPv6 address
- Use SNMP diagnostics over IPv6 network.
- Allow IPv6 hosts to connect to the ODBC database
- Configuring NTP servers with IPv6 addresses
- Do network diagnostics using ping, traceroute over IPv6 network. Serial console only.
- Enable static routes using IPv6 addresses. Serial console only.

Valid IPv6 Address Formats

Power IQ accepts IPv6 addresses written in any of the valid formats.

IPv6 addresses need to be enclosed in square brackets when used in the browser.

These examples show several valid versions of the same IPv6 address, and one invalid example.

▶ **Valid IPv6 address formats:**

FE00:0000:0000:0001:0000:0000:0000:0056

FE00::1:0:0:0:56

FE00:0:0:1::56

In a browser: https://[FE07:2fa:6cff:2113::101]/login

▶ **Invalid IPv6 address formats:**

Note: The :: abbreviation, meaning one or more quartets of all 0s, cannot be used twice.

The abbreviation FE00::1::56 is not valid.

Adding PDUs to Power IQ Management

Once Power IQ is configured, add Raritan PX or other PDUs to its management. Power IQ can then gather data from these PDUs. If you're adding a PDU that uses a custom dynamic plugin, see **Adding PDUs with Custom Dynamic Plugins** (on page 28).

You can also add PDUs to Power IQ by uploading a CSV file containing the information. See **Adding PDUs in Bulk with CSV Files** (on page 24) in the Power IQ User Guide.

▶ **To add PDUs to Power IQ management:**

1. In the PDUs tab, click Add.

2. Enter the IP address of the PDU.

3. If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number in the Proxy Index field. You can also specify branch circuit monitors using the Proxy Index field. See **Adding Veris Branch Circuit Monitors with Acquisuite** (on page 27).

   Note: If the PDU is not in this type of configuration, leave the Proxy Index field blank.

4. Enter an asset tag number or other asset management code in the External Key field. **Optional.**

5. Enter data in Custom Field 1 and Custom Field 2. **Optional.** The labels may have been changed in Power IQ to identify these fields.

6. If the PDU is a Raritan PX, enter a valid Username and Password for the PDU in the PDU Administrative Credentials section. Re-enter the password in the Password Confirm field.

7. Select the SNMP Version.

   - For SNMP version 1/2c PDUs, enter an SNMP Community String that has at least READ permissions to this PDU. This enables polling the PDU for data. Enter an SNMP community string that has both READ and WRITE permissions to the PDU to enable power control, outlet naming, sensor naming, and buffered data retrieval.

   - For SNMP version 3 PDUs, enter the Username and select an Authorization Level. The authorization levels are:

≣Raritan.

- noAuthNoPriv - No Authentication Passkey, No Encoding Passkey

- authNoPriv - Authentication Passkey, No Encoding Passkey

- authPriv - Authentication Passkey, Encoding Passkey

a. Depending on the Authorization Level selected, you must enter additional credentials for Authorization and Privacy.

b. Authorization Protocol: Select MD5 or SHA.

c. Enter the PDU's Authorization Passkey, then re-enter the passkey in the Authorization Passkey Confirm field.

d. Privacy Protocol: Select DES or AES.

e. Enter the PDU's Privacy Passkey, then re-enter the passkey in the Privacy Passkey Confirm field.

Note: You must enable the SNMP agent on all PDUs added to Power IQ.

8. Select "Validate and wait for discovery to complete before proceeding" to check credentials and view the discovery process status as you add this PDU. **Optional.** See *Validating PDU Credentials* (on page 22) in the Power IQ User Guide.

9. Click Add.

Note: PDU discovery is complete once the PDU model type is determined. SNMP fields such as contact or location values are not determined until this device is polled for the first time.

Once added, the PDU appears in the PDU list. Power IQ begins polling the PDU for sensor data. You can configure how often Power IQ polls PDU. See *Configuring Polling Intervals* (on page 8) in the Power IQ User Guide.

Discovery Progress Status

Viewing the discovery process displays a status result for each PDU. See *PDU Status* (see "*PDU Connectivity Health Statuses*" on page 149).

Validating PDU Credentials

When adding PDUs to Power IQ individually, you can specify whether the admin credentials are validated.

Check the "Validate and wait for discovery to complete before proceeding" checkbox on the Add a New PDU page. See *Adding PDUs to Power IQ Management* (on page 20) for details on adding PDUs.

When you specify validation, the PDU will not be added if the credentials are incorrect. If you opt not to validate, all PDUs will be added, and those added with incorrect credentials will trigger an event called PDUCredentialsInvalid.

When adding PDUs to Power IQ with a CSV file, the admin credentials are not validated before the PDU is added. When credentials are found to be incorrect, an event is logged.

Power IQ can poll PDUs without the correct credentials. You cannot upgrade PDUs or use bulk configuration without the correct credentials.

Editing PDUs under Power IQ Management

Editing a PDU allows you to reconfigure the SNMP community string for a PDU, or change the username and password used to access that PDU.

You cannot edit IP address, proxy index or name. If these values have changed, delete the PDU and re-add it.

▶ **To edit PDUs under Power IQ management:**

1. In the PDUs tab, click a PDU link to open the PDU Details.

2. Choose Actions > Edit.

3. Enter an asset tag number or other asset management code in the External Key field. **Optional.**

4. Enter data in Custom Field 1 and Custom Field 2. **Optional.** The labels may have been changed in Power IQ to identify these fields.

5. Select the SNMP Version. Then, use the fields that display to enter the credentials. To delete previous credentials for either SNMP version, select the "Delete SNMP privacy credentials" checkbox.

    ▪ For SNMP version 1/2c PDUs, enter an SNMP Community String that has at least READ permissions to this PDU. Use an SNMP community string that has both READ and WRITE permissions to the PDU to enable power control, outlet renaming, and buffered data retrieval. Re-enter the string in the Community String Confirm field.

    ▪ For SNMP version 3 PDUs, enter the Username and select an Authorization Level. The authorization levels are:

- ▪ noAuthNoPriv - No Authentication Passkey, No Encoding Passkey

- ▪ authNoPriv - Authentication Passkey, No Encoding Passkey

- ▪ authPriv - Authentication Passkey, Encoding Passkey

a. Depending on the Authorization Level selected, you must enter additional credentials for Authorization and Privacy.

b. Authorization Protocol: Select MD5 or SHA.

c. Enter the PDU's Authorization Passkey, then re-enter the passkey in the Authorization Passkey Confirm field.

d. Privacy Protocol: Select DES or AES.

e. Enter the PDU's Privacy Passkey, then re-enter the passkey in the Privacy Passkey Confirm field.

6. PDU Phase:

- ▪ When Power IQ can detect the phase, the Automatic option is selected, and the phase displays. For example, "Automatic (determined to be single phase)."

- ▪ When a PDU does not report phase, the Ignored option is selected. You can keep this setting to ignore phase, or set the phase manually.

- ▪ To set the phase manually, either if it cannot be determined automatically, or is incorrect, select the "Manually set to single phase" or "Manually set to three phase" option.

7. If the PDU is a Raritan PX, enter a valid Username and Password for the PDU in the Raritan PX Credentials section. Re-enter the password in the Password Confirm field. Leave the fields blank to keep using the password already configured. If you want to use a blank password, select the "Delete PX credentials checkbox."

8. Click Save.

Configure Estimated Voltages

Power IQ can estimate Active Power for PDUs that do not directly provide Active Power measurements.

If a PDU does not provide one of the following values, the default estimated voltage will be applied. See *Setting Default Estimated Voltages* (on page 18).

- Inlet Voltage
- Outlet Voltage
- Active Power

These voltage values are only editable when they are NOT coming from the PDU.

▶ **To configure estimated voltages:**

1. In the PDUs tab, select a PDU then click the Edit this PDU icon in the Actions column.

2. For three-phase PDUs, enter the voltages in the Manually Configured Inlet Voltage and Manually Configured Outlet Voltage fields.

3. For single-phase PDUs, enter the inlet voltage in the Manually Configured Voltage field.

   If no value is entered, the default value is used.

4. Click Save.

Adding PDUs in Bulk with CSV Files

You can add PDUs in bulk by uploading a CSV file.

Power IQ does not check the credentials of the PDU while adding it during a CSV import. If the credentials are incorrect, an event called PDUCredentialsInvalid is logged.

Importing more than 100 PDUs at a time causes polling to suspend while the import is in progress.

You can download a step-by-step CSV template file in the Support section of Raritan's website, under Firmware and Documentation. See http://www.raritan.com/support/power-iq/.

See *Structure of the Add PDUs CSV File* (on page 25) for file requirements.

▶ **To add PDUs in bulk with CSV files:**

1. In the PDUs tab, choose Activities > Import PDUs from CSV file. The Import PDUs page opens.

2. Click Browse and select the CSV file.

3. Select "View progress of the import as each PDU is discovered" to view the discovery progress and the resulting status. **Optional.**

4. Click Begin Import.

Structure of the Add PDUs CSV File

The structure of the CSV file is as follows:

* One line per PDU to import.

* No header row.

* Each line has only the following value columns, in the following order:

    1. IP address

    2. Proxy index: If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number. See ***Proxy Index Details*** (on page 26).

    Leave blank if the PDU is not in this type of configuration.

    ---

    3. Dominion PX username

    4. Dominion PX password

    Leave the Dominion PX username and Dominion PX password fields blank for other PDUs.

    ---

    5. SNMP Community String

    Leave the SNMP Community String blank if it does not apply for a PDU.

    ---

    6. SNMPv3 enabled: `true` or `false`.

    Leave columns 7-12 blank if SNMPv3 is set to false.

    ---

    7. SNMPv3 username

    8. SNMPv3 authorization level: `noAuthNoPriv`, `authNoPriv` or `authPriv`.

    9. Authorization protocol: `MD5` or `SHA`.

    10. Authorization passkey: no commas allowed

    11. Privacy protocol: `DES` or `AES`

    12. Privacy passkey: no commas allowed

    13. External key

    14. Custom field 1

15. Custom field 2

▶ **For example:**

```
192.168.43.184,,admin,raritan,private

192.168.44.101,,,,PDUread
```

The first line in this example represents a Dominion PX PDU. The second line represents a PDU from another vendor. Uploading this CSV file would instruct Power IQ to add two PDUs to management. The first PDU is located at 192.168.43.184, and uses the login/password combination admin/raritan for authentication. Its SNMP Community String is set to private. The second PDU is located at 192.168.44.101 and does not use a user name and password for authentication. Its SNMP Community String is set to PDUread.

Proxy Index Details

For stand-alone PDUs, the proxy index field should be left blank.

For PDUs acting in a daisy-chain, or for PDUs that are being proxied through another PDU, the proxy index field should contain the number of the PDU's position.

For daisy chained systems, the proxy index field should be set to the PDU's position within the chain. The head-end or master system should have a proxy index value of 1. The second system in the chain would have a proxy address of 2 and so on.

For element managed systems, such as PDUs behind a serial proxy, the proxy index field should contain the serial port number to which the PDU is attached on the management console.

Adding MRV PDUs

For MRV PDUs, make sure you have configured the get and set clients with the same community string, and use that community string when adding the PDU to Power IQ.

Adding Raritan EMX

You can add a Raritan EMX to Power IQ the same way you add a PDU. All information in this help that refers to PDUs can be applied to EMX, with a few exceptions.

Power IQ collects and displays sensor and asset strip data from a EMX in the same way as other PDUs with attached sensors or asset strips. EMX does not have any outlets.

You cannot upgrade or use bulk configuration for EMX through Power IQ.

See *Adding PDUs to Power IQ Management* (on page 20)

Adding Veris Branch Circuit Monitors with Acquisuite

Use the Add a PDU function to add a Veris branch circuit monitor (BCM) connected to a Veris or Obvius Acquisuite modbus to Power IQ.

See *Adding PDUs to Power IQ Management* (on page 20).

Specify the following information when adding the Veris BCM to ensure Power IQ connects to the correct panel.

Field name in Add a PDU page	Modbus/BCM information
IP Address	IP address of the Acquisuite modbus.
Proxy Index **REQUIRED**	Device number of the BCM panel. Example: The device number of the panel as configured in the Acquisuite. This information can be found in the Acquisuite web client.

Each panel displays as a PDU with up to 42 outlets. Each branch displays as an outlet.

Each single-phase branch is monitored independently as a single-phase circuit.

Groupings into multi-phase circuits is not supported.

Adding PDUs Managed by Dominion SX

You can add PDUs that are managed by a Dominion SX serial console to Power IQ.

Specify the following information when adding the PDU to ensure Power IQ connects to the correct SX-managed PDU.

See **Adding PDUs to Power IQ Management** (on page 20).

Field name in Add a PDU page	Modbus/BCM information
IP Address	IP address of the Dominion SX
Proxy Index	Dominion SX port number that the PDU is connected to
PDU Administrative Credentials Username, Password, Password Confirm	Dominion SX username and password
SNMP fields	Leave blank.

Adding PDUs with Custom Dynamic Plugins

When adding a PDU that uses a custom dynamic plugin, use the same Add a PDU feature as any other addition. See **Adding PDUs to Power IQ Management** (on page 20).

When Power IQ detects that there is at least one custom dynamic plugin configured, a Plugin drop-down field displays.

- Automatic: Use Automatic to allow Power IQ to determine the correct plugin for the PDU you are adding. Automatic attempts to find an exact match between the PDU and the plugin for SysObjectID, PDU Model name, and Proxy ID.

  - If there is no exact match, but several dynamic plugins are eligible to manage the PDU, based on sysObjectID, then Power IQ selects from among the eligible plugins. If automatic mode does not select the desired dynamic plugin, delete the PDU and add it again, selecting the specific custom dynamic plugin from the list.

- Or, select the specific custom dynamic plugin from the list.

Bulk Configuration of Dominion PX PDUs

By leveraging Dominion PX's ability to create a backup of its configuration, Power IQ can configure additional PX PDUs of the same model type. This is helpful for large scale deployments.

This applies to Dominion PX version 1.2 and later, only.

Requirements for Bulk Configuration

Prerequisites for bulk configuration:

- Each PX must be of the same model type.
- Each PX must have the same firmware version (1.2 or later).
- Each PX must be configured with an IP address and be under Power IQ management.
- A configuration backup file from a configured PX.

Plan a New Rollout

▶ **To plan a new rollout:**

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click "Plan a new rollout." The bulk pdu configuration rollout planning wizard starts.

3. Enter a name for the plan and click Continue.

   A summary of plan options appears at the top of the page. Continue adding details of your plan at the bottom of the page, or click the links in the summary list to add details.

4. In the Choose a PDU Configuration File section, you can add a new PX backup file or select a previously uploaded file. Configuration backup files are .XML files for PX2 configurations, and do not show a file extension for PX1 configurations.

- To add a new file, click the Upload a New File tab, then click Browse to select the file. Enter comments. Click Upload. The file is automatically selected for the plan.

- To select a previously uploaded file, click the Available Files tab, then select a file from the list, and click Continue.

5. All PX PDUs available for the rollout appear in a list. Select the checkboxes for the PDUs you want to configure, then click Selected PDUs to add them to the "PDUs selected for this plan" list at the bottom of the page. Or, click All PDUs to add all available PX PDUs to the list.

    - To remove PDUs from the plan, click Selected PDUs or All PDUs in the bottom list. Only PDUs in the bottom list will be configured.

6. Click Continue. Click the Plan Options link in the summary at top.

7. On the Plan Options page, edit the plan name, if needed, and set other preferences.

    a. Select the "Abort on failure" checkbox if you want Power IQ to cancel all remaining configurations in the plan if a configuration failure occurs. This could help prevent a configuration problem from affecting other Dominion PX PDUs in the plan.

    b. Select the "Allow simultaneous rollouts" checkbox if you want Power IQ to configure multiple Dominion PX PDUs at once. This makes batch configurations faster by allowing up to 25 configurations to run at the same time.

8. Click Continue. Review the summary of the plan. Click Add Comment if you want add notes to the plan. Click Add or Remove PDUs if you want to edit the list of PDUs to configure.

9. Click Save. The completed plan summary page opens.

10. Click Start Rollout to execute the plan immediately. The rollout starts, and the status page displays. You can also execute the saved plan later. See *Execute Saved Configuration Plans* (see "*Execute a Saved Rollout Plan*" on page 31).

    - See *View Status of Rollout Plans in Progress* (on page 32) for details on checking rollouts in progress.

    - See *View Completed Rollout Plans* (on page 32) for details on checking completed rollouts.

View Saved Rollout Plans

View saved rollout plans to verify and edit their details before executing a plan.

▶ **To view saved rollout plans:**

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click "View saved plans." All plans display in a list.

3. Click the Plan name link to view the details and edit if needed.

Edit a Saved Rollout Plan

Saved rollout plans can be edited to change details, add or remove PDUs, or change the configuration file.

▶ **To edit a saved rollout plan:**

1. In the PDUs tab, choose Activities > View Status of Current Rollouts.

2. All plans display in a list. Click the Plan name's link to view the details.

3. Click the blue links in the plan summary to edit the plan. Or, scroll down to click Edit and use the wizard to edit.

   See *Plan a New Rollout* (on page 29) for details of plan settings.

Execute a Saved Rollout Plan

▶ **To execute a saved configuration plan:**

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click "View saved plans." All plans display in a list.

3. Click the Plan name link for the plan you want to execute.

4. Click Start Roll Out to execute the plan.

   ▪ See *View Status of Rollout Plans in Progress* (on page 32) for details on checking rollouts in progress.

   ▪ See *View Completed Rollout Plans* (on page 32) for details on checking completed rollouts.

Rollout Timing

Each PX PDU configuration takes approximately 30 seconds.

If you select "Allow simultaneous rollouts" in the plan options, 25 configurations will begin simultaneously, and each batch of 25 will take approximately 30 seconds.

View Status of Rollout Plans in Progress

Rollout plans in progress have 3 possible statuses.

- Init: Initializing to prepare the PDU for configuration
- Login: Logging in to the PDU
- Verify: Verifying the PDU is responsive after configuration is complete

▶ **To view status of upgrade plans in progress:**

The status page for plans in progress displays when you execute the plan. You can return to the status page at any time, even after the plan has finished.

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click "View saved plans." All saved plans display in a list.

3. Click the Status link for the plan you executed to view the status page.

View Completed Rollout Plans

When a plan has been executed, you can view details of the plan status and results of each PDU included in the plan.

▶ **To view completed rollouts:**

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click "View previously completed rollouts." All completed plans display in a list.

3. Click the Plan name link to view the details.

   - If the plan completed successfully, a success message displays at the top of the plan details.

   - The list of PDUs included in the plan includes a Success or Failure message.

   - Click the "View detailed upgrade status messages" link for more information about each PDU.

Manage Configuration Files

You can upload different configuration files for use in rollout plans, and view previously uploaded configurations.

Configuration files are .DAT files. Configuration files are created by backing up a Dominion PX.

▶ **To view uploaded configuration files:**

1. In the PDUs tab, choose Activities > Bulk Configuration.

2. Click Manage Configuration Files. The link is not available if you do not have any uploaded configuration files. The PDU Configuration Files page opens.

3. All configuration files previously uploaded appear in a list.

▶ **To delete a configuration file:**

- Select the checkbox for the configuration file you want to delete, then click Delete.

▶ **To upload a new configuration file:**

1. Scroll down to the Upload New Configuration File section.

2. Enter the model name that the file is for in the Model Name field.

3. Click Browse to select the .DAT file.

4. Click Upload. The file is added to the list and will be available to select when creating a new rollout plan. See *Plan a New Rollout* (on page 29).

PDU Outlet Naming and Setting System Attributes

Power IQ enables you to export all the current PDU Outlet and System Attribute names to a CSV file that you can edit, and then re-import new names. See ***Naming Outlets in Bulk with CSV Files*** (on page 34). Change individual names manually by clicking a field and editing. See ***Naming Individual Outlets*** (on page 34).

Raritan PDU outlet names can be up to 32 characters in length, with no character restrictions. See the manufacturer's specification for naming requirements for other brands of PDUs.

Note: PDUs must be configured in Power IQ with an SNMP community string that has write-level access to allow outlet naming.

The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces.

Naming Individual Outlets

▶ **To name individual outlets:**

1. In the PDUs tab, click the link for a PDU to open the smart view.

2. Scroll down to the Outlets list.

3. Double-click the outlet name, then enter the new name in the field.

4. Press Enter to save the name.

    The names are written back to the PDU. If you connect to the PDU directly, the outlets appear there with their new names.

Naming Outlets in Bulk with CSV Files

When you import an outlet name CSV file, Power IQ names the outlets according to the values in the file. The names are written back to the PDU. If you connect to the PDU directly, the outlets appear there with their new names.

For details on creating the outlet name CSV file, see ***Structure of the Outlet Name CSV File*** (on page 36).

▶ **To name outlets in bulk with CSV files:**

1. In the PDUs tab, choose Activities > Outlet Naming.

2. Click Browse, then select the CSV file.

3. Click Import.

Setting SNMP System Attributes for PDUs

In addition to naming the outlets of PDUs, this CSV file can be used to set three SNMP system attributes. These attributes are SYS_CONTACT, SYS_NAME and SYS_LOCATION. These settings are optional values in the CSV file.

- SYS_CONTACT: is used to identify a person to contact regarding the PDU. For example, the IT administrator.
- SYS_NAME: is used to set the name of the PDU.
- SYS_LOCATION: is used to describe where the PDU is located. For example, "Sales Rack - Server Closet 2."

Note: Setting SNMP system attributes is not available for Dominion PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

Structure of the Outlet Name CSV File

The CSV file used for outlet naming and setting SNMP system attributes uses the following structure. There is one PDU per line/row.

CSV Import Templates are also available at: http://www.raritan.com/support/power-iq/

Note: The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces. Setting SNMP system attributes is not available for Dominion PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

- The first column is an IP address identifying a PDU.
- The second column is the Proxy Index value. Leave this value blank if the PDU does not support or is not using this configuration. You cannot change the Proxy Index value via CSV import. See **Proxy Index Details** (on page 26).
- The third column is the SNMP SYS_CONTACT value. **Optional.**
- The fourth column is for the SNMP SYS_NAME value. **Optional.**
- The fifth column is for the SNMP SYS_LOCATION value. **Optional.**
- Each value/column following the SYS_LOCATION represents an outlet on that PDU. Outlets start at 1 and increase sequentially with each column.

These values indicate only what is changed by the naming operation:

- If an IP address does not appear in the file, no naming operations occur on that PDU.
- If an outlet value is blank, its name does not change.

For example:

```
192.168.77.102,,Michael,Test PX2,RACK1,KVMSwitch1,KVMSwitch2,,Sales FTP Server
```

A PDU at 192.168.77.102 would receive the system name "Test PX2". Its first outlet would be renamed to "KVMSwitch1" and its second outlet renamed to "KVMSwitch2." The third outlet would not be renamed. The fourth outlet would be renamed to "Sales FTP Server."

Exporting Outlet Names to a CSV File

You can export the outlet names in Power IQ to a CSV file.

You can edit the file to change outlet names, then import it. See *Naming Outlets in Bulk with CSV Files* (on page 34).

Note: The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces. Setting SNMP system attributes is not available for Dominion PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

▶ **To export outlet names to a CSV file:**

1. In the PDUs tab, choose Activities > Outlet Naming.

2. Click the export link.

Bulk Change PDU IP Addresses

You can update the IP addresses of multiple PDUs, including facilities objects such as Floor PDUs, Floor UPS, Power Panels, and so on, using a CSV import. This is useful if you need to repartition a network and move PDUs from one subnet to another.

Power IQ will report lost connectivity events until the systems are aligned after the bulk IP address change is complete.

Polling will be interrupted by the bulk IP address change.

The CSV file is validated at import:

- IP addresses must be properly formatted.

- Existing IP addresses cannot be reused as new IP addresses.

- If the existing IP address in your CSV file is not found in Power IQ, that change is rejected.

- New IP addresses that already exist in Power IQ are rejected.

▶ **To bulk change PDU IP addresses:**

1. Create the CSV import file. See *Bulk Change PDU IP Address File Requirements* (on page 38).

2. In the PDUs tab, choose Activities > Import IP Address Changes.

3. Click Browse, then select the CSV file.

4. Click Begin Import. A progress bar displays.

   ▪ If all changes are successful, Power IQ redirects to the PDUs list.

   ▪ If any changes fail, the errors are listed in the Import page, and **nothing is imported**. Correct the errors in the file, and try the import again.

Upload new PDU IP addresses

CSV File: ChangeIpAddress4Pdu.csv [Browse...]

[Cancel] [Begin Import]

ERRORS IN CSV FILE
Line: 2 - **Source IP Address 192.168.47.241 does not exist in system.**
192.168.47.241, 192.168.45.241
Line: 3 - **Source IP Address 192.168.47.242 does not exist in system.**
192.168.47.242, 192.168.45.242
Line: 4 - **Source IP Address 192.168.47.243 does not exist in system.**
192.168.47.243, 192.168.45.243
Line: 5 - **Source IP Address 192.168.47.244 does not exist in system.**
192.168.47.244, 192.168.45.244

Bulk Change PDU IP Address File Requirements

The CSV import file for changing PDU IP address should follow this format.

Column 1	Column 2
Old IP address	New IP address

To help you create the CSV file, you can export your PDU IP addresses from Power IQ, then edit the file to prepare it for import.

▶ **To export IP addresses:**

1. In the PDUs tab, make sure the IP column is visible.

   ▪ To display the IP column, click any column header, then click Columns, and select the IP checkbox. The column displays.

2. In the PDUs tab, click the Export/Save icon ⊟ in the upper right corner of the grid.

   Save or open the file using the dialog that appears.

3. Edit the exported file to contain only the old IP addresses in column 1, and the new IP addresses in column 2.

4. Save the file as .CSV.

Configuring Event Management

Power IQ can receive SNMP traps from supported PDUs and display them as events.

You can also enable notifications, so that Power IQ sends an email message for specific events.

User Permissions for Event Management

You must have the Event Manager role to view the Events tab. See *Assign Roles to a User* (on page 75).

Prepare PDUs for Power IQ Event Management

Power IQ receives and displays supported events in the Events tab, and sends notifications if enabled.

You must configure PDUs to send the supported SNMP traps to Power IQ. SNMP v1 and SNMP v2 trap types are supported. See *Supported Events* (on page 40).

PDU trap names differ by vendor, so Power IQ maps the trap names to common event names to highlight the common traps across PDUs.

Supported Events

Power IQ supports the following events from supported PDUs. See the vendor name for supported events.

- *APC* (see "*APC Supported Events*" on page 40)
- *APC Netbotz* (see "*APC Netbotz Supported Events*" on page 41)
- *Aphel* (see "*Aphel Supported Events*" on page 42)
- *Avocent* (see "*Avocent Supported Events*" on page 42)
- *Baytech* (see "*Baytech Supported Events*" on page 42)
- *Cyberswitching* (see "*Cyberswitching Supported Events*" on page 43)
- *Geist* (see "*Geist Supported Events*" on page 44)
- *Geist EM* (see "*Geist EM Supported Events*" on page 44)
- *Geist V3* (see "*Geist V3 Supported Events*" on page 45)
- *Hewlett Packard* (see "*Hewlett Packard Supported Events*" on page 46)
- *Knurr* (see "*Knurr Supported Events*" on page 47)
- *Liebert* (see "*Liebert Supported Events*" on page 48)
- *MRV* (see "*MRV Supported Events*" on page 48)
- *Raritan Dominion PX* (see "*Raritan Dominion PX Supported Events*" on page 49)
- *Rittal* (see "*Rittal Supported Events*" on page 55)
- *Servertech* (see "*Servertech Supported Events*" on page 58)

APC Supported Events

APC Supported Events

Event description	Trap name	Common event name
Underload Threshold	rPDULowLoad	inletCurrentLowerWarning
Underload Condition Cleared	rPDULowLoadCleared	inletCurrentLowerWarningClear
Low Overload Threshold	rPDUNearOverload	inletCurrentUpperWarning
Low Overload Threshold cleared	rPDUNearOverloadCleared	inletCurrentUpperWarningClear
Overload Threshold	rPDUOverload	inletCurrentUpperCritical
Overload Threshold cleared	rPDUOverloadCleared	inletCurrentUpperCriticalClear
Outlet Turned on	rPDUOutletOn	outletPowerOn
Outlet Turned off	rPDUOutletOff	outletPowerOff

APC Supported Events

Event description	Trap name	Common event name
High temperature threshold violated on the probe	envHighTempThresholdViolation	envTemperatureUpperCritical
High temperature threshold violation cleared on the probe	envHighTempThresholdViolationCleared	envTemperatureUpperCriticalClear
Low temperature threshold violated on the probe	envLowTempThresholdViolation	envTemperatureLowerCritical
Low temperature threshold violation cleared on the probe	envLowTempThresholdViolationCleared	envTemperatureLowerCriticalClear
High humidity threshold violated on the probe	envHighHumidityThresholdViolation	envHumidityUpperCritical
High humidity threshold violation cleared on the probe	envHigHumidityThresholdViolationCleared	envHumidityUpperCriticalClear
Low humidity threshold violated on the probe	envLowHumidityThresholdViolation	envHumidityLowerCritical
Low humidity threshold violation cleared on the probe	envLowHumidityThresholdViolationCleared	envHumidityLowerCriticalClear

APC Netbotz Supported Events

APC Netbotz Supported Events

Event description	Trap name	Common event name
Temp Env Sensor High Threshold	netBotzTempTooHigh	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	netBotzTempTooHighRTN	envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	netBotzTempTooLow	envTemperatureLowerCritical
Temp Env Sensor Low Threshold Cleared	netBotzTempTooLowRTN	envTemperatureLowerCriticalClear
Humidity Env Sensor High Threshold	netBotzHumidityTooHigh	envHumidityUpperCritical
Humidity Env Sensor High Threshold Cleared	netBotzHumidityTooHighRTN	envHumidityUpperCriticalClear
Humidity Env Sensor Low Threshold	netBotzHumidityTooLow	envHumidityLowerCritical

APC Netbotz Supported Events

Event description	Trap name	Common event name
Humidity Env Sensor Low Threshold Cleared	netBotzHumidityTooLowRTN	envHumidityLowerCriticalClear

Aphel Supported Events

Aphel Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	ampsCT1TRAP ampsCT8TRAP	inletCurrentUpperCritical

Avocent Supported Events

Avocent Supported Events

Event description	Trap name	Common event name
Outlet Turned on	avctPmOutletStatusOnTrap avctPmOutletCmdOnTrap	outletPowerOn
Outlet Turned off	avctPmOutletStatusOffTrap avctPmOutletCmdOffTrap	outletPowerOff
Inlet Current Upper Critical Threshold	avctPmPduMaxLoadHighTrap	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentUpperCriticalClear
Inlet Current Low Critical Threshold	avctPmPduMinLoadLowTrap	inletCurrentLowerCritical
Inlet Current Low Critical Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentLowerCriticalClear
Inlet Current Upper Warning Threshold	avctPmPduWarnLoadTrap	inletCurrentUpperWarning
Inlet Current Upper Warning Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentUpperWarningClear

Baytech Supported Events

Baytech Supported Events

Event description	Trap name	Common event name
Outlet Turned on	outletOn	outletPowerOn
Outlet Turned off	outletOff	outletPowerOff
Inlet Current Upper Critical Threshold	currentThresholdViolation	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared	currentThresholdViolationCleared	inletCurrentUpperCriticalClear
Inlet Current Low Critical Threshold	currentUnderThresholdViolation	inletCurrentLowerCritical
Inlet Current Low Critical Threshold Cleared	currentUnderThresholdViolationCleared	inletCurrentLowerCriticalClear
Inlet Voltage Upper Critical Threshold	voltageOverThresholdViolation	inletVoltageUpperCritical
Inlet Voltage Upper Critical Threshold Cleared	voltageOverThresholdViolationCleared	inletVoltageUpperCriticalClear
Inlet Voltage Lower Critical Threshold	voltageUnderThresholdViolation	inletVoltageLowerCritical
Inlet Voltage Lower Critical Threshold Cleared	voltageUnderThresholdViolationCleared	inletVoltageLowerCriticalClear
Circuit Breaker Tripped	circuitBreakerAlarm	cbTripped
Circuit Breaker Recovered	circuitBreakerAlarmClearTrap	cbRecovered
Temp Env Sensor High Threshold	sensorTempThreshHiAlarmTrap	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	sensorTempThreshHiAlarmClearedTrap	envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	sensorTempThreshLoAlarmTrap	envTemperatureLowerCritical
Temp Env Sensor Low Threshold Cleared	sensorTempThreshLoAlarmClearedTrap	envTemperatureLowerCriticalClear

Cyberswitching Supported Events

Cyberswitching Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	tricomG2UnitCurrentCritical	inletCurrentUpperCritical

Cyberswitching Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Warning Threshold	tricomG2UnitCurrentWarning	inletCurrentUpperWarning
Outlet Current Upper Warning Threshold	tricomG2OutletHighCurrentWarning	outletCurrentUpperWarning
Outlet Current Lower Warning Threshold	tricomG2OutletLowCurrentWarning	outletCurrentLowerWarning
Circuit Breaker Tripped	tricomG2OutletTripped	cbTripped

Geist Supported Events

Geist Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	totalDeciAmpsPhaseATRAP totalDeciAmpsPhaseBTRAP totalDeciAmpsPhaseCTRAP	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared		inletCurrentUpperCriticalClear
Circuit Breaker Current Upper Critical Threshold	outlet1ADeciAmpsTRAP outlet12CDeciAmpsTRAP	CBCurrentUpperCritical
Circuit Breaker Current Upper Critical Threshold Cleared		CBCurrentUpperCriticalClear
Outlet Current Upper Critical Threshold	outlet1ADeciAmpsTRAP outlet12CDeciAmpsTRAP	OutletCurrentUpperCritical
Outlet Current Upper Critical Threshold Cleared		OutletCurrentUpperCriticalClear

Geist EM Supported Events

Geist EM Supported Events

Event description	Trap name	Common event name
Circuit Breaker Current Threshold Warning Event	mainChannelDeciAmps01WARN mainChannelDeciAmps07WARN	

Geist EM Supported Events

Event description	Trap name	Common event name
Circuit Breaker Current Threshold Critical Event	mainChannelDeciAmps01ALARM mainChannelDeciAmps07ALARM	
Outlet Current Threshold Warning Event	auxChannelDeciAmps01WARN auxChannelDeciAmps32WARN outlet1AB-1DeciAmpsWarningTRAP outlet24CA-8DeciAmpsWarningTRAP	OutletCurrentUpperCritical
Outlet Current Threshold Warning Event Cleared		
Outlet Current Threshold Critical Event	auxChannelDeciAmps01ALARM auxChannelDeciAmps32ALARM outlet1AB-1DeciAmpsTRAP outlet24CA-8DeciAmpsTRAP	OutletCurrentUpperCritical
Outlet Current Threshold Critical Event Cleared		OutletCurrentUpperCriticalClear
Phase Current Threshold Warning Event	totalDeciAmpsPhaseAWarningTRAP totalDeciAmpsPhaseCWarningTRAP	inletCurrentUpperWarning
Phase Current Threshold Warning Event Cleared		inletCurrentUpperWarningClear
Phase Current Threshold Critical Event	totalDeciAmpsPhaseATRAP totalDeciAmpsPhaseCTRAP	inletCurrentUpperCritical
Phase Current Threshold Critical Event Cleared		inletCurrentUpperCriticalClear

Geist V3 Supported Events

Geist V3 Supported Events

Event description	Trap name	Common event name
Temperature Threshold High Violation	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY	

Geist V3 Supported Events

Event description	Trap name	Common event name
	(alarmTripType = 2)	
Temperature Threshold Low Violation	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY (alarmTripType = 1)	
Temperature Threshold Clear	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY (alarmTripType = 0)	
Humidity Threshold High Violation	gstClimateHumidityNOTIFY (alarmTripType = 2)	
Humidity Threshold Low Violation	gstClimateHumidityNOTIFY (alarmTripType =)1	
Humidity Threshold Clear	gstClimateHumidityNOTIFY (alarmTripType = 0)	
Outlet Current Threshold High Violation	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 2)	
Outlet Current Threshold Low Violation -	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 1)	
Outlet Current Threshold Violation Clear	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 0)	

Hewlett Packard Supported Events

Hewlett Packard Supported Events

Event description	Trap name	Common event name
Voltage High Critical	trapCritical	inletOverVoltageCritical

Hewlett Packard Supported Events

Event description	Trap name	Common event name
Voltage High Critical Clear	trapCleared	inletOverVoltageCriticalClear
Voltage Low Critical	trapCritical	inletUnderVoltageCritical
Voltage Low Critical Clear	trapCleared	inletUnderVoltageCriticalClear
Current Critical	trapCritical	inletOverCurrentCritical
Current Critical Clear	trapCleared	inletOverCurrentCriticalClear
Voltage High Warning	trapWarning	inletOverVoltageWarning
Voltage High Warning Clear	trapCleared	inletOverVoltageWarningClear
Voltage Low Warning	trapWarning	inletUnderVoltageWarning
Voltage Low Warning Clear	trapCleared	inletUnderVoltageWarningClear
Current Warning	trapWarning	inletOverCurrentWarning
Current Warning Clear	trapCleared	inletOverCurrentWarningClear

Knurr Supported Events

Knurr Supported Events

Event description	Trap name	Common event name
Inlet Pole Current Upper Critical Threshold	pdu-M1TrapAlarmPh1	inletCurrentUpperCritical
	pdu-M1TrapAlarmPh2	
	pdu-M1TrapAlarmPh3	
	pdu-M2TrapAlarmPh1	
	pdu-M2TrapAlarmPh2	
	pdu-M2TrapAlarmPh3	
	pdu-M3TrapAlarmPh1	
	pdu-M3TrapAlarmPh2	
	pdu-M3TrapAlarmPh3	
	pdu-M4TrapAlarmPh1	
	pdu-M4TrapAlarmPh2	
	pdu-M4TrapAlarmPh3	

Knurr Supported Events

Event description	Trap name	Common event name
Inlet Pole Current Threshold Clear - All	pdu-M1TrapRetToNormPh1	inletCurrentUpperCriticalClear
	pdu-M1TrapRetToNormPh2	
	pdu-M1TrapRetToNormPh3	
	pdu-M2TrapRetToNormPh1	
	pdu-M2TrapRetToNormPh2	
	pdu-M2TrapRetToNormPh3	
	pdu-M3TrapRetToNormPh1	
	pdu-M3TrapRetToNormPh2	
	pdu-M3TrapRetToNormPh3	
	pdu-M4TrapRetToNormPh1	
	pdu-M4TrapRetToNormPh2	
	pdu-M4TrapRetToNormPh3	

Liebert Supported Events

Liebert Supported Events

Event description	Trap name	Common event name
Outlet turned on	lgpEventRcpPowerStateChangeOn	outletPowerOn
Outlet turned off	lgpEventRcpPowerStateChangeOff	outletPowerOff

MRV Supported Events

MRV Supported Events

Event description	Trap name	Common event name
Temp Env Sensor High Threshold	irTempHighTholdAlarmRaised	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	irTempHighTholdAlarmCleared	envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	irTempLowTholdAlarmRaised	envTemperatureLowerCritical
Temp Env Sensor Low	irTempLowTholdAlarmCleared	envTemperatureLowerCriticalClear

MRV Supported Events

Event description	Trap name	Common event name
Threshold Cleared		
Humidity Env Sensor High Threshold	irHumidityHighTholdAlarmRaised	envHumidityUpperCritical
Humidity Env Sensor High Threshold Cleared	irHumidityHighTholdAlarmCleared	envHumidityUpperCriticalClear
Humidity Env Sensor Low Threshold	irHumidityLowTholdAlarmRaised	envHumidityLowerCritical
Humidity Env Sensor Low Threshold Cleared	irHumidityLowTholdAlarmCleared	envHumidityUpperCriticalClear

Raritan Dominion PX Supported Events

Some Dominion PX models support Event Rules, so that you can specify which events will be sent to Power IQ

Set up rules to reduce the number of traps sent to Power IQ. Optional.

Once rules are created, associate the rule with the SNMP Trap Action, with Power IQ as the trap destination.

See Event Rules or Actions in the Raritan Dominion PX User Guide.

Note: Model numbers that begin with "DPX2" support Event Rules.

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Outlet Current Upper Critical Threshold	thresholdAlarm **or** outletSensorStateChange	outletCurrentUpperCritical outletCurrentUpperCriticalClear
Outlet Current Upper Warning Threshold	thresholdAlarm **or** outletSensorStateChange	outletCurrentUpperWarning outletCurrentUpperWarningClear
Outlet Current Lower Critical Threshold	thresholdAlarm **or** outletSensorStateChange	outletCurrentLowerCritical outletCurrentLowerCriticalClear
Outlet Current Lower Warning Threshold	thresholdAlarm **or**	outletCurrentLowerWarning outletCurrentLowerWarningClear

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
	outletSensorStateChange	
Outlet Voltage Upper Critical Threshold	outletSensorStateChange	outletVoltageUpperCritical outletVoltageUpperCriticalClear
Outlet Voltage Upper Warning Threshold	outletSensorStateChange	outletVoltageUpperWarning outletVoltageUpperWarningClear
Outlet Voltage Lower Critical Threshold	outletSensorStateChange	outletVoltageLowerCritical outletVoltageLowerCriticalClear
Outlet Voltage Lower Warning Threshold	outletSensorStateChange	outletVoltageLowerWarning outletVoltageLowerWarningClear
Outlet Pole Current Upper Critical Threshold	outletPoleSensorStateChange	outletCurrentUpperCritical outletCurrentUpperCriticalClear
Outlet Pole Current Upper Warning Threshold	outletPoleSensorStateChange	outletCurrentUpperWarning outletCurrentUpperWarningClear
Outlet Pole Current Lower Critical Threshold	outletPoleSensorStateChange	outletCurrentLowerCritical outletCurrentLowerCriticalClear
Outlet Pole Current Lower Warning Threshold	outletPoleSensorStateChange	outletCurrentLowerWarning outletCurrentLowerWarningClear
Outlet Pole Voltage Upper Critical Threshold	outletPoleSensorStateChange	outletVoltageUpperCritical outletVoltageUpperCriticalClear
Outlet Pole Voltage Upper Warning Threshold	outletPoleSensorStateChange	outletVoltageUpperWarning outletVoltageUpperWarningClear
Outlet Pole Voltage Lower Critical Threshold	outletPoleSensorStateChange	outletVoltageLowerCritical outletVoltageLowerCriticalClear
Outlet Pole Voltage Lower Warning Threshold	outletPoleSensorStateChange	outletVoltageLowerWarning outletVoltageLowerWarningClear
Outlet Power on/off	powerControl	outletPowerOn utletPowerOff

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Circuit Breaker Current Upper Critical Threshold	thresholdAlarm **or** overCurrentProtectorSensorStateChange	cbCurrentUpperCritical cbCurrentUpperCriticalClear
Circuit Breaker Current Upper Warning Threshold	thresholdAlarm **or** overCurrentProtectorSensorStateChange	cbCurrentUpperWarning cbCurrentUpperWarningClear
Circuit Breaker Current Lower Critical Threshold	thresholdAlarm **or** overCurrentProtectorSensorStateChange	cbCurrentLowerCritical cbCurrentLowerCriticalClear
Circuit Breaker Current Lower Warning Threshold	thresholdAlarm **or** overCurrentProtectorSensorStateChange	cbCurrentLowerWarning cbCurrentLowerWarningClear
Circuit Breaker Tripped	circuitBreakerTripped **or** overCurrentProtectorSensorStateChange	cbTripped
Circuit Breaker Recovered	circuitBreakerRecovered **or** overCurrentProtectorSensorStateChange	cbRecovered
Inlet Current Upper Critical Threshold	inletSensorStateChange	inletCurrentUpperCritical inletCurrentUpperCriticalClear
Inlet Current Upper Warning Threshold	inletSensorStateChange	inletCurrentUpperWarning inletCurrentUpperWarningClear
Inlet Current Lower Critical Threshold	inletSensorStateChange	inletCurrentLowerCritical inletCurrentLowerCriticalClear
Inlet Current Lower Warning Threshold	inletSensorStateChange	inletCurrentLowerWarning inletCurrentLowerWarningClear

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Inlet Voltage Upper Critical Threshold	inletSensorStateChange	inletVoltageUpperCritical lineVoltageUpperCriticalClear
Inlet Voltage Upper Warning Threshold	inletSensorStateChange	inletVoltageUpperWarning inletVoltageUpperWarningClear
Inlet Voltage Lower Critical Threshold	inletSensorStateChange	inletVoltageLowerCritical inletVoltageLowerCriticalClear
Inlet Voltage Lower Warning Threshold	inletSensorStateChange	inletVoltageLowerWarning inletVoltageLowerWarningClear
Inlet Pole Current Upper Critical Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletCurrentUpperCritical inletCurrentUpperCriticalClear
Inlet Pole Current Upper Warning Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletCurrentUpperWarning inletCurrentUpperWarningClear
Inlet Pole Current Lower Critical Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletCurrentLowerCritical inletCurrentLowerCriticalClear
Inlet Pole Current Lower Warning Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletCurrentLowerWarning inletCurrentLowerWarningClear
Inlet Pole Voltage Upper Critical Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletVoltageUpperCritical lineVoltageUpperCriticalClear
Inlet Pole Voltage Upper Warning Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletVoltageUpperWarning inletVoltageUpperWarningClear
Inlet Pole Voltage Lower Critical Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletVoltageLowerCritical inletVoltageLowerCriticalClear

Raritan.

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Inlet Pole Voltage Lower Warning Threshold	thresholdAlarm **or** inletPoleSensorStateChange	inletVoltageLowerWarning inletVoltageLowerWarningClear
Env. Temperature Upper Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envTemperatureUpperCritical envTemperatureUpperCriticalClear
Env. Temperature Upper Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envTemperatureUpperWarning envTemperatureUpperWarningClear
Env. Temperature Lower Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envTemperatureLowerCritical envTemperatureLowerCriticalClear
Env. Temperature Lower Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envTemperatureLowerWarning envTemperatureLowerWarningClear
Relative Humidity Upper Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envHumidityUpperCritical envHumidityUpperCriticalClear
Relative Humidity Upper Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envHumidityUpperWarning envHumidityUpperWarningClear
Relative Humidity Lower Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envHumidityLowerCritical envHumidityLowerCriticalClear
Relative Humidity Lower Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envHumidityLowerWarning envHumidityLowerWarningClear

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Discrete Sensor State Change	externalOnOffSensorStateChange **or** pduSensorStateChange	SensorContactOpen SensorContactClosed SensorSmokeDetected SensorSmokeCleared SensorWaterDetected SensorWaterCleared SensorVibrationDetected SensorVibrationCleared
Asset Strip and Tag Changes	assetStripDisconnected assetStripConnected assetTagDisconnected assetTagConnected	assetStripDisconnected assetStripConnected assetTagDisconnected assetTagConnected
Airflow Over Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envOverAirflowCritical envOverAirflowCriticalClear
Airflow Over Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envOverAirflowWarning envOverAirflowWarningClear
Airflow Under Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envUnderAirflowCritical envUnderAirflowCriticalClear
Airflow Under Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envUnderAirflowWarning envUnderAirflowWarningClear
Air Pressure Over Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envOverAirPressureCritical envOverAirPressureCriticalClear
Air Pressure Over Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envOverAirPressureWarning envOverAirPressureWarningClear

Raritan Dominion PX Supported Events

Event description	Trap name	Common event name
Air Pressure Under Critical Threshold	thresholdAlarm **or** externalSensorStateChange	envUnderAirPressureCritical envUnderAirPressureCriticalClear
Air Pressure Under Warning Threshold	thresholdAlarm **or** externalSensorStateChange	envUnderAirPressureWarning envUnderAirPressureWarningClear

Raritan EMX Supported Events

Raritan EMX Supported Events

Event description	Trap name	Common event name
Numeric sensor threshold crossing events	External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'above upper critical'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'above upper warning'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'below lower warning'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'below lower critical'.	envTemperatureUppe envTemperatureUppe envTemperatureLowe envTemperatureLowe envHumidityUpperCrit envHumidityUpperCrit envHumidityLowerCrit envHumidityLowerCrit
External Sensor Slot State Change	External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' is closed.	SensorContactOpen SensorContactClosed

Rittal Supported Events

Rittal Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Critical	alarmUnit1	inletCurrentUpperCritical

Rittal Supported Events		
Event description	**Trap name**	**Common event name**
Threshold	alarmUnit2 alarmUnit3 alarmUnit4	
Inlet Current Upper Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentUpperCriticalClear
Inlet Current Lower Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentLowerCritical
Inlet Current Lower Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentLowerCriticalClear
Inlet Voltage Upper Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageUpperCritical
Inlet Voltage Upper Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageUpperCriticalClear
Inlet Voltage Lower Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageLowerCritical

Rittal Supported Events		
Event description	**Trap name**	**Common event name**
Inlet Voltage Lower Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageLowerCriticalClear
Temp Env Sensor Upper Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureUpperCritical
Temp Env Sensor Upper Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureUpperCriticalClear
Temp Env Sensor Low Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureLowerCritical
Temp Env Sensor Low Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureLowerCriticalClear
Humidity Env Sensor Upper Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityUpperCritical
Humidity Env Sensor Upper Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityUpperCriticalClear

Rittal Supported Events

Event description	Trap name	Common event name
Humidity Env Sensor Lower Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityLowerCritical
Humidity Env Sensor Lower Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityLowerCriticalClear

Servertech Supported Events

Servertech Supported Events

Event description	Trap name	Common event name
Infeed Current High Threshold	infeedLoadEvent	inletCurrentUpperCritical inletCurrentUpperCriticalClear
Infeed Current Low Threshold	infeedLoadEvent	inletCurrentLowerCritical inletCurrentLowerCriticalClear
Outlet Current High Thresholds	outletLoadEvent	outletCurrentUpperCritical outletCurrentUpperCriticalClear
Outlet Current Low Thresholds	outletLoadEvent	outletCurrentLowerCritical outletCurrentLowerCriticalClear
Outlet Current Status Change	outletChangeEvent	outletPowerOn outletPowerOff
Temp Env Sensor High Threshold	tempHumidSensorTempEvent	envTemperatureUpperCritical envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	tempHumidSensorTempEvent	envTemperatureLowerCritical envTemperatureLowerCriticalClear
Humidity Env Sensor High Thresholds	tempHumidSensorHumidEvent	envHumidityUpperCritical envHumidityUpperCriticalClear

Servertech Supported Events

Event description	Trap name	Common event name
Humidity Env Sensor Low Thresholds	tempHumidSensorHumidEvent	envHumidityLowerCritical
		envHumidityLowerCriticalClear

PDU Connectivity Lost and Restored Events

Power IQ generates PDU connectivity events when connectivity is lost or restored with a PDU. The PDU's health status will change to red when connectivity is lost. Loss of connectivity is a critical severity event.

Power IQ checks PDUs that it has lost communication with every 15 minutes. If a PDU remains inaccessible for 1 hour, the Connectivity Lost event is generated. Once communication with the PDU is restored, the Connectivity Restored event is generated, and the health status will update.

To configure email notifications for this event, see **Configure Notification Filters** (on page 62). Event notifications must be enabled. See **Enable or Disable Event Notifications** (on page 61).

The event details are in the table.

Event description	Trap name
Loss of connectivity detected. A timestamp is associated with the event.	Connectivity Lost
Connectivity with the PDU is restored.	Connectivity Restored

View Events

The Events tab displays all events that Power IQ receives from configured PDUs.

▶ **To view events:**

- Click the Events tab. The Events browser page opens.

▶ **To view event details:**

1. Click the Events tab. The Events browser page opens.
2. Click the links in the Events column to open the Event details page.

Filter the Events List

You can customize your view of the Events list by using filters and sorting.

See *Customizing Your View of PDUs, Devices, and Events* (on page 65).

▶ **To filter the events list:**

In the Events tab, all events in the system display in a list.

Most columns of data contain a filter criteria selection. Click the arrow in the column header to open the options. Filter is the last option.

- Filter by date: In the Occurred on column filter, select the checkbox for Before, After or On, then select a date in the calendar to view events that occurred before, after or on the date you select.

- Filter by event severity: In the Severity column filter, select the checkbox for the severity of events you want to view. Select multiple options as needed.

- Filter by event name: In the Event column filter, enter an event name to view.

- Filter by PDU associated with the event: In the Associated PDU column filter, enter a PDU name or IP address to view events associated with a PDU.

- Filter by event status: In the Status column filter, select the checkbox for the status of events you want to view, either active, or cleared. Select multiple options as needed.

Export the Events List to CSV

Export the Events list to create a CSV file that contains all the information in the grid on the Events tab.

The exported file contains the same columns as the page in Power IQ. If you have applied filters, the same filters will apply to the exported information. Export includes all records matching the filter criteria. The export is not limited by the number of events shown in the list grid.

▶ **To export the Events list to CSV:**

1. In the Events tab, click the Export/Save icon 🖫 in the upper right corner of the grid.

2. Save or open the file using the dialog that appears.

Clear Events

Events can be automatically cleared by other events, or you can clear them manually.

▶ **To clear events in the Events browser view:**

1. In the Events tab, select the checkbox for an event in the list. Select multiple checkboxes to choose multiple events to clear.

2. Click Clear Selected Events.

▶ **To clear an event from the Events details page:**

1. In the Events tab, click the link for an event to open the Event details page. The link to open Event details is in the Events column.

2. In the Event details page, click "Clear this event".

Automatic Delete of Cleared Events

Power IQ automatically deletes cleared events from the system hourly.

Cleared events will only be deleted when there are more than 100,000 events in the database.

The oldest events in the system are eligible to be deleted first. If there are 100,000 or fewer events in the database at the hourly check, then no events will be deleted.

Only cleared events are eligible to delete. Power IQ will not delete active events.

You can access events and event configurations via ODBC views. If you need to keep a log of all generated events, run a script periodically that retrieves event data via ODBC before Power IQ deletes cleared events automatically.

Enable or Disable Event Notifications

If you would like to receive email notification for events that Power IQ receives, you must enable event notifications. When event notification is enabled, Power IQ sends an email message for every event. Set up notification filters if you do not want to receive emails for every event. See *Configure Notification Filters* (on page 62).

▶ **To enable or disable event notifications:**

1. In the Settings tab, click Power IQ Settings in the Application Administration section.

2. In the Event Notification Settings box, select the "Enable e-mail delivery of event notifications" checkbox to enable event notifications.

or

Deselect the "Enable e-mail delivery of event notifications" checkbox to disable event notifications.

3. Click Save.

▪ After enabling event notifications, the "Configure event notifications for your account" link appears. Click this link to use filters to manage your notifications.

▪ After enabling, configure the SMTP settings for your system. See **SMTP Server Settings** (on page 63).

Configure Notification Filters

When event notification is enabled, Power IQ sends an email message for every event. Set up notification filters if you do not want to receive emails for every event.

▶ **To add notification filters:**

1. Click your username link, next to the Logoff link in the upper right corner of Power IQ.

2. Click Manage Event Notifications.

3. Click "Add a filter."

4. Select the Enable this Filter checkbox.

5. Select the Severity levels of the events for which you want Power IQ to send email notifications: Critical, Warning, and Informational.

6. Select the Sources of the events for which you want Power IQ to send email notifications: Outlet, Inlet, Circuit Breaker, Environmental Sensors, and PDU Connectivity. Power IQ generates PDU connectivity events when connectivity is lost or restored with a PDU.

7. Select "Send notifications for all PDUs" to receive email notifications for all PDUs that meet the Severity level and Source criteria selected.

or

Select "Send notifications only for the following PDUs" and then enter IP addresses for PDUs or values for Custom Fields associated with PDUs.

▪ Enter a value in either or both custom fields to receive email notifications only for PDUs that have those custom field values assigned. Custom Field 1 and Custom Field 2 may be renamed in your system. See **Configuring Custom Fields** (on page 134).

- Click Add to enter the IP addresses of the PDUs for which email notifications should be sent. Enter a partial IP address to specify a group of PDUs in sequence. For example, enter 192.168.45 to specify all IP addresses beginning with that sequence. Click See Matching PDUs to verify the list of PDUs for which Power IQ will send email notifications.

8. Click Save.

Manage Event Notifications for Users

Users with the Site Administrator role can manage other user's event notification settings.

▶ **To manage event notifications for users:**

1. In the Settings tab, click User Accounts in the Authorization and Authentication section.

2. Click the username link for the user whose event notification settings you want to view.

3. Click "Manage event notifications."

4. Change the settings as needed and click Save. See ***Configure Notification Filters*** (on page 62) for details.

SMTP Server Settings

Configure the SMTP server settings to determine how email notifications are sent when Power IQ receives events.

You must reboot Power IQ after changing the encryption method in the SMTP server settings. See ***Shutting Down and Restarting Power IQ*** (on page 215).

▶ **To configure SMTP server settings:**

1. In the Settings tab, click Server Settings in the Appliance Administration section.

2. In the SMTP Server Settings section, enter the basic settings for the SMTP server.

   a. Server name/IP address: Enter the email server's domain name or IP address.

   b. Port: The default port is 25. Change this number if you use a different port.

   c. "Sender email address": Enter the Power IQ's IP address.

3. In the Authentication and Encryption Settings section, select the method for your SMTP server.

    a. Authentication type: Select None or Password. If you select Password, enter the Username, Password, and Confirm password.

    b. Select an Encryption method.

4. Click Send a Test Email to enter your email address and try sending an email message using the settings you configured. If you see a success message, click Save SMTP Settings.

If you see a failure message, edit your settings and try again. A password must be entered in the page to test the settings. Once saved, passwords do not display in the page for security.

Event Fuse Handling

The event fuse will not be de-activated until the trap rate drops 30% below the 15 traps/sec threshold and the trap rate is re-calculated each time a trap is received. Therefore the fuse will not be de-activated until Power IQ receives a trap and determines that the trap rate is 30% below 15 traps/sec.

If the event fuse is tripped and then no more traps are received, the event fuse will remain tripped until the next event is received.

Configuring Proxy Connections to Power IQ

If network restrictions prevent some users from connecting directly to Power IQ®, they may need access through a proxy server that is authorized to make the connection. Check your firewall and security settings to ensure that communication between the proxy server and Power IQ is allowed.

▶ **To configure proxy connections to Power IQ:**

1. In the Settings tab, click Server Settings in the Application Administration section.

2. In the Proxy Configuration section, select the web protocol the proxy server communicates over, HTTP or HTTPS.

3. Enter the IP address of the proxy server in the Proxy Host field. Power IQ only accepts proxy communication from this address.

4. Enter the communications port the proxy server uses in the Proxy Port field.

5. If the proxy server is required to authenticate with Power IQ, select Yes in the Authentication Required field, and enter a Username and Password. These fields must use a valid Power IQ username and password combination.

6. Click Save Proxy Settings.

Configuring PDU Display Settings - View PDUs by IP or Name

Select whether you want all PDUs in the system to be identified by PDU name or IP address in the Settings tab. This setting affects all pages where PDUs are listed, and is used in email notifications when identifying PDUs. This setting applies to all users in the system.

PDU names are retrieved from the PDU, via SNMP, NOT from the network. PDU name is not guaranteed to be unique. If a PDU name is not available, the PDU label is set to "Unnamed" and the IP address is included.

▶ **To configure PDU display settings:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.

2. In the Display Settings box, select Show PDU IP Address or Show PDU Name, then click Save Display Settings.

Customizing Your View of PDUs, Devices, and Events

Each user can save their own customized views of PDU, Device and Events lists in Power IQ. Once you save a customized view, it is retained even if you leave the tab and return, or use a different browser or client.

Note: If you open the PDU list by clicking on a health chart, your view will be filtered by the chart. For example, click the red bar of a health chart to view only the PDUs with red health status.

▶ **To customize your view of PDUs, Devices and Events:**

1. In the PDU, Device, or Events tab, drag and drop columns to customize your view. Hover the mouse on a column heading then click the arrow to view a drop-down list of other options. You can hide or show each column, set the ascending or descending order of data, or enter a search term to filter the column to include only items that match the search term.

   ▪ See *Filter the Events List* (on page 60).

   ▪ See *Filter the PDUs List* (on page 154).

   ▪ See Filter the Devices List.

2. Click the Panel Options button ⚙ in the upper right corner of the list view then select Save Current Grid Configuration to save your view.
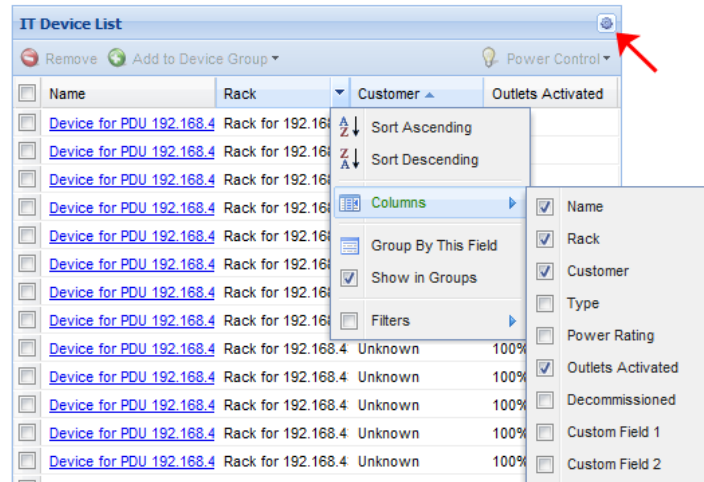
▶ **To return to the default view:**

- In the PDU, Device or Events tab, click the Panel Options button in the upper right corner of the list view, then select Use Default Grid Configuration.

Chapter 5   User Configuration

You can add both LDAP and locally authenticated users. All user permissions are authorized locally.

In This Chapter

Change the Administrator Password

It is important to change the default admin account password as soon as possible. This helps prevent unauthorized administrator access to Power IQ.

The password must follow the requirements selected in Settings > Password Requirements. See **Configuring Password Requirements** (on page 105).

▶ **To change the administrator password:**

1. Click the Settings tab.

2. Click User Accounts. The User Configuration page opens, displaying a list of all the user accounts created for the system.

3. Click Edit for the admin user.

4. Type a new password for the admin account in the Password field, then type it again in the Confirm Password field.

5. Click Save.

Adding, Editing, and Deleting Users

Add a User

▶ **To add a user:**

1. In the Settings tab, click User Accounts. The User Configuration page opens displaying a list of all the user accounts created for the system.

2. Choose Add > Add User. A blank user information page opens.

3. Enter the Common User Information.

   a. Enter a username with at least 3 characters, but not more than 40 characters. **Required**

   b. Enter the user's first name, last name, and email address.

   c. Password and Confirm Password: Enter a password for this user. Default password strength requires at least 8 characters, including one numerical character, one uppercase character, one lowercase character, and one of the following special characters: ~!@#$%^&*()_+{}|:"<>?/.,';][=-`"). See *Configuring Password Requirements* (on page 105). **Required**

   d. In the Description field, enter comments about the user.

Editing and Deleting Users - Local and LDAP

Edit Users

You can view and edit all users, including local and LDAP, in the User Accounts page.

Edited information is saved only to Power IQ, not to your LDAP server.

For information on editing user permissions, see *Assigning Roles for User Permissions* (on page 74).

▶ **To edit a user:**

1. In the Settings tab, click User Accounts.

2. Click the blue Login for the user you want to edit.

3. Click Edit and edit the information as needed.

   ▪ Login: 3 characters minimum. 40 characters maximum.

   ▪ First Name: 1 character minimum.

   ▪ Last Name: 1 character minimum.

   ▪ Email: Must contain a correctly formatted email address.

   ▪ Description: **Optional.**

Delete Users

You can delete users that no longer need access to Power IQ. Both local and LDAP users can be deleted. When a user is deleted, all data, roles, and public shared reports that may be used by other users, are deleted. Only one user can be deleted at a time.

▶ **To delete users:**

1. In the Settings tab, click User Accounts.

2. Select the checkbox for the user you want to delete.

3. Click Remove. A confirmation message appears. Click Delete User to confirm.

Configuring LDAP Authentication

Repair an LDAP Configuration After Upgrade

When you upgrade Power IQ to release 4.1, your previously configured LDAP settings require a repair process to be run. The Repair finds the DN of each user and stores that information in the database. Power IQ needs the DN of each user to be able to authenticate in Power IQ 4.1 and later.

You must run the repair function once after upgrade. LDAP users will not be able to login to Power IQ until you run the repair. Only the "admin" user account will be able to login before the repair is run.

Your LDAP server configuration, Bind DN and Base DN are retained. Your Bind Password is not retained, and you must enter it to run the repair. Search settings are not retained, but they are not needed to run the repair. You must enter them after repair if you need to find and add new LDAP users.
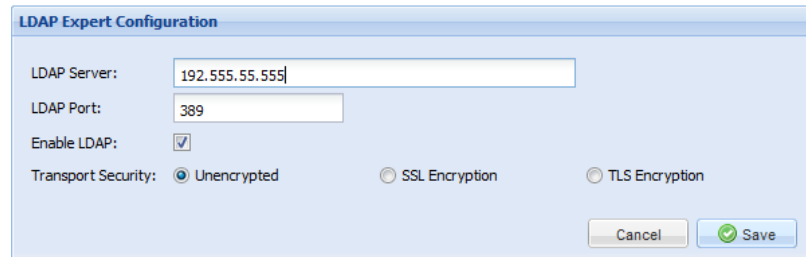
▶ **To repair an LDAP configuration after upgrade:**

1. In the Settings tab, click User Accounts.

2. Click Add > Find LDAP Users.

3. Enter your Bind Password and click Repair.

4. When the repair process completes, a message appears showing how many users were repaired.

5. To view any users that were not repaired, go to the User Accounts list, and check the LDAP DN column.

   a. In the Settings tab, click User Accounts.

   b. Click the LDAP DN column header to sort the list by LDAP DN value. Sort again if needed to find users with a blank LDAP DN value.

Configuring the LDAP Server Settings

The LDAP server settings enable Power IQ to connect to your LDAP server. To configure the LDAP search settings, go to Settings > User Accounts. See *Finding and Adding LDAP Users* (see "*Find LDAP Users*" on page 70).

▶ **To configure the LDAP server settings:**

1. In the Settings tab, click LDAP Server Settings.

2. Complete the fields with your LDAP information.

   ▪ LDAP Server: Enter the IP address or hostname.

   ▪ LDAP Port: Enter the port number.

      ▪ Port 389 is the standard, unencrypted and TLS-encrypted LDAP communication port.

      ▪ Port 636 is the standard, SSL-encrypted LDAP communication port.

   ▪ Transport Security: Select Unencrypted, SSL Encryption, or TLS Encryption.

3. Click Save.

   ▪ Next steps: See *Finding and Adding LDAP Users* (on page 70).

Finding and Adding LDAP Users

Find LDAP Users

Enter search and filter criteria to find LDAP users you want to add.

▶ **To find LDAP users:**

1. Make sure your LDAP server settings are configured. See *Configuring the LDAP Server Settings* (on page 70).

2. In the Settings tab, click User Accounts.

3. Click Add > Find LDAP Users.

4. Enter the Bind DN and Bind Password for an LDAP user that has permissions to perform search queries in the LDAP server.

5. Specify a Base DN (directory level/entry) under which the authentication search query will be executed. Power IQ can do a recursive search downward from this Base DN.

Example	Description
dc=raritan,dc=com	The search query for the user entry will be made over the whole directory structure.
cn=Administrators,cn=Users,dc=raritan,dc=com	The search query for the user entry will be performed only in the Administrators sub-directory (entry).

6. Type a user's attributes in the Filter field so the search query will be restricted to only those entries that meet this criterion. For example, (objectClass=user) or (objectClass=person) depending on how LDAP is configured.

7. Select the Scope. Select Subtree to allow a recursive search starting at the Base DN.

8. Select the Follow Referrals checkbox to allow LDAP to follow referrals to complete a search if referral objects are encountered while Power IQ is searching the LDAP server.

9. Click Find to search the LDAP server. A list of users displays in the Results section. Search results include a limited number of records. See **LDAP Search Results Limits** (on page 71).

10. You can edit the user account details, and add the LDAP users shown in the Results list. See **Add and Edit LDAP Users** (on page 72).
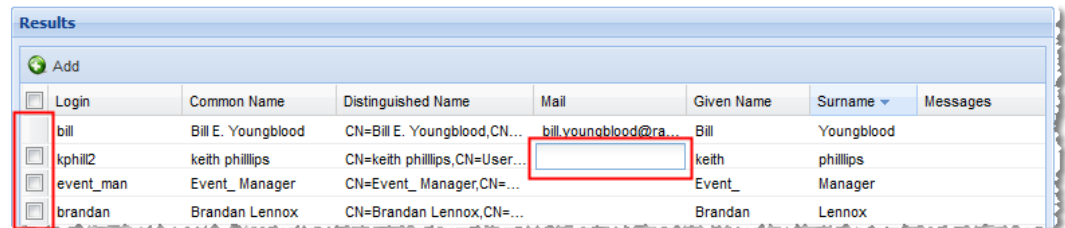
LDAP Search Results Limits

Power IQ's Find LDAP Users search result size is limited to the LDAP server's search limit. The number of records returned depends on the type of LDAP server being queried, and whether the server is configured with the default limit or some other value.

If your search results don't return the needed users due to the limit, refine your search configuration using more specific Base DN, Filter, and Scope. See **Find LDAP Users** (on page 70).

Add and Edit LDAP Users

Using an LDAP server search results list, you can edit user account details, and add the users to Power IQ.

▶ **LDAP users results list details:**

▶ **To add and edit LDAP users:**

1. Complete a search for LDAP users. See *Finding LDAP Users* (see "*Find LDAP Users*" on page 70).

2. Select the checkboxes for the users you want to add. Users without a checkbox have already been added.

3. Edit the user information as needed. User information can also be edited after users are added. To edit, click in the field to activate it. The Login, Mail, Given Name, and Surname columns are editable. Edits are saved to Power IQ only, not to the LDAP server. Edited fields display a triangle indicator.

   ▪ Login is required and must contain the username. 3 characters minimum. 40 characters maximum.

   ▪ Mail is required and must contain a correctly formatted email address.

4. Click Add. Successfully added users no longer have a checkbox. Check the Messages column to see errors for users who could not be added. Correct the information and click Add.

Adding, Editing, and Deleting User Groups

Default User Groups

There are two default user groups, All Users and Site Administrators.

The All Users group contains every user you add to Power IQ, and has the View role assigned to it.

The Site Administrators group contains the Admin user, and has the Site Administrator role assigned to it. The Site Administrator role allows users to do all tasks in Power IQ.

You can change the roles assigned to both groups.

Add a User Group

▶ **To add a user group:**

1. Click Settings.

2. Click User Groups.

3. Click Add, then enter a name. Click Next. The Group Information page opens.

4. In the Group Members section, select users in the drop-down list, then click Add. Users in the group appear in the list by login, name, and email.

5. In the Group Roles section, select roles in the drop-down list, then click Add to assign the permission to the group. Roles assigned to the group appear in the list. See *Role Definitions* (see "*Power IQ Role Definitions*" on page 74).

Edit a User Group Name

▶ **To edit a user group name:**

1. Click Settings.

2. Click User Groups.

3. Select a group then click Edit.

4. Click Edit to change the group name.

5. Click Save.

Delete a User Group

▶ **To delete a user group:**

1. In the Settings tab, click User Groups.

2. Select a group and click Remove.

Assigning Roles for User Permissions

Power IQ Role Definitions

Assign these roles to users or user groups to allow the permissions for operations within Power IQ.

You can assign any role to apply globally, meaning access to perform the tasks will be granted for every object in Power IQ. For example, a user assigned a global Power Control role can perform power control on any PDU or IT device, no matter where it is in the enterprise data model.

See *Assign Roles to a User Group* (on page 76) and *Assign Roles to a User* (on page 75).

Or, you can assign the Administrator, Operator, View, and Power Control roles to apply only to a certain object in your enterprise data model, such as a rack. See *Assign Roles within a Data Center* (on page 77). When these roles are assigned to the user or user group directly at the EDM-node-level via the Data Centers tab, the permission allowed will be limited to the selected enterprise data object, and all levels beneath it.

Role	Tasks	Applies To
Site Administrator ▪ The Site Administrators group is assigned this role by default, and contains the Admin user. ▪ "Super user"	Every task in Power IQ.	▪ Power IQ ▪ Global only.
Administrator	Every task in Power IQ, except for: ▪ Tasks in the Settings tab	▪ Global, when applied in Settings > User Accounts page. ▪ Selected EDM node and down, when applied in Data Centers tab
Operator	Every task in Power IQ, except for: ▪ Tasks in the Settings tab ▪ Power control ▪ Create reports and charts	▪ Global, when applied in Settings > User Accounts page. ▪ Selected EDM node and down, when applied in Data Centers tab
View	▪ View EDM in the Data Centers tab ▪ View all other tabs in Power IQ	▪ Global, when applied in Settings > User Accounts page. ▪ Selected EDM node and down, when applied in Data Centers tab

Role	Tasks	Applies To
Power Control	▪ Power control ▪ Create device groups ▪ View devices, device groups, PDUs.	▪ Global, when applied in Settings > User Accounts page. ▪ Selected EDM node and down, when applied in Data Centers tab ▪ See **Permissions for Power Control on a Device Group** (on page 78) for details on this task.
Create Reports and Charts	▪ Create reports and charts in the Analytics tab ▪ Create dashboards in the Dashboard tab	▪ Global only, applied in Settings > User Accounts page. ▪ The information a user can include or view in a report, chart, or dashboard is based on View permissions. ▪ A user with this role also needs the View role, or another role that includes View permission.
Event Manager	▪ View the Events tab ▪ Create event notification filters ▪ View and clear events ▪ View events in the Smart PDUs view	▪ Global only, applied in Settings > User Accounts page.

Roles Information for Upgraded Systems

If you upgraded Power IQ, all users who used to have the Administrator role will now be assigned the Site Administrator role.

Assign Roles to a User

Roles assigned to groups or users in the Settings tab give permissions that apply to all Data Centers, PDUs and Devices in Power IQ. These are sometimes referred to as "global" roles. See **Power IQ Role Definitions** (on page 74).

You can also assign the Administrator, Operator, Power Control, and View roles to a user or user group, but limit the role to only a specific level of a data center. To limit the permission, assign the role in the Data Centers tab, in the Permissions section of the data center level the role should cover. See **Assign Roles within a Data Center** (on page 77).

You must be assigned the Site Administrator role to assign roles.

▶ **To assign roles to a user:**

1. In the Settings tab, click User Accounts. Select a user then click Edit.

2. In the User Roles section, select roles in the drop-down list, then click Add to assign the permission to the user. Roles assigned to the user appear in the list.

   Users can perform the tasks allowed by the roles assigned.

Remove Roles from a User

► **To remove roles from a user:**

1. Click Settings.

2. Click User Accounts.

3. Select a user and click Edit.

4. In the User Roles list, select a role, then click Remove. The user can no longer perform the tasks allowed by the role.

Assign Roles to a User Group

Roles assigned to users or user groups in the Settings tab give permissions that apply to all Data Centers, PDUs and Devices in Power IQ. See *Role Definitions* (see "*Power IQ Role Definitions*" on page 74).

You can also assign the Administrator, Operator, Power Control, and View roles to a user or user group, but limit the role to only a specific level of a data center. To limit the permission, assign the role in the Data Centers tab, in the Permissions section of the data center level the role should cover. See *Assign Roles within a Data Center* (on page 77).

You must be assigned the Site Administrator role to assign roles.

► **To assign roles to a user group:**

1. In the Settings tab, click User Groups.

2. Select a user group, then click Edit.

3. In the Group Roles section, select roles in the drop-down list, then click Add to assign the permission to the group. Roles assigned to the group appear in the list.

   Users can perform the tasks allowed by the roles assigned to the group.

Remove Roles from a User Group

► **To remove roles from a user group:**

1. In the Settings tab, click User Groups.

2. Select a user group then click Edit.

3. Select a role, then click Remove. Users in the group can no longer perform the tasks allowed by the role.

▶ **To remove all roles from a user group:**

1. In the Settings tab, click User Groups.

2. Select a user group then click Edit.

3. In the Group Roles section, click Empty.

Assign Roles within a Data Center

You can control what individual users or user groups can see and do in Power IQ at each level in each data center. Permissions extend to levels nested below the selected level.

You can also assign global permissions for users and user groups for all levels of all data centers in Power IQ, and to PDUs not mapped into a data center. See *Assign Roles to a User* (on page 75) and *Assign Roles to a User Group* (on page 76).

Permissions are included in different roles that you assign. See *Role Definitions* (see "*Power IQ Role Definitions*" on page 74).

You must be assigned the Site Administrator role to assign roles.

▶ **To assign roles within a data center:**

1. In the Data Centers tab, select a data center level, such as a rack. The details page opens. At the Rack and PDU levels, the Smart Rack or Smart PDU view opens. See Smart Rack View and Smart PDU View

2. Permissions are accessed differently for Racks and PDUs than all other enterprise data model levels.

   ▪ For Data Centers, Rooms, Aisles, and Rows, use the Permissions section in the Data Centers tab to view or assign roles.

   ▪ For Racks, click Configure Rack Details in the Smart Rack view to open a dialog that contains permissions settings.

   ▪ For PDUs, click Configure PDU Details in the Smart PDU view to open a dialog that contains permissions settings.

3. Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object. level of the data center.

4. Select the role to allow in the Roles list. Click OK.

Permissions for Power Control on a Device Group

To perform power control operations on a device group, your permissions must satisfy one of the following.

- You have the global power control role.

OR

- You are the creator of the device group **AND** you have the power control role assigned within the Data Centers tab for every device in the device group.

Chapter 6   Dashboard

The Power IQ dashboard allows each user to customize collections of charts and widgets in a single view. You can create multiple versions of your dashboard and select which one to view, or start a slideshow for all or selected dashboards.

The default dashboard configuration includes 2 rows. The top row includes a health chart that shows overall PDU health, and a capacity gauge. The second row is a device chart that shows average active power over the past 24 hours.

You must have the Analyst role to edit the dashboard.

In This Chapter

Viewing the Dashboard

You can configure more than one version of the dashboard.

Other users can share their dashboards with you, as a shared report. You can share your dashboards with other users. You cannot edit dashboards that you did not create.

▶ To view the dashboard:

1. Click the Dashboard tab.

2. If more than 1 dashboard is configured, click the binoculars icon [icon] in the top right corner of the Dashboard tab. The Report Browser dialog appears.

- Dashboards shared by other users are marked as "Shared by username." Dashboards you are sharing are marked as "Shared by you."
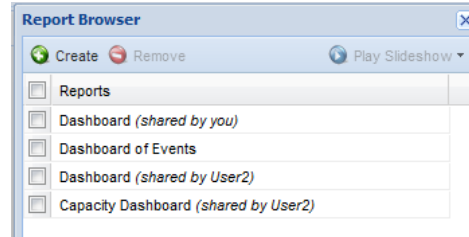
3. Hover over the dashboard you want to view then click the View link that appears. The selected dashboard loads in the Dashboard tab.

Sharing a Dashboard

A dashboard and its widgets are called a report in Power IQ. When you see the term "report" on a dashboard page, it means the whole dashboard configuration and all its widgets.

Choose to share a report on the dashboard when you want to make it public. Sharing reports gives other Power IQ users access to your dashboards, and the widgets it contains.

Users must have the View and the Create Reports and Charts role assigned to view your shared dashboards.

Reports that are shared are marked as "You are sharing." Reports that have been shared by other users are marked as "Shared by username."

The data that displays in a report is based on each individual user's permissions in Power IQ. If another user does not have permission to see information about a rack or datacenter, for example, that you have shared a report about, the user will not see the data.

Users that you share a report with cannot edit your report. You cannot edit reports that you did not create.

▶ **To share a dashboard:**

1. In the Dashboards tab, select a report. If you only have 1 dashboard, it will be displayed already. If you have configured multiple dashboards, click the 🗄 icon in the upper right corner to open the Report Browser. Hover over the dashboard you want to view then click the View link that appears. The selected dashboard loads in the Dashboard tab.

2. In the Dashboard tab, click the 🔧 icon in the upper right corner of the page. The Report Configuration dialog appears.

3. Select the Share this Report checkbox to make this dashboard and widgets public.

Report Configuration
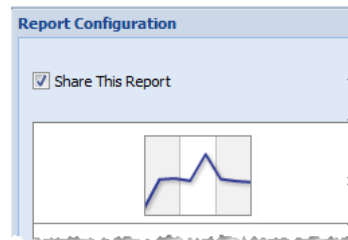
☑ Share This Report

4. Click Save.

▶ **To make a dashboard private:**

1. In the Dashboard tab, click the 🔘 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Deselect the Share this Report checkbox to remove the dashboard from public view.

3. Click Save.

Setting the Dashboard Layout

You can set the number of rows of widgets on your dashboard, drag and drop widgets into the rows, and resize each widget and row.

▶ **To set the dashboard layout:**

1. In the Dashboard tab, click the 🔘 icon in the upper right corner of the page. The Report Configuration dialog appears.

   ▪ To see a list of all available dashboards, use the Report Browser. Click the 📖 icon in the upper right corner of the Dashboard. You can only edit dashboards that you created.

2. Select the Share this Report checkbox to make this dashboard and widgets public.

3. Click a Layout to view the configuration in the dialog. The layouts are 1 row, 2 rows, 3 rows, or 4 rows.

4. Resize the rows by clicking and dragging the edges of a row. You can resize the width of a widget in a row, and the height of an entire row.

5. Drag and drop widgets from the bottom of the dialog into the rows. Drag and drop widgets from row to row to rearrange them. The row you're dropping into highlights green.

6. Drop a widget back into the bottom of the dialog to remove it from the layout.

7. Click Save. The dashboard layout you selected displays in the tab.

Configuring Widgets

Widgets are the configurable tools and charts you can add to the dashboard layout.

- *Active Events Widget* (on page 82)
- *Device Chart Widget* (on page 83)
- *PDU Health Chart Widget* (on page 84)
- *Capacity Forecast Chart Widget* (on page 85)
- *Capacity Gauge Widget* (on page 86)
- *Image Widget* (on page 87)
- *Report Heading Widget* (on page 88)
- *HTML Widget* (on page 89)
- *Cooling Chart Widget* (on page 90)
- *PUE Trend Chart Widget* (on page 96)
- *Latest PUE Reading Gauge Widget* (on page 97)
- *Facilities Chart Widget* (on page 99)

Active Events Widget

The active events widget displays the 10 highest severity, active events in a list.

You must have the Event Manager role assigned to view events. See *Assign Roles to a User* (on page 75).

The list refreshes automatically every 30 seconds.

▶ **To configure the active events widget:**

1. In the Dashboard tab, click the 🔘 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Active Events widget icon into a row. See *Setting the Dashboard Layout* (on page 81) for details.

3. Click Save. The widget is added to the dashboard.

≡E Raritan.

▶ **To use the active events widget:**

- Click an event link to open the event details page, where you can clear the event. See **Clear Events** (on page 61).

- See **Enable or Disable Event Notifications** (on page 61) for details on receiving email notifications of events.

Device Chart Widget

The device chart widget displays a default setting of average active power over the past 24 hours.

You can configure the device chart to display power measurements for different parts of the data center. Devices must be mapped to rack PDU outlets or circuits in the EDM before the data can be charted. See **Creating Your EDM** (on page 117).


Note: Use the Facilities Chart widget to display power measurements for your facilities objects. See **Facilities Chart Widget** *(on page 99).*

▶ **To configure the device chart widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Device Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.
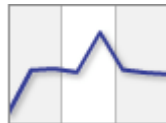
3. See **Device Chart Settings** (on page 203) for details on configuring this chart.

4. Click Save. The widget is added to the dashboard.

▶ **To use the device chart widget:**

- Click the export icon 🖫 to export all data in the chart to a .CSV file.

- The chart will automatically refresh at each polling interval. Click the refresh icon to refresh the chart manually.
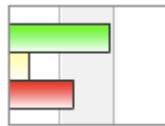
![Raritan logo]

PDU Health Chart Widget

The default PDU health chart widget shows overall health of all PDUs in the system.

You can configure the chart to show overall health, which includes connectivity and active events, or active events only, or connectivity only. You can also set the chart to include all PDUs in the system, or just the PDUs in a specific level of a data center. The chart refreshes automatically every minute.

▶ **To configure the PDU health chart widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the PDU health chart widget icon into a row. See *Setting the Dashboard Layout* (on page 81) for details.

3. Click the Settings icon ⚙.

4. Enter a name for the chart in the Title field in the Basics section.

5. In the Data From field, select All to include all PDUs in the system in the chart. Select Data Center or other section of the data center to filter the next field's selections. For example, select Racks to filter the Contained In field to include the racks in your system.

6. In the Contained In field, select the location of the PDUs you want to include in the Health chart.

7. In the Options section, select the health measurement.

   ▪ Select Overall Health to view a health chart that combines connectivity and active events to create an overall health status of the selected PDUs.

   ▪ Select Event Health Only to exclude connectivity from the health status.

   ▪ Select Connectivity Health Only to exclude active events from the health status.

8. Click Save.

▶ **To use the PDU health chart widget:**

   ▪ See *Overall PDU Health* (on page 209) for details on how health status is determined.

▪ Click a color-coded bar in the graphic to view the list of PDUs with the selected health status.

▪ The chart will automatically refresh to show the new health status based on any new and cleared events. Click the refresh icon to refresh the chart manually.

Capacity Forecast Chart Widget

The capacity forecast chart widget tracks maximum active power of a data center. Based on the capacity settings, the chart displays how many days of supply remain before your data center reaches capacity, or it will indicate that you have adequate capacity.

You must have configured the enterprise data model and have a minimum of 2 days of daily rollup of KW data. 30 days of daily rollup data is recommended for more accurate forecasts. The capacity field must be set for the data center node selected. Power capacity is set in KW with granularity of 2 decimal places, such as 5.04 KW. You can configure the capacity for different locations in your data center as part of your enterprise data model configuration. See **Enterprise Relationships** (see "**Enterprise Relationships and the EDM**" on page 114). To set individual capacities, see **Set a Capacity** (on page 86).

▶ **To configure the capacity forecast chart widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Capacity Forecast Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.

3. Click the Settings icon ⚙.

4. Enter a name in the Title field.

5. In the Show field, click the browse button, then select the data center node whose capacity you want to show in the chart. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node.

6. In the Period field, select the time period to include in the forecast.

7. Click Save. The widget is added to the dashboard.

▶ **To use the capacity forecast chart widget:**

- The solid line in the chart represents the measured time period. The dashed line represents the projected time period.

- The blue line shows the observed data.

- The purple line is the linear trend line.

- The dashed green line shows the projected data.

- The chart legend will indicate "adequate supply" when the trend does not cross the capacity line for the time period. If the trend line crosses the capacity line, the chart legend will indicate the number of days of supply remaining until capacity is reached: "Projected X days of capacity remaining."

Set a Capacity

Capacity in kilowatts can be set with up to 2 decimal places.

Capacity for Racks can only be set in the Data Centers tab. Capacity for data center, room, aisle, and row can be set either in the Data Center tab, or by importing the enterprise data model .CSV file. See ***Importing Object Mappings*** (see "***Import EDM Object Mappings***" on page 122).

▶ **To set a capacity:**

1. In the Data Centers tab, select a data center level, such as a room. The details page opens.

2. Enter the capacity in the Capacity (kW) field. On the Data Center level, first expand the Ratings and Settings section to find the Capacity field.

   Note: For the Rack level, click Configure Rack Details in the Smart Rack view to find the Capacity field. See **Configure Rack Details - Smart Rack View** *(see "***Rack Details***" on page 146).*

3. Click Save.

Capacity Gauge Widget

The capacity gauge widget shows how much power a selected node of your data center has consumed over a specified time period. The gauge shows a tick mark for minimum, maximum and average power consumed during the time period. The dial points to the real time active power reading.

▶ **To configure the capacity gauge widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Capacity Gauge widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.

3. Click the Settings icon .

4. Enter a name in the Title field.

5. In the Show field, click the browse button, then select the data center node whose power consumption you want to show in the dial. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node.

6. In the Period field, select the time period of power consumption to include in the dial.

7. Click Save. The widget is added to the dashboard.

Image Widget

The image widget displays an image that you upload on the dashboard.

The maximum images size is 800 pixels high by 800 pixels wide. The maximum file size is 2MB for dashboard images. Images uploaded for logo usage can be up to 512KB.

Uploading a new image to an image widget removes the previously uploaded image.

For details on adding a logo to every page in Power IQ, see **Display a Logo on Every Page** (on page 217).

▶ **To configure the image widget:**

1. In the Dashboard tab, click the icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Image widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.

3. Click the Settings icon .

4. Click the Browse button, select the image and click Open.

5. Click Save. The widget is added to the dashboard.

Report Heading Widget

The report heading widget allows you to add and format text on the dashboard. Position the report heading widget above or next to other widgets to use it as a heading. See *Setting the Dashboard Layout* (on page 81).

▶ **To configure the report heading widget:**

1. In the Dashboard tab, click the 🔘 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Report Heading widget icon into a row. See *Setting the Dashboard Layout* (on page 81) for details.

Title

3. In the Text field, enter the text you would like to display in the dashboard. Maximum title length is 64 characters.

4. Select the font type in the Font field.

5. Select the font size in the Size drop-down list.

6. Select the text color in the Color drop-down list.

7. In the Align field, select Left, Center or Right to specify how text will be oriented in the widget space on the dashboard.

8. Select the Bold or Italic checkboxes to format the text.

9. Click Save. The widget is added to the dashboard.

▶ **To edit text only:**

Once added to the dashboard, you can edit the text only, without changing style or layout, directly from the dashboard.

- In the Dashboard tab, double click heading text and edit in the text box that appears. Press Enter to save changes.
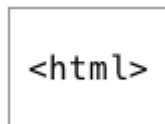
HTML Widget

The HTML widget enables you to add your custom HTML portlet to the dashboard. Use this widget to add a weather tool, maps, a video camera, or anything you can code using HTML.

HTML portlets may have security implications. You must allow them before you can add an HTML widget to the Dashboard tab. See ***Allow HTML Widgets on Dashboard*** (on page 217).

In Internet Explorer, you must accept a security warning the first time you view a dashboard containing an HTML widget.

▶ **To configure the HTML widget:**

1. In the Dashboard tab, click the 🔵 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the HTML widget icon into a row. See ***Setting the Dashboard Layout*** (on page 81) for details.

```
<html>
```

If you don't see the HTML widget icon, you must allow HTML portlets. See **Allow HTML Widgets on Dashboard** *(on page 217).*

3. Click the Settings icon 🔵.

4. Enter your HTML code in the HTML field.

5. Click Save. The widget is added to the dashboard.

Note: If you see unexpected changes in your dashboard after adding an HTML widget, you can reset it by disabling HTML portlets in the Settings tab. See **Allow HTML Widgets on Dashboard** *(on page 217).*

![Raritan.]

Cooling Chart Widget

Cooling charts enable you to compare your data center's sensor readings against industry recommendations.

American Society of Heating, Refrigerating and Air-Conditioning® (ASHRAE) is an industry consortium that provides guidelines for energy efficient data center operations.

ASHRAE recommends certain safe and energy-efficient operating temperatures and humidity levels. This data displays on the psychrometric chart in Power IQ. ASHRAE offers two different sets of recommendations, one from 2004, and one from 2008. The 2008 recommendations allow for slightly higher temperatures. When viewed on the chart, ASHRAE refers to these recommended regions of data as "envelopes."

In Power IQ, you configure the chart to display your data center's humidity and temperature readings on the same psychrometric chart as ASHRAE's recommendations. You can also specify smaller sections within a data center, such as a room or rack. This allows you to determine how your readings compare to an ASHRAE recommendation. You can also specify your own custom target operating zones. See Create a Custom Region.

▶ **To configure the cooling chart widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the cooling chart widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.

3. Click the Settings icon ⚙.

4. In the Show field, click the browse button to select a node from your enterprise data model. You can select any level, up to and including the data center. Potential energy savings is calculated only when a data center is selected.

5. In the Sensor Position field, select Inlet, Outlet, or Outside Air. Inlet specifies a "cold aisle" chart, and uses data from inlet located sensors. Outlet specifies a "hot aisle" chart, and uses data from outlet located sensors. Outside air uses data from outside located sensors. See **Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors** (on page 181).

6. Select the region to display on the chart. See **ASHRAE® Envelope Descriptions** (on page 92) for details of each region.

- All regions display in blue on the chart. Custom regions have default settings you can change. Select Custom, then select the Min Temperature and Max Temperature and the Min Humidity and Max Humidity.

7. Select Zoom In or Zoom Out to specify a more or less detailed view of the chart to display.

8. Enter a name for the chart, or check the Autoname checkbox to accept the system name. The system name for a cooling chart contains the level of the enterprise data model, such as data center, and the sensor location information.

9. Click Save. The widget is added to the dashboard.

▶ **To use the cooling chart widget:**

- Hover your mouse over the sensor data points to view details. See **View Sensor Data Point Details** (on page 93).

- Click the export icon 🖫 to export sensor data in the chart to a .CSV file. See **Export Sensor Data** (on page 94).

- The chart will automatically refresh at each polling interval. Click the refresh icon to refresh the chart manually.

- To calculate savings, see **Calculate Potential Cooling Energy Savings** (on page 95)

Requirements for Cooling Charts

Cooling charts use data from the humidity and temperature sensors in your data center.

You must have at least 1 temperature sensor and at least 1 humidity sensor connected to use Cooling charts.

ASHRAE® Envelope Descriptions

ASHRAE® operating envelopes comprise the following settings.

- X-Axis: Temperature
- Y-Axis: Humidity Ratio, with the relative humidity percentage calculated along curves on the chart

The area inside the region created by plotting the thresholds for these data points are recommended by ASHRAE to be safe and energy-efficient zones of operation for a data center.

There are two ASHRAE® envelopes available for display in Power IQ, based on recommendations issued by ASHRAE in 2004 and in 2008.

You can also create a custom region to display on the chart, in addition to ASHRAE regions. See Create a Custom Region.

▶ **ASHRAE 2004 Envelope:**

The ASHRAE 2004 recommended operating envelope is a rectangular area with the following coordinates.

- 20 Celsius (68 F), 40% RH
- 20 Celsius (68 F), 55% RH
- 25 Celsius (77 F), 40% RH
- 25 Celsius (77 F), 55% RH

▶ **ASHRAE 2008 Envelope:**

The ASHRAE 2008 recommended operating envelope is a pentagon-shaped area with the following coordinates.

- 18 Celsius (64.4 F), 42% RH
- 18 Celsius (64.4 F), 60% RH
- 22.7 Celsius (73 F), 60% RH
- 27 Celsius (80.6 F), 49% RH
- 27 Celsius (80.6 F), 25%RH

View Sensor Data Point Details

On a cooling chart, the data points for your sensors display as green points.

You can verify whether the points are inside the recommended region you chose to display. The cooling chart allows you to view the details of each data point, and access the associated PDU details page.

Note: If more than one sensor has the same reading, the points will appear stacked, so that 2 points appear to be 1. Hover the mouse over the point to view the details of each stacked point. Export the sensor data to view the details of each point in a text file. See **Export Sensor Data** *(on page 94)*

▶ **To view sensor data point details:**

1. In the Dashboard tab, locate your cooling chart. Hover the mouse over a green data point.

2. The sensor data point details display in a pop-up.

   - Humidity Sensor Label

   - Humidity Sensor Location - (EDM Hierarchy Rack location)

   - Temperature Sensor Label

   - Temperature Sensor Location - (EDM Hierarchy Rack location)

3. Click the green data point. The Sensor List for Data Point dialog appears.

4. Click a row of data to open the PDU details page for the PDU where the sensor is located. Pop-up blockers may prevent this page from opening.

Cooling Chart Details - How Your Sensor Data is Charted

By default, Power IQ considers all environmental sensors to be inlet located. You can specify a sensor as outlet, inlet, or outside air located in the PDU details page. See *Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors* (on page 181).

For each sensor data point, the cooling chart will display the details of the associated humidity and temperature sensors. See *View Sensor Data Point Details* (on page 93).

Each data point requires two coordinates: temperature and humidity. For each temperature measurement, Power IQ correlates the corresponding humidity value. If the same sensor does not support both humidity and temperature readings, then the nearest humidity sensor is used to correlate temperature measurement with humidity measurement. The determination of the nearest humidity sensor is based on the Power IQ Enterprise Data Model hierarchy. For example, Floor -> Room -> Aisle -> Row ->Rack.

Export Sensor Data

To view pairs of sensor readings in a CSV file, export the data. The exported file contains a column called In Region, and a list of points. Points inside the region are listed as TRUE. Points outside the region are listed as FALSE.

Calculate Potential Cooling Energy Savings

Power IQ calculates the estimated cost savings you may experience by raising the temperature of your data center to a higher temperature while remaining within the guidelines of a selected ASHRAE® or custom region.

The potential cooling energy savings displays at the bottom of a cooling chart automatically when a data center is selected as the EDM node included.

- Potential cooling energy savings can only be calculated at the data center level, not at lower levels, such as room, or rack.

- All temperature sensor data points must be below the upper temperature limit for the region selected, or the calculation will show as 0%. The calculation works by showing you a potential estimated savings based on raising your highest temperature to the maximum allowed by the selected region.

Industry estimates show that you could save 3.9% for each 1 degree Fahrenheit that you raise the data center temperature; or 7% for each 1 degree Celsius that you raise the data center temperature. Your actual savings will vary. You can adjust the savings percentage used in the calculation.

▶ **To adjust the savings percentage used:**

1. In the Data Centers tab, select the data center node.

2. In the Ratings and Settings section, enter the percentage to use in the calculation in the Savings % per degrees C field.

   - The Savings % is set to a default: 7% for Celsius readings. Readings for Fahrenheit are calculated based on the Celsius percentage, and estimated at 3.9%.

3. Click Save. Go back to the cooling chart in the Dashboard to view updated potential cooling energy savings.

PUE Trend Chart Widget

The PUE trend chart allows you to see how your data center's PUE has changed over a time period you select. Either daily or monthly calculations may be used. The length of the trend depends on how much data Power IQ has collected, as well as your selection.

Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. Monthly data charts will update after each rollup. Monthly adjustments will affect this chart. See *List PUE Calculations and Adjustments* (on page 213). Note that daily values cannot include adjustments. A daily chart may be significantly different than a monthly chart when monthly adjustments are used.

You must configure your system before PUE is calculated. See *Requirements for PUE* (on page 211).

▶ **To configure the PUE trend chart widget:**

1. In the Dashboard tab, click the 🔘 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the PUE trend chart widget icon into a row. See *Setting the Dashboard Layout* (on page 81) for details.
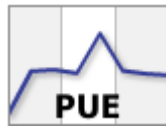
3. Click the Settings icon 🔘.

4. In the Granularity field, select the data you want plotted in the chart, either Monthly or Daily .

5. In the Time Selection section, select Period or Range.

6. Select Period to show constantly updated measurement.

7. Select Range to show measurements from a custom Start Date and End Date. Select the start and end dates using the calendar dialogs.

8. Enter a name for the chart, or check the Autoname checkbox to accept the system name.

9. Select the Include Legend checkbox to display a legend with the data center names included on the chart.

10. Click Save. The widget is added to the dashboard.

Latest PUE Reading Gauge Widget

The latest PUE reading gauge allows you to see where your data center's PUE falls in the threshold range you have configured. You can set a warning and critical threshold level for each data center.Warning and critical threshold levels are displayed as yellow and red in the gauge. See *Set PUE Thresholds* (on page 98).

The gauge also shows the minimum PUE calculation and the maximum PUE calculation for a time period you specify. This data displays as tick marks, and may overlap.

Either daily or monthly calculations may be used. The latest PUE calculation is used. For daily gauges, the previous day is used. For monthly gauges, the previous full month is used. Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. Monthly gauges will update after each rollup.

You must configure your system before PUE is calculated. See *Requirements for PUE* (on page 211).
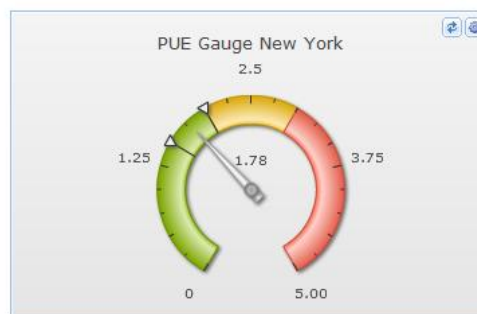
▶ **To configure the latest PUE reading gauge widget:**

1. In the Dashboard tab, click the 🔧 icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the latest PUE reading gauge widget icon into a row. See *Setting the Dashboard Layout* (on page 81) for details.

3. Click the Settings icon 🔧.

4. Enter a Title for the gauge.

5. Select the Data Center whose PUE you want to display.

6. In the Granularity field, select the calculation you want to display, either Monthly or Daily .

7. In the Min/Max Period field, select the time period to include in the gauge calculation. The gauge displays the minimum and maximum of PUE values over the time period selected The values are indicated with tick marks.
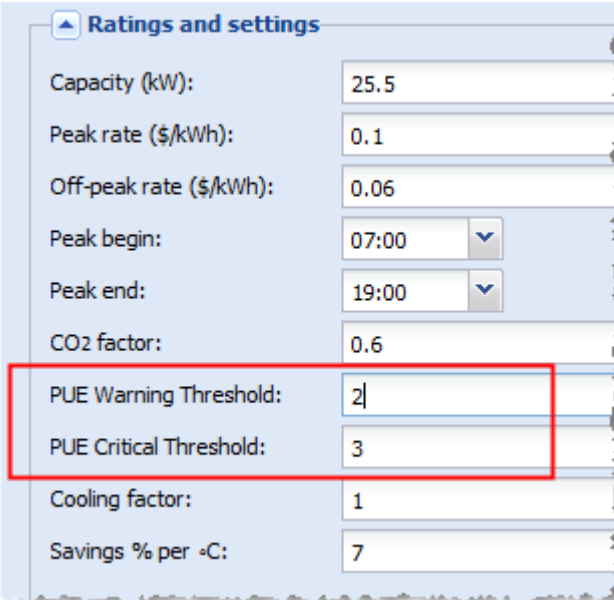
8. Click Save. The widget is added to the dashboard.

Set PUE Thresholds

An ideal PUE is 1.0. You can set warning and critical thresholds for your data center, and Power IQ uses those values to help visualize your PUE in the dashboard. See **Latest PUE Reading Gauge Widget** (on page 97) for details on the widget that displays this data.

PUE is calculated only at the data center level.

▶ **To set PUE thresholds:**

1. In the Data Centers tab, click a data center node.

2. In the Ratings and Settings section, set the threshold values for PUE Warning Threshold and PUE Critical Threshold.

▲ Ratings and settings	
Capacity (kW):	25.5
Peak rate ($/kWh):	0.1
Off-peak rate ($/kWh):	0.06
Peak begin:	07:00
Peak end:	19:00
CO2 factor:	0.6
PUE Warning Threshold:	2
PUE Critical Threshold:	3
Cooling factor:	1
Savings % per °C:	7

3. Click Save. See **Latest PUE Reading Gauge Widget** (on page 97) for details on configuring the widget that uses these values.

Facilities Chart Widget

The facilities chart widget enables you to display active power or energy readings for one or more facilities objects, such as a CRAC, floor PDU, floor UPS, power panel, or standalone meter, in your data center.

Rack PDUs are excluded from this chart.

Facilities objects must be mapped in the EDM before the data can be charted. See **Create Your EDM** (see "**Creating Your EDM**" on page 117).

▶ **To configure the facilities chart widget:**

1. In the Dashboard tab, click the ⚙ icon in the upper right corner of the page. The Report Configuration dialog appears.

2. Drag and drop the Facilities Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 81) for details.

3. Configure the settings.

   - Measurement: Active Power or Energy

   - Time Range: Period or Custom

     - Period shows preconfigured time options, such as Past hour, Past week, Past month, and so on. Select the time period from the drop-down list. See **What's the difference between "Past" and "Last" time periods?** (on page 206)

     - Custom show measurements between the Start Date and End Date chosen in the calendar dialogs.

   - Granularity: Monthly, Daily, Hourly, Poll Interval

     - Monthly, Daily, and Hourly show 1 data point per month/day/hour for the time period the chart includes. The time period must be longer than the granularity.

     - Poll Interval shows 1 data point per poll interval for the time period the chart includes. The Poll Interval must be set to 5 minutes or longer to use Poll Interval granularity.

   - Statistic: Minimum, Maximum, or Average readings for each data point.

   - Title: Automatic or Custom. Automatic chart title is Statistic + Measurement + Time Range. For example, Average Active Power - Past 24 Hours.

- Lines: Show one line per data source, or Sum all data sources into one line. A data source is one facility object selected in the Data Sources table.

4. In the Data Sources table, click Add, then select the facilities objects to include. Use Control-Click to select multiple objects. Click Select Nodes. The table displays your selections.

5. Click Save. The widget is added to the dashboard.

View Dashboards as a Slideshow

When you have more than 1 dashboard configured, you can view them as a slideshow. Slideshows play in full screen mode. To enhance the full screen affect, set your browser to full screen mode, too.

▶ **To view dashboards as a slideshow:**

1. In the Dashboard tab, click the Manage icon 🔖 in the top right corner of the dashboard.

2. The Report Browser dialog appears. All configured dashboards display in a list. The first dashboard listed will display as your default dashboard. Drag and drop the entries in the list to set a new default, and to choose the order the entries will display in the slideshow.

3. Select the checkboxes for the dashboards you want to include in the slideshow. Select the first checkbox to automatically select all configured dashboards.

4. In the Play Slideshow drop-down list, select the length of time each dashboard will display in the slideshow before moving to the next dashboard. When you select the time, the slideshow starts.

▶ **To exit the slideshow:**

- Click the "Exit full-screen mode" link in the top right corner, or click the Raritan logo.

View Dashboard in Full Screen Mode

You can view the dashboard in full screen mode, which removes all other borders and controls.

▶ **To view dashboard in full screen mode:**

- In the Dashboard tab, click the full screen mode icon ▣ in the top right corner of the dashboard.

▶ **To exit full screen mode:**

- Click the "Exit full-screen mode" link in the top right corner, or click the Raritan logo.

How Does Power IQ Calculate the Sum of a Data Center Node?

Power IQ uses a formula for charting a whole data center node, such as a Room, that prevents duplication of data.

The sum of a node is the sum of the inlets of all rack PDUs under the node, plus the sum of all non-duplicate Circuits in all Power Panels, Floor PDUs, and UPSs contained by the node. See Floor PDUs, Power Panels, UPS, Standalone Meters in the Data Center Browser

If a node contains a rack that contains an IT device mapped to a floor PDU outside that node, the IT device is not part of the sum of that node.

An HVAC system's power is part of the sum of the power for charts drawn for the physical location it serves, as position in the Data Center browser. See *CRACs in the Data Center Browser* (on page 159)

Chapter 7   Security and Encryption

In This Chapter

Installing an HTTPS Certificate

A PEM file upload is required to replace the current certificate and private key. The PEM file needs to contain both an RSA private key and an X509 certificate.

Note: Power IQ® does not provide a Certificate Signing Request (CSR). OpenSSL or any other utility can be used to generate CSR. Power IQ does not use encrypted private keys. You must remove the password from the Private key before it can be used. To remove the encryption from the key, issue a command like: "openssl rsa -in server.key -out server2.key". Use "server2.key" when using openSSL utility.

It is not required to provide root certificate of CA signing Power IQ certificate signing request (CSR).

▶ Step 1: Generate a private key

This example procedure is for generating a private key using OpenSSL on a Linux server.

1. This command creates an RSA key with Triple DES 1024 byte encryption.

   ```
   openssl genrsa -des3 -out server.key 1024
   ```

2. Remember the key password from this command.

3. Generate a Certificate Signing Request. Be prepared to complete the following information:

   - private key password

   - two character country code

   - full state or province name

- city name

- company name

- organizational unit or leave it blank

- servers common name or fully qualified domain name

- admin email address

- other attributes can be left blank

4. Create the request.

   ```
   openssl req -new -key server.key -out server.csr
   ```

5. Display the CSR request.

   ```
   cat server.csr
   ```

6. Copy the CSR request and send it to the certificate authority to be signed. Make sure to copy everything between the first "-----" and the last "-----".

7. Submit CSR to certificate authority and receive signed X.509 certificate.

8. Modify the server key to remove the password

   ```
   cp server.key server.key.secure
   ```

   ```
   openssl rsa -in server.key.secure -out server.key
   ```

   Warning: The server.key file must be kept private and secure. If this key file is compromised, the certificate should be removed and then reissued.

9. Create PEM file.

   - The PEM file should contain both the RSA private key without password and the X.509 certificate.

   - Concatenate the unprotected private key to the signed X.509 certificate file from the top level certificate authority.

   - Use this file in the upload in Step 2.

▶ **Step 2: Upload the PEM file to Power IQ:**

1. In the Settings tab, click HTTPS Certificate in the Security and Encryption section.

2. If uploaded, the currently HTTPS certificate displays. To replace it or add a new certificate, click Browse and select the PEM file.

3. Click Upload.

Restricting Web and Shell Access Based on IP Address

To increase security, Power IQ® can be configured to restrict web interface and SSH access by IP address. When trusted hosts are specified, Power IQ blocks attempts to connect from addresses not specified. When no hosts are specified, ports 22, 80, 443, 5432 are open to all hosts.

▶ **To restrict web and shell access:**

1. In the Settings tab, click IP based Access Control in the Security and Encryption section.

2. The global options will override any options that allow access to the SSH and ODBC service.

   - Allow ICMP ping responses

   - Block all SSH access

   - Block all ODBC access: See *ODBC Access* (on page 278).

3. Identify the hosts to allow access to in the Trusted Hosts fields.

   You can enter an IP address, or a subnet using CIDR notation such as 192.168.45.0/24.

4. For each address, select how it is permitted to access Power IQ.

   - Select the Enable SSH to allow SSH access checkbox.

   - Select the Enable HTTP/HTTPS checkbox to enable access through the web interface.

   - Select Enable ODBC to allow third party access.

5. Click Save.

Configuring Password Requirements

To specify password strength for Power IQ users, select from a list of password requirements. Users that are locally authenticated will be required to use passwords that comply with the settings. For example, you may require that all passwords contain a number and are longer than 8 characters.

Password requirements apply to locally authenticated users only. If LDAP is enabled, the password requirements selected are not followed.

Changes to the password requirements apply only to future new and changed passwords. Users whose passwords were created before the password requirement change will not be forced to change passwords to comply with the requirements.

▶ **To configure password requirements:**

1. In the Settings tab, click Password Requirements in the Security and Encryption section.

2. In the Minimum Password Length field, select the minimum number of characters a password must include.

3. In the Maximum Password Length field, select the maximum number of characters a password may include.

4. Select the checkboxes for each requirement you want included in locally-authenticated user passwords.

   ▪ a lowercase character: Password must contain any lowercase letter.

   ▪ an uppercase character: Password must contain any capital letter.

   ▪ a numeric character: Password must contain a number.

   ▪ a special character: Password must contain any special character, including: ~!@#$%^&*()_+{}|:"<>?/.,';][=-\`

5. Click Save.

Encrypting Data Backup Files

Power IQ encrypts data backup files using a GnuPG/PGP public key that you generate.

You can generate PGP Encryption Keys using free tools. Go to https://www.gnupg.org and look for a binary for your operating system on the Downlaods page.

Important! Make sure to save both the public and private keys that you generate. You need the public key for backup file encryption and the private key for backup file decryption. See *Decrypt Backup*

Files Before Restoring **(on page 112)**

▶ **To encrypt the data backup files:**

1. In the Settings tab, click Data Backup Encryption in the Security and Encryption section.

2. Select the Encrypt Backups checkbox.

3. Click Browse, then select and upload a GnuPG/PGP Public Key to Power IQ.

4. Click Save.

Enabling Single Sign On for Raritan Products

You can launch the web interface of a Raritan PX1 or PX2 PDUs or a Raritan EMX by clicking the Launch link on the PDU details page. When single sign on is not enabled, users must then login manually.

Enable single sign on to allow users to automatically authenticate with their Power IQ credentials.

Users must have identical credentials on Power IQ and on the target Raritan product, and be logged in to Power IQ with those credentials for single sign on to succeed. Single sign on must be enabled in Settings > Single Sign On.

See *Launch the Web Interface for a Dominion PX PDU* (on page 156).

▶ **To enable or disable single sign on for Raritan Products:**

1. In the Settings tab, click Single Sign on in the Security and Encryption section.

2. Select the "Enable single sign on to Raritan PDUs" checkbox to enable, or deselect the checkbox to disable single sign on.

3. Click Save.

Enabling the WS API

To get started with the WS API, the API needs to be enabled through the Settings Tab. It is disabled by default.

▶ **To enable the Web API:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.

2. In the Web API Settings, select the Enable Web API checkbox, then click Save.

Enabling the Web API User Account

The Web API user account is a locally authenticated user that can be used for Web API scripts that require user credentials. The username is "web_api." The password for the account can be configured.

The Web API account is configurable only on the Settings > Other Security Settings page. The Web API user is always authenticated locally, even when LDAP is enabled.

The Web API account is assigned the administrator role. This role assignment cannot be changed.

▶ **To enable the Web API user account:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.

2. In the Web API Settings, select the "Enable web API user web_api" checkbox.

3. In the Web API user password field and the Confirm password field, enter a password.

   ▪ The password must follow the requirements selected in Settings > Password Requirements. See **Configuring Password Requirements** (on page 105).

4. Click Save.

Change Web User Session Timeouts

You can set Power IQ™ to log out any web users who have been inactive for a certain period of time.

▶ **To change web user session timeouts:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.

2. In the User Session Timeout box, select a time from the "Log users out" list. The time indicates how long users can remain idle on the Power IQ web interface before being logged out. Select Never to disable this feature.

3. Click Save Timeout.

Configuring the Authorization Warning Message

The authorization warning message displays on the Power IQ login page. You can change the default message.

▶ **To configure the authorization warning message:**

Warning: Do not use html scripts in the message. Some scripts could cause the system to lock you out.

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.

2. In the Authorization Warning message section, enter the message you want to display on the login page.

   - Header: Text entered in this field displays on the login page in a bold font, as the heading to the message

   - Body: Text entered in this field displays in a normal font, as the main content of the message.

3. Click Save. Log out of Power IQ to return to the login page and view the message.

Configuring Enterprise Power IQ Settings

Enterprise Power IQ must use the password configured to communicate with a local Power IQ installation.

▶ **To configure Enterprise Power IQ settings:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.

2. Enter the password that will be required in Enterprise Power IQ to communication with this local Power IQ.

3. Enter the password again to confirm.

4. Click Save Enterprise Power IQ Settings.

≡E Raritan.

Chapter 8   Data Management

In This Chapter

Configuring Data Rollup Retention

Power IQ performs periodic roll-ups. During a roll-up, the values over that period are averaged and stored along with the minimum and maximum values that were measured. As time passes, the stored roll-up data itself is rolled up into larger sets of data. Raw data measurements are rolled up every hour, and 24 hourly roll-ups are rolled up every day, and so on.

Data does not have to be purged immediately after a roll-up occurs. For example, raw data is rolled up every hour but a set of raw data can still be made available five hours later. You can configure how long Power IQ retains each level of data.

Ideally, you should adjust the data retention periods before adding PDUs to Power IQ management. You should also revisit these settings after adding a large number of PDUs.

Note: Power IQ collects a lot of data. Keeping this data for long periods of time consumes large amounts of storage space and may affect performance. If you need long term access to the raw poll data, you should download daily sensor readings regularly. See **Downloading Daily Sensor Readings** *(on page 214).*

Before making any changes to this configuration, enter your settings in the data storage calculator to ensure adequate database capacity. Improper configuration may result in data loss. Access the data storage calculator by clicking the link on the Settings > Data Rollup Retention page in Power IQ.

► **To configure data rollup retention:**

1. In the Settings tab, click Data Rollup Retention, in the Data Management section.

2. Start with the "Retain raw data" row. Use the drop-down lists in that row to select how long Power IQ should keep this raw data.

3. In the Retain hourly averages of data row, configure how long hourly roll-ups are stored.

4. In the Retain daily averages of data row, configure how long daily roll-ups should be stored.

5. In the Retain monthly averages of data row, configure how long monthly roll-ups should be stored by Power IQ.

Data Backups

Power IQ creates a daily system configuration backup file.

You can download the files to another location. *Downloading System Configuration Backup Files* (on page 110).

To automatically download daily backup files, setup a remote storage location. See *Configuring Remote Storage of Archive Files* (on page 113).

You can also create a new system configuration backup file at any time. See *Create a System Configuration Backup File* (on page 110).

If needed, you can use a backup file to restore your Power IQ to an earlier, backed-up configuration. See *Restoring System Configuration Backups* (on page 111).

Downloading System Configuration Backup Files

The configuration of your Power IQ is backed up and archived once each day. Administrators should periodically copy these backup files to an external server for redundancy purposes.

Note: You can also manually create an archive of the system configuration by clicking Create at any time.

▶ **To download the system configuration backup file:**

1. In the Settings tab, click Data Backups in the Data Management section. The Data Backups page opens.

2. Select a backup entry from the list and click its name to download the backup file to your computer.
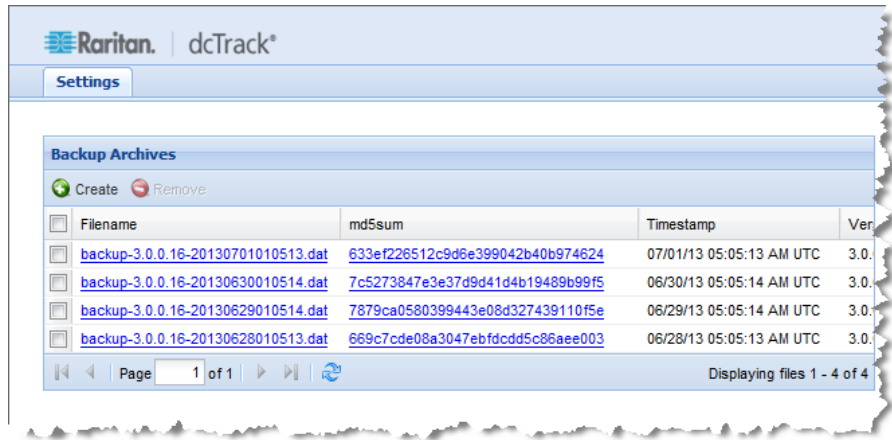
Create a System Configuration Backup File

Power IQ creates a daily backup file. You can create a new backup file at any time.

▶ **To create a system configuration backup file:**

1. In the Settings tab, click Data Backups in the Data Management section.

2. In the Backup Archives section, click Create. The file is created and added at the top of the list. An MD5 file is also created along with the backup file for verification purposes.

3.

Restoring System Configuration Backups

If your system configuration backup file is encrypted, see *Decrypt Backup Files Before Restoring* (on page 112).

Restoring a system configuration backup file returns Power IQ's configuration to the settings captured when the backup was made.

Note: If you restore a backup containing an SSL security certificate that is different from the one currently installed on the system, the progress bar for "Restoring the system and restarting..." will not complete. This happens because the browser will not accept any messages from Power IQ until you establish a secure connection using the restored certificate. Start a new browser session and you can log into the system once the former certificate has been restored.

▶ **To restore a system configuration:**

1. In the Settings tab, click Data Backups in the Data Management section. The Data Backups page opens.

2. In the Restore a Backup Archive section, click Browse, then select a backup file.

Click Upload. The Power IQ data and configuration settings are restored to the backup's configuration settings, and the server is rebooted.

Decrypt Backup Files Before Restoring

You must decrypt encrypted backup files before they can be used to restore a Power IQ system.

▶ **To decrypt X.509/MIME encrypted backup file:**

Use the openssl Linux command to decrypt a X.509/MIME encrypted backup file.

- Example:

```
[root@localhost ~]# openssl smime -decrypt -in
/root/backup-3.1.0.30-20111118010513.dat -inkey
user-private-key -inform DER -recip
user-public-key >unencrypted-backup.dat
```

▶ **To decrypt a PGP encrypted backup file:**

Use the gpg Linux commands to decrypt a PGP encrypted backup file.

- Example:

```
[root@dhcp-209 ~]# gpg --import PGP_private_key2.txt

gpg: directory `/root/.gnupg' created

gpg: new configuration file `/root/.gnupg/gpg.conf'
created

gpg: WARNING: options in `/root/.gnupg/gpg.conf' are not
yet active during this run

gpg: keyring `/root/.gnupg/secring.gpg' created

gpg: keyring `/root/.gnupg/pubring.gpg' created

gpg: key 41965311: secret key imported

gpg: /root/.gnupg/trustdb.gpg: trustdb created

gpg: key 41965311: public key "username@email.com"
imported

gpg: Total number processed: 1

gpg: imported: 1 (RSA: 1)

gpg: secret keys read: 1

gpg: secret keys imported: 1


[root@dhcp-209 ~]# gpg --decrypt --output
/root/unencypted.dat
/root/backup-4.0.2.8-20130220153455.dat
```

```
You need a passphrase to unlock the secret key for

user: "username@email.com"

1024-bit RSA key, ID 41965311, created 2013-02-19


can't connect to `/root/.gnupg/S.gpg-agent': No such file
or directory

gpg-agent[9705]: directory
`/root/.gnupg/private-keys-v1.d' created

gpg: encrypted with 1024-bit RSA key, ID 41965311, created
2013-02-19

"username@email.com"

gpg: WARNING: message was not integrity protected
```

System Configuration Backup File Retention

Power IQ retains backup for four days. A file older than four days is deleted automatically, unless it is the only stored backup file. One backup file is always kept, regardless of age.

Configuring Remote Storage of Archive Files

Configure a remote storage server to automatically store your archive files. All files that are not being actively written to are automatically stored on the configured server. Sensor reading archives are often being actively written to, so their storage may be approximately one day delayed.

Two file types are eligible for automatic remote storage.

- System configuration archives, that is, system configuration backup files, including daily automatic backups and manually created backups

- Sensor reading archive files

▶ **To configure remote storage of backup files:**

1. In the Settings tab, click Remote Storage in the Data Management section.

2. Select the remote storage service type.

   - None: to stop automatic remote storage

   - Amazon Web Services

   - SCP

- SFTP

- FTP

3. Select the checkboxes for the file types you want to automatically store on a remote server.

- Store backup archives

- Store sensor reading archives

4. Complete the authentication and location information for your selected remote server.

5. Click Save.

Configuring Remote Access to Database

Power IQ's ODBC interface allows ODBC compliant applications access to the power data of managed devices. For example, an ODBC compliant reporting application like Crystal Reports can access Power IQ data to create customized reports.

See **ODBC Access** (on page 278) for details on configuration and queries.

Enterprise Relationships and the EDM

One of Power IQ's advanced features is the ability to model the IT equipment infrastructure within your data center. Power IQ can model something as simple as a single rack, or as large as a building with multiple server rooms.

In Power IQ, this hierarchical representation of your data center is called the enterprise data model, or EDM. The EDM shows the relationships between objects in your data center and enables Power IQ to:

- Display a representation of your equipment in the Data Centers tab.

- Generate charts in the Analytics tab.

- Generate charts and gauges on the Dashboard.

- Calculate PUE.

What is an Enterprise Data Model (EDM) Object?

An object is an item that is a part of your data center.

The objects are mapped by relationships of parent and child, creating a hierarchy.

Higher-level objects contain and organize lower-level objects. For example, a Rack is an object that contains Devices, a Row is an object that can contain Racks, and an Aisle is an object that can contain Rows. See *Object Types and their Hierarchy* (on page 116)

The lowest-level objects are called Devices. Devices are items such as servers, KVM drawers, network switches, or other equipment commonly installed in server racks. Generally speaking, these are items you provide power to.

There are a couple of special exceptions. You can map circuits and outlets as part of your EDM, but these objects don't show in the main hierarchy in the Data Centers tab. Since their associations are to your IT devices, circuits display in the device details pages, and outlets display in both the device details pages, and rack PDU smart pages.

What are Mappings and Relationships?

All objects, except for the Data Center, must have a larger object as a parent. Generally speaking, a parent object is a larger object that contains a smaller object.

The Data Center object is the largest object. It has no parent object.

This ability to identify an object's parent is a single mapping. Mapping each object to its parent describes a model of equipment and how it is organized to Power IQ.

Your model does not have to include every level, as long as it follows the rules for parent-child relationships. See *Object Types and their Hierarchy* (on page 116).

Object Types and their Hierarchy

From the top of the hierarchy to the bottom:

- DATA_CENTER - The data center object type. This object has no parent.
- FLOOR - The floor object type. This object can only have a DATA_CENTER as a parent.
- ROOM - The room object type. This object can have a DATA_CENTER or FLOOR as a parent.
- AISLE - The aisle object type. This object can have a DATA_CENTER, FLOOR, or ROOM as a parent.
- ROW - The row object type. This object can have a DATA_CENTER, FLOOR, ROOM, or AISLE as a parent.
- RACK - The rack object type. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, ROW, or RACK as a parent.
- DEVICE - The IT Device object type. This object can only have a RACK as a parent.

These objects represent outlets, circuits, PDUs, and sensors:

- PDU - The PDU object type. This object represents all types of PDUs in Power IQ, including Rack PDUs, CRACs, Floor PDUs, Floor UPS, Power Panels, and Standalone Meters. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, ROW, or RACK as a parent.
- SENSOR - The sensor object type. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, or ROW as a parent.
- OUTLET - The outlet object type. This object can only have a DEVICE as a parent.
- CIRCUIT - The circuit object type. This object can only have a DEVICE as a parent.

Requirements for Creating EDM

- All PDUs included in your EDM must already be added to Power IQ. See *Adding PDUs to Power IQ Management* (on page 20).

Creating Your EDM

There are several ways to create your EDM:

- Import a CSV file containing the EDM object mappings. See *Importing EDM Object Mappings* (see "*Import EDM Object Mappings*" on page 122).

- Add objects manually in the Data Centers tab, using drag-and-drop to arrange the hierarchy. See *Create an EDM Manually* (on page 118).

- Generate a default EDM. A default EDM gives you a starting point for customization using the other methods, and enables you to start using dashboard charts immediately. See *Generate a Default EDM* (on page 129).

Create an EDM Manually

The Data Centers tab has menu options to add each EDM object manually, and associate PDUs and sensors. Once objects are added, drag and drop them to arrange the hierarchy that represents your data center. See **Object Types and their Hierarchy** (on page 116) for details on each object and how it can be used in the EDM.

See **Importing EDM Object Mappings** (see "**Import EDM Object Mappings**" on page 122) for an alternative to creating the EDM manually.

Prerequisite: PDUs must be added to Power IQ before creating an EDM. See **Adding PDUs to Power IQ Management** (on page 20).

▶ **To add EDM objects:**

You can add Data Center, Floor, Room, Aisle, Row, Rack, and IT Device objects.

Click Add, then select the object and name it when it appears in the tab.
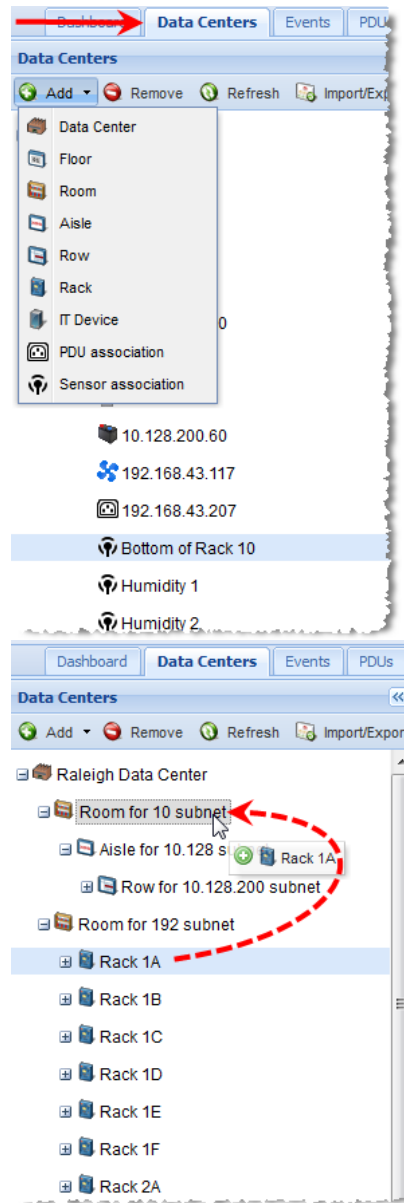
▶ To associate PDUs and sensors:

To associate PDUs in the EDM, you must add them to Power IQ first. Use the PDU Association menu option to find PDUs that are not yet in the EDM, and place them in the hierarchy. Power IQ automatically adds your sensors to the EDM when you associate their PDUs. And, Power IQ moves your sensors when they have the same parent as the PDU. See **Automatically Associate Sensors in the EDM** (on page 121).
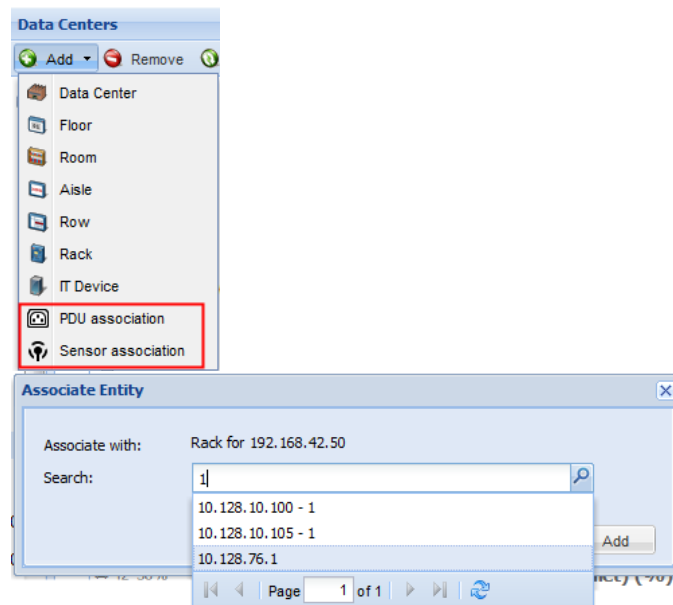
Note: Only PDUs and sensors that are unassociated will appear as options. PDUs include facilties objects.

▶ **To associate outlets and circuits with IT devices:**

Outlets and circuits can be associated with IT Device objects only. See ***Associate a Circuit or Outlet with an IT Device*** (on page 130).

Automatically Associate Sensors in the EDM

Power IQ automatically associates your sensors into the EDM. See **Enterprise Relationships and the EDM** (on page 114).

Every five minutes, Power IQ checks for sensors that are not part of the EDM. If the sensor's PDU is in the EDM, Power IQ adds the sensor to the PDU's parent object, usually a rack. Click Refresh in the Data Centers tab to view the updated EDM.

When you associate a PDU in the EDM, Power IQ adds the sensors to the PDU's parent object.

When you remove a PDU from the EDM, Power IQ unassociates sensors that are associated with the PDU's parent object. But, any sensor that were associated to other EDM objects stay where they are.

When you move a PDU in the EDM, Power IQ moves the sensors that had the same parent to the new parent. But, any sensors that were associated to other EDM objects stay where they are.

Note: Because unassociated sensors attached to an associated PDU will be re-associated every five minutes, you cannot remove a sensor from the EDM if it's PDU is in the EDM.

You can also associate sensors manually and by import. See **Create an EDM Manually** (on page 118) and **Import EDM Object Mappings** (on page 122).

Icons for EDM Objects

The following icons are used to represent each object in the EDM.

Icon	Object
	Data Center
	Floor
	Room
	Aisle
	Row
	Rack
	IT Device
	Rack PDU
	Sensor

Icon	Object
	CRAC
	Floor PDU
	Floor UPS
	Power Panel
	Standalone Meter

Import EDM Object Mappings

One method to create or add to an EDM is to import the objects and their mappings. These mappings are imported as one or more Comma Separated Value (CSV) files. Additional CSV files append to the EDM, except when objects are duplicated in the CSV files. In the case of duplicates, the last uploaded object updates the previous entries.

If an EDM already exists, you can export it as a single CSV file. This file can then be edited to make additions, or used as a template to create a new file. See *Exporting an EDM* (on page 130).

For details on creating the CSV file, see *Structure of the EDM Import File* (on page 123).

Note: All PDUs must be added to Power IQ first, before importing an EDM. Importing a CSV file that lists a PDU not added to Power IQ results in an error. See **Adding PDUs to Power IQ Management** *(on page 20).*

▶ **To import EDM object mappings:**

1. In the Settings tab, click Enterprise Relationships.

2. In the CSV Data Mapping Actions area, click Browse, and select the CSV file.

3. Click Import.

A status window indicates any issues that occurred when the upload completes. If any errors have occurred, none of the objects in the file are added. Edit the CSV file to correct any issues and try again.

Structure of the EDM Import File

The EDM import file must be in .CSV format.

▶ **General structure:**

- One Object per line.

- All Objects except for a Data Center list another valid object as a parent.

- All Objects have a unique key for their type.

- Within a single CSV file, object order is not important. All objects are processed at the same time.

- The CSV file has a maximum length of 2500 lines, meaning a maximum of 2500 objects can be imported at one time. See ***Importing More than 2500 Objects*** (on page 129) for details on importing multiple files. Object order and import order are important in this case.

▶ **Object key:**

An object's unique identity is a combination of its object type and its object key, which is called an external key. This means you could have two objects with the same name, as long as they are different types of objects.

However, if two lines are both type "DEVICE" and both have an external key "Sales1", Power IQ sees only one device object with the key "Sales1". In this case, it uses the last DEVICE object identified as "Sales1" as the description for that device.

The columns required for each object varies, depending on the object type.

All columns are separated by a comma.

- Most columns containing text information can be up to 64 characters long. These columns can contain any character except for a comma.

- The custom_field_1, custom_field_2, external_key and parent_external_key fields can be up to 255 characters long. These columns can contain any character except for a comma.

CSV Columns for DATA_CENTER Objects

A line that describes a Data Center object has the following attribute columns in the order listed.

All columns are separated by a comma.

Note the attribute columns toward the end. For example: by providing the cost of energy for the data center, Power IQ can calculate the cost of running the data center in an Analytics report. Report can be filtered to include only a smaller object, such as a Rack. See *Configuring Charts* (on page 203).

- object_type - this value is always "DATA_CENTER"
- external_key - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.
- name - The name of the data center.
- contact_name - The name of the contact for this data center.
- contact_phone - The phone number for the contact for this data center.
- contact_email - The email address of the contact for this data center.
- company_name - The name of the company that owns this data center
- city - The city where the data center resides.
- state - The state/province where the data center resides.
- country - The country where the data center resides.
- peak_kwh_rate - The cost per kilowatt hour during peak hours
- off_peak_kwh_rate - The cost per kilowatt hour during off-peak hours
- peak_begin - The time the peak hours begin.
- peak_end - The time the peak hours end.
- co2_factor - The co2 factor for this site. This indicates thse amount of carbon dioxide produced per kWh.
- cooling_factor - The cooling factor per kw energy used. This is the energy used for cooling, or how many kilowatts of energy are used to cool 100 kilowatts of power consumption.
- custom_field_1 - A custom field for the user to specify.
- custom_field_2 - A second custom field for the user to specify.
- capacity - The peak capacity in kilowatts, specified with up to two decimal places.

CSV Columns for FLOOR, ROOM, AISLE, and ROW Objects

Lines that describe a Floor, Room, Aisle, or Row have the following attribute columns in this order:

- object_type - One of the following values: FLOOR, ROOM, AISLE, ROW

- external_key - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.

- name - The name of the object.

- parent_object_type - One of DATA_CENTER, FLOOR, ROOM, or AISLE, as described previously.

- parent_external_key - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object (however, many "child" objects may have the same parent).

- capacity - The peak capacity in kilowatts, specified with up to two decimal places.

CSV Columns for RACK Objects

A line that describes a Rack has the following attribute columns in this order:

- object_type - RACK

- external_key - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.

- name - The name of the object.

- parent_object_type - One of DATA_CENTER, FLOOR, ROOM, AISLE, or ROW, as described previously.

- parent_external_key - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object (however, many "child" objects may have the same parent).

- location - an optional field that can be used to identify where rack sits in a row or aisle.

The Rack model object is similar to the Floor, Room, Aisle and Row objects. The exception is the location value. This value is intended to make the rack easier to identify, and can be given a location value. For example: "3rd Rack" to indicate the third rack in a particular row.

It can also use some other identifying trait. For example: "Yellow" if the rack has a yellow color.

CSV Columns for DEVICE Objects

A line that describes a Device object has the following attribute columns in this order:

- object_type - this value is always "DEVICE"

- external_key - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.

- name - The name of the data center.

- parent_object_type - This value is always "RACK".

- parent_external_key - The external key for the parent rack.

- customer - The customer using this device.

- device_type - The type of device. For example: "exchange server" or "test unit".

- power_rating - The power rating of this device in watts or VA.

- decommissioned - Indicates whether this device has been decommissioned or not. This value is either "true" or "false".

- custom_field_1 - A custom field for the user.

- custom_field_2 - A second custom field for the user.

- device_ip - The IP address of the device. Required when also importing a graceful shutdown command.

- shutdown_command_name - The name of the shutdown command assigned to this device. See **Add Shutdown Commands** (on page 191).

- shutdown_wait_time - The number of seconds Power IQ should wait for the shutdown to complete before powering off the associated outlet. See **Enable Graceful Shutdown for an IT Device** (on page 192).

▶ **Sample CSV for a device with a graceful shutdown command:**

DEVICE,Device -- 54,Web Server 7,RACK,Rack -- 12,Marketing,Linux Server,,false,Dell PowerEdge R910,Tag# 336549,192.168.43.142,Marketing Linux Servers Shutdown Commands,5

▶ **Sample CSV for a device without a graceful shutdown command:**

DEVICE,Device -- 55,Router,RACK,Rack -- 12,Marketing,Cisco Router,,false,Cisco 7600 Router,Tag#044142,,,

CSV Columns for OUTLET Objects

A line that describes an Outlet object has the following attribute columns in this order:

- object_type - this value is always "OUTLET"

- pdu_ip - The IP address of the PDU that this is attached to.

- pdu_proxy_address - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.

- outlet_number - The outlet number on the side of the PDU for this outlet.

- parent_object_type - This value is always "DEVICE"

- parent_external_key - The unique identifier for the DEVICE that this outlet serves.

Power IQ automatically creates Outlet objects when Dominion PX PDUs are placed under its management. If you create an Outlet object with a pdu_ip not under Power IQ management, the CSV file generates an error.

CSV Columns for PDU Objects

You must add all PDUs to Power IQ before you can map them in the EDM.

A line that describes a PDU object has the following attribute columns in this order:

- object_type - This value is always `PDU`.

- pdu_ip - The IP address of the PDU.

- pdu_proxy_address - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.

- parent_object_type - One of DATA_CENTER, FLOOR, ROOM, AISLE, ROW, RACK.

- parent_external_key - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object. Many "child" objects may have the same parent.

CSV Columns for CIRCUIT Objects

You must add all PDUs to Power IQ before you can map them in the EDM.

A line that describes a CIRCUIT object has the following attribute columns in this order:

- object_type - This value is always `CIRCUIT`.
- pdu_ip - The IP address of the PDU.
- pdu_proxy_address - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- panel_number - If the circuit is located in a panel, enter the panel number.
- circuit_number - The circuit's number
- parent_object_type - A circuit's parent_object is always DEVICE.
- parent_external_key - The parent DEVICE's external key. This field must be unique to that parent object. Many "child" objects may have the same parent.

CSV Columns for SENSOR Objects

Sensors must have unique labels.

A line that describes a SENSOR object has the following attribute columns in this order:

- object_type - This value is always `SENSOR`.
- pdu_ip - The IP address of the PDU the sensor is attached to.
- pdu_proxy_address - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- type - One of the following values: `AIR_FLOW,, AIR_PRESSURE, CONTACT_CLOSURE, HUMIDITY, SMOKE, TEMPERATURE, VIBRATION, WATER.`
- ordinal: The number of the sensor's position on the PDU.
- parent_object_type - A sensor's parent_object is one of the following: `DATA_CENTER, FLOOR, ROOM, AISLE, ROW, RACK.`
- parent_external_key - The parent DEVICE's external key. This field must be unique to that parent object. Many "child" objects may have the same parent.

Importing More than 2500 Objects

The EDM import file may contain a maximum of 2500 lines, one line per object. If you have an EDM with more than 2500 objects, create multiple CSV files.

In this case, the contents of each CSV file, and the order in which you import them is important.

All objects except for Data Center must have a valid parent when added. Importing a child object in file #1, and the parent object in file #2, results in an error.

Make sure each file contains a parent object for each object, or import all high-level parent objects first, such as Data Center and Room, then import the lower-level child objects in subsequent files.

Recommended Number of Objects Per Level

In the EDM hierarchy, a maximum of 350 "child" objects per parent is recommended.

For example, a Data Center should not have more than 350 Racks under it.

Generate a Default EDM

If you've added PDUs to Power IQ, you can generate a default EDM. You can customize the default EDM using the menu options in the Data Centers tab, or use export, edit the file, and re-import.

Generating a default EDM deletes all mappings already configured.

The default EDM contains:

- 1 data center
- 1 room
- 1 aisle
- 1 row per facilities object types of PDU, that is CRAC, floor PDU, floor UPS, power panel, standalone meter
- 1 rack per rack PDU

▶ **To generate a default EDM:**

1. In the Settings tab, click Enterprise Relationships in the Data Management section.

2. Click Generate Default Enterprise Relationships in the CSV Data Mapping Actions section.

3. Click OK to confirm.

Associate a Circuit or Outlet with an IT Device

To allow for power control functions for outlets, you must associate your IT devices with their outlet. To allow for charting devices, the IT devices must be associated to their circuits or outlets.

▶ **To associate a circuit or outlet with an IT device:**

1. In the Data Centers tab, select the IT device in its rack. The IT device details page opens.

2. In the Power Connections section, click Associate, then choose Outlets or Circuits.
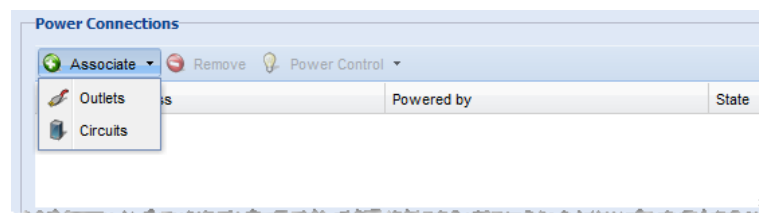
3. The Associate Entity dialog opens. Begin typing the circuit or outlet name in the Search field. A list of unassociated circuits or outlets appears that match your search.

   Note: If a list does not appear, there are no unassociated outlets or circuits in Power IQ.

4. Select the circuit or outlet in the list, then click Add.

Exporting an EDM

Power IQ can export the existing EDM, as well as any unmapped PDUs, circuits, and sensors, as a CSV file. Use the file to edit and re-import, as a backup, or as a template for creating a new file.

Power IQ exports all object mappings as a single CSV file, regardless of how many objects it contains. If you want to re-import a file that contains more than 2500 objects, separate them into multiple CSV files.

Note: To find unmapped PDUs, circuits, and sensors in the exported file, look for objects with a blank "parent_external_key".

▶ **To export an EDM:**

1. In the Settings tab, click Enterprise Relationships.

2. In the CSV Data Mapping Actions area, click Export Relationships.

Clearing Enterprise Relationships

Clearing the enterprise relationships deletes the EDM. Deleting the EDM will disrupt all configured charts that are based on EDM relationships.

▶ **To clear enterprise relationships:**

1. In the Settings tab, click Enterprise Relationships in the Data Management section.

2. In the CSV Data Mapping Actions box, click Clear Enterprise Relationships.

3. Click "Clear all enterprise relationships" in the warning message to confirm.

Viewing Enterprise Relationship Summaries

The summary of enterprise mappings provides an overview of the EDM configured in Power IQ.

In the Settings tab, click Enterprise Relationships. The summary is in the top left corner.

Summary of Enterprise Mappings			
51 Total PDUs	20 Mapped PDUs	3 Data Centers	6 Rows
337 Total Outlets	337 Mapped Outlets	0 Floors	36 Racks
35 Total Sensors	35 Mapped Sensors	2 Rooms	339 IT Devices
		2 Aisles	

Viewing Orphaned Systems Information

The Orphaned Systems information shows whether there are any PDUs in Power IQ that are not mapped to a parent object in the EDM. PDUs that are not in the EDM cannot be included in charts.

▶ **To view orphaned systems information:**

• In the Settings tab, click Enterprise Relationships in the Data Management section of the page.

  The Orphaned Systems information is in the top right section of the page that opens.

  See the table for explanations and possible action required.

	Outlets Mapped	Outlets Not Mapped

	Outlets Mapped	Outlets Not Mapped
PDU Mapped	The number of PDUs that are mapped to a parent object such as a rack, and have at least one outlet mapped to an IT device. No action is required.	The number of PDUs that are mapped to a parent object such as a rack, but do not have any outlets mapped to IT devices. No action is required.
PDU Not Mapped	The number of PDUs that are not mapped to a parent object such as a rack, but have 1 or more outlets mapped to IT devices.	The number of PDUs that are not mapped to a parent object such as a rack, and have zero outlets mapped to a device.
	Action required! If you have unmapped PDUs, you must assign them to a parent object for analytics to perform correctly. See ***Find and Map Unmapped PDUs*** (see "***Finding Unmapped PDUs***" on page 132).	Action required! If you have unmapped PDUs, you must assign them to a parent object for analytics to perform correctly. See ***Find and Map Unmapped PDUs*** (see "***Finding Unmapped PDUs***" on page 132).

Finding Unmapped PDUs

There are several ways to find unmapped PDUs so that you can map them to parent objects in the EDM.

All PDUs must be mapped to a parent object, such as a rack. PDUs that are not in the EDM cannot be included in charts.

▶ **To view the number of unmapped PDUs:**

See ***Viewing Orphaned Systems Information*** (on page 131).

▶ **To find unmapped PDUs in CSV file export:**

1. In the Settings tab, click Enterprise Relationships.

2. Click Export Relationships.

3. In the CSV file, find the section labeled "`# The following section contains the current list of PDUs and the PDU column headers for use during import.`"

4. In that section, find the "`parent_object_type`" column. Rows without data in the "`parent_object_type`" column are unmapped PDUs.

5. Map the unmapped PDUs to parent objects in a data center.

▶ **To find unmapped PDUs in a default Enterprise Data Model:**

This method maps unmapped PDUs to an "Unassigned Data Center" parent object so that you can view the PDUs in the Data Centers tab. Then, you can drag and drop the PDUs to the correct position beneath a parent object, such as a rack.

1. In the Settings tab, click Enterprise Relationships.

2. Click Generate Default Enterprise Relationships.

3. When the generation completes successfully, click the Data Centers tab and find the Unassigned Data Center.

4. Expand the Unassigned Data Center. All the previously unmapped PDUs are assigned to this data center object.

5. Drag and drop the PDU objects to assign them to the correct parent objects, such as racks, within the correct data center.

▶ **To manually assign PDUs to a parent object:**

When you attempt to manually associate PDUs to a parent object in the Data Centers tab, only unmapped PDUs are available in the search tool.

1. In the Data Centers tab, select the parent object, such as a rack, that you want to associate an unmapped PDU with.

2. Click Add > PDU Association.

3. In the Associate a PDU dialog, select an unmapped PDU in the PDU IP Address field, and click OK. The PDU is mapped to the data center parent object.

Configuring Custom Fields

The Data Center, Device, and PDU objects each contain two custom field values.

Custom fields display in the Data Centers tab's hierarchy on the object page, for all 3 types of custom field. PDU custom fields also display in the PDUs tab, in the PDU Details. IT Device custom fields also display in the Devices tab, in the Device Details. You can use custom field values as filters when configuring charts. See **Configuring Charts** (on page 203).

By default, these are named:

- Data Center Custom Field 1 and Data Center Custom Field 2

- IT Device Custom Field 1 and IT Device Custom Field 2

- PDU Custom Field 1 and PDU Custom Field 2

Rename the field to specify the information it will contain. For example, to add data about the department that uses a group of devices, rename the IT Device Custom field "Department," and enter department names in the field for each device in Power IQ.

► **To configure custom fields:**

1. In the Settings tab, click Enterprise Relationships in the Data Management section.

2. In the Configure Custom Fields box, enter the new field name next to each custom field.

3. To assign data to the field, enter the data in the newly renamed custom field in either the Data Centers tab, on the objects page, or in the PDUs or Devices tab, in the details page. Data Center custom fields can only be accessed in the Data Centers tab. Or, you can use CSV import to update the information. See **Importing Object Mappings** (see "**Import EDM Object Mappings**" on page 122).

Chapter 9   PDUs

For simplicity in the GUI, Power IQ uses the term PDU to encompass any device that Power IQ polls to gather power or sensor data.

When you see the term PDU in the product interface, remember that it includes every polled object: rack PDUs, CRACs, floor PDUs, floor UPSs, power panels, standalone meters, and environmental sensor aggregators.

In this guide, the following terms are also used:

- Rack PDU

Facilities Objects: CRAC, floor PDU, floor UPS, power panel, and standalone meter.

In This Chapter

Viewing a PDU

All PDUs have a smart view page, which you can access from different tabs.

For details on the smart views:

- *Rack PDU Smart View* (on page 137)
- *Rack Smart View* (on page 143)
- *CRAC Smart View* (on page 160)
- *Floor PDUs Smart View* (on page 163)
- *Floor UPS Smart View* (on page 168)
- *Power Panels Smart View* (on page 172)
- *Standalone Meters Smart View* (on page 176)

▶ **View a PDU in the Data Centers tab:**

The Data Centers tab displays your EDM. See *Enterprise Relationships and the EDM* (on page 114). Find your PDU within the EDM hierarchy, and click it to access the smart view.
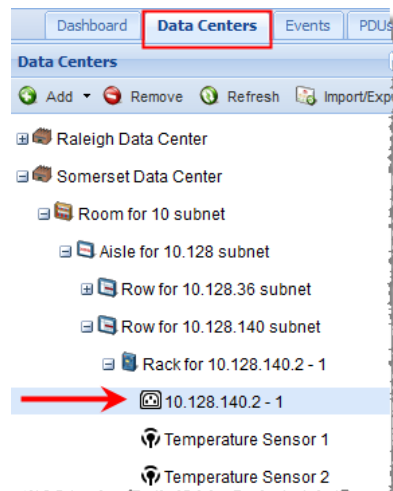
> **View a PDU in the PDUs tab:**

The PDUs tab lists all PDUs in Power IQ, even if they are not in the EDM. To go to the smart view, find your PDU in the list, and click the Label link.
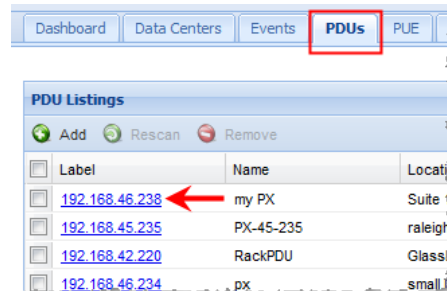
- If the PDU is not in the EDM, the smart view opens in the PDUs tab.
- If the PDU is in the EDM, the smart view opens in the Data Centers tab, and you'll see the EDM hierarchy expand to show you where the PDU is organized in the EDM.

Rack PDU Smart View

A rack PDU smart view may contain the following sections, depending on the PDU:

- *Rack PDU Energy Trends* (on page 138)
- *PDU Elements - Rack Smart View and Rack PDU Smart View* (on page 147)
- *Rack PDU Readings* (on page 139)
- *Rack PDU Sensors* (on page 141)
- *Rack PDU Details* (on page 142)
- *Rack PDU Event Listing* (on page 142)
- *Rack PDU Asset Strips* (on page 143)

Rack PDU Energy Trends

Energy Trends display at the top of the rack PDU smart view.

- Active Power
- IT Energy
- Line Current - one trend-line for each line in the PDU
- Circuit Breaker Current - one trend-line for each circuit breaker in the PDU
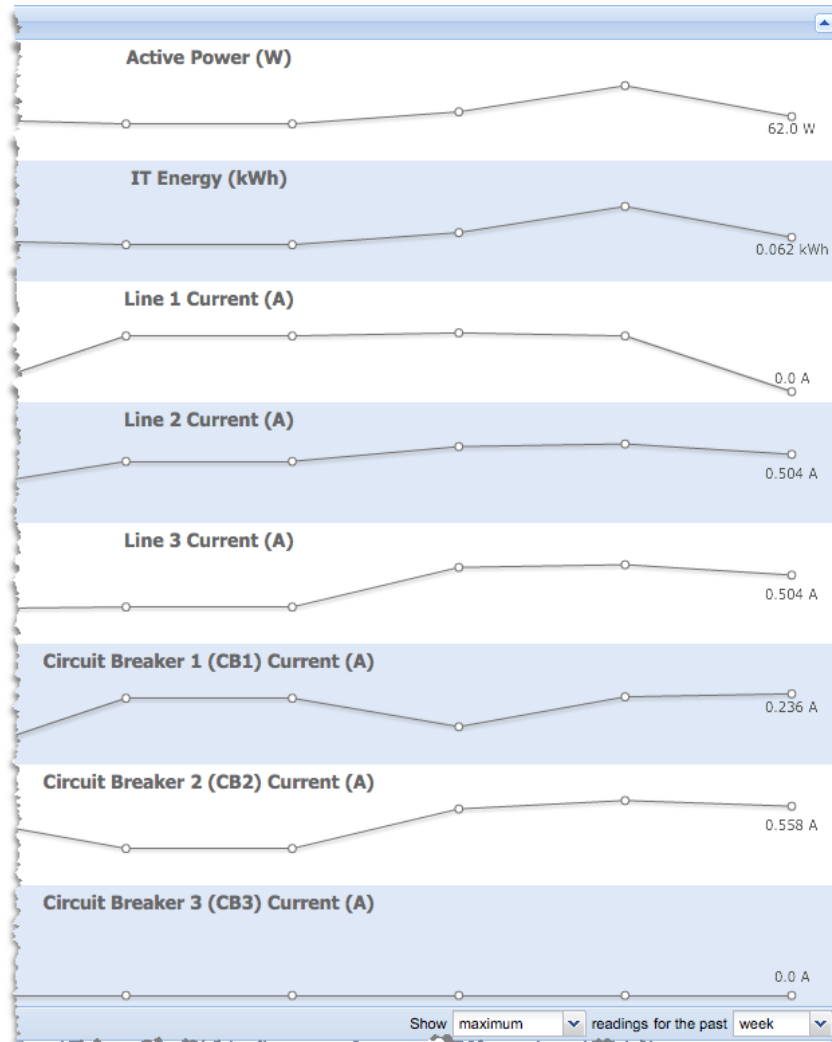
Rack PDU Readings

The Readings section of the Smart PDU view contains the power readings for the PDU.

- The Inlet Readings shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy for each inlet of the PDU. Readings are shown for each inlet on a multiple inlet PDU.

- The Inlet/Outlet Readings section for an inline meter shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy for each inlet/outlet.

- The Line Readings section shows Voltage, Current, and the available current for each line.

- The Circuit Breakers Readings section shows the Current in amps and the available current for each circuit breaker.

- The Sensor Readings section shows the latest reading for each attached sensor, and the ordinal number of the sensor on the PDU.

- The status at the bottom of the Readings section shows the latest reading time.

Readings

Inlet Readings

PDU Element	Voltag...	Current (A)	Active Power (W)	Apparent Powe...	Power Factor	Energy (Wh)
Inlet 1	207	1.9	161.0	280.0	0.58	3,524,321

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
⊟ **Inlet 1**			
L1	209	0.3	N/A
L2	207	0.2	N/A
L3	207	1.9	N/A

Circuit Breaker Readings

Circuit Breaker	Current (A)	Unutilized Capac...
Circuit Breaker 1...	0.3	19.7
Circuit Breaker 2...	0	20
Circuit Breaker 3...	0	20
Circuit Breaker 4...	0.2	19.8
Circuit Breaker 5...	0.7	19.3
Circuit Breaker 6...	1.2	18.8

Sensors

Or...	Label	Type	Latest Reading
1	Temperature 1	Temperature	77.5°F
2	Humidity 1	Humidity	30.0%
3	Temperature 2	Temperature	75.0°F
4	Humidity 2	Humidity	34.0%

Latest reading taken 10 minutes ago

Inlet Readings and Line Readings for Three Phase PDUs

For three phase PDUs, the Inlet Current and Voltage readings are maximum current and minimum voltages of the individual line readings of the inlet.

The line readings voltages are "line-to-line."

1	The inlet voltage reading is the Minimum of the line voltages.	Min Line Voltage
2	The inlet current reading is the maximum of the line currents.	Max Line Current
3	The line voltage readings are from line to line.	L1 = L1-L2 L2 = L2-L3 L3 = L3-L1

Multi-Inlet PDU Readings

A multi-inlet PDU displays readings for each inlet, and for each line of each inlet, the same as single inlet PDUs.

The Readings section of the rack PDU smart view contains this information.

Readings

Inlet/Outlet Readings

PDU Element	IT Device	Voltage (V)	Current (A)	Active Po...	Apparent P...	Power Factor	Active Ene...
Infeed 1	infeed 1	204	7.213	1,664	1,897	0.877174	3,736,620
Infeed 2	infeed 2	205	3.459	795	987	0.805471	1,816,650
Infeed 3	infeed 3	203	3.084	542	748	0.724599	1,105,940
Totals:				**3,001**	**3,632**		**6,659,210**

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
⊟ Inlet/Outlet 1			
L1	207	5.161	26.839
L2	204	3.667	28.333
L3	204	7.213	24.787
⊟ Inlet/Outlet 2			
L1	207	3.459	28.541
L2	205	2.455	29.545
L3	205	2.453	29.547
⊟ Inlet/Outlet 3			
L1	207	0.319	31.681
L2	203	2.945	29.055
L3	204	3.084	28.916

Rack PDU Sensors

A sensors list displays in the rack PDU smart view when attached sensors are detected.

The sensor label is clickable and opens the sensor smart view. If the sensor is not associated in the EDM, the label is not clickable, and there is no smart view. See *Sensors* (on page 180).

Sensors ▲

Ordinal	Label	Type	Latest Reading
1	Humidity EPIQ6 (Inlet)	Humidity	36.0%
2	Temperature EPIQ6 (Inlet)	Temperature	75.2°F

Rack PDU Details

The Details section contains all information about the PDU.

Click the Belongs To link to view the rack, or other parent object in the EDM.

Details	
Type	Rack PDU
IP Address	192.168.42.50
External Key	192.168.42.50
Name	px130
Manufacturer	Raritan
Model	DPCS20-20
Firmware	1.5.5-10603
Contact	
Location	Rack 5
Serial Number	
Rated Voltage	120V
Rated Current	20.00A
Rated VA	1.9kVA
Custom Field 1	15
Custom Field 2	15
SNMP Version	1/2c
Inlet Phase	∿ Single Phase
Belongs to	🖴 Rack for 192.168.42.50
Health	**Connectivity:** OK Most recent poll of the target PDU was successful. **Active events:** Good No active events.

Rack PDU Event Listing

The Event Listing section of the rack PDU smart view shows all events for the PDU.

- Click an Event link to open the Event details page.

- Select the checkbox for one or more events, then click Clear Selected Events to clear them. See *Clear Events* (on page 61).

Event Listing

Clear selected events

	Occurred at ▼	Severity	Event	Summary
☐	10/28/11 03:30:02 PM E…	Informational	Outlet power on	Outlet "Fail tree" switched on by
☐	10/28/11 03:25:01 PM E…	Informational	Outlet power off	Outlet "Fail tree" switched off by
☐	10/24/11 03:05:17 PM E…	Informational	Outlet power on	Outlet "Fail tree" switched on by
☐	10/24/11 03:00:16 PM E…	Informational	Outlet power off	Outlet "Fail tree" switched off by
☐	10/21/11 03:31:52 PM E…	Informational	Outlet power on	Outlet "Pass tree" switched on b
☐	10/21/11 02:00:03 PM E…	Informational	Outlet power on	Outlet "Fail tree" switched on by
☐	10/21/11 01:55:50 PM E…	Warning	Admin credentials invalid	Admin credentials failed to valid

Page 1 of 1   25

Rack PDU Asset Strips

Power IQ can detect asset management strips connected to rack PDUs.

The asset strip information displays in the rack PDU smart view.

▶ **To change the color of an LED:**

1. In the row of the asset tag whose color you want to change, double click the hexadecimal color code.

2. Select the new color from the chart of colors.

3. The LED color on the strip changes.

▶ **To associate an asset tag with an IT device:**

1. Copy the asset tag ID number from the PDU smart view for the PDU connected to the asset strip.

2. In the Devices tab, select the device you want to associate with the asset tag.

3. In the Device details page, paste the code into the Asset Tag Id field then click Save.

Asset Strip and Tag Events

Power IQ can receive an event whenever an asset strip or tag is moved.

See *Raritan Dominion PX Supported Events* (on page 49).

Rack Smart View

The rack smart view combines data from objects mapped to each rack in your EDM to give you perspective on a whole rack, including trends, elements like outlets and circuit breakers, and IT devices.

Racks are part of your EDM, so you cannot see the rack smart view until you've added PDUs and created an EDM. See *Creating Your EDM* (on page 117).

▶ **To open the rack smart view:**

- In the Data Centers tab, select a rack. The rack smart view opens.

  The rack smart view contains three sections:

  ▪ *Rack Energy and Environmental Trends* (on page 144)

  ▪ *Rack IT Devices* (on page 145)

  ▪ *PDU Elements - Rack Smart View and Rack PDU Smart View* (see "*PDU Elements - Rack Smart View and Rack PDU Smart View*" on page 147)

- ***Rack Details*** (on page 146)
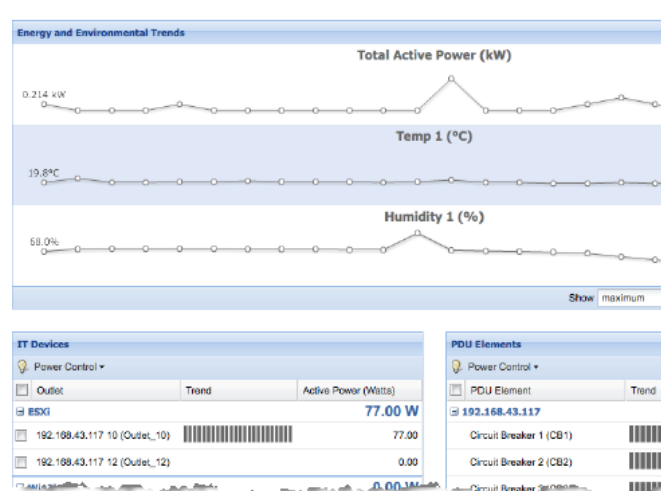
Rack Energy and Environmental Trends

The rack smart view shows Energy and Environmental Trends at the top of the page.

The first and last data points in the trend are shown at the left end of the chart.

The minimum and maximum values in the trend are shown at the right end of the chart.

- Environmental sensor charts
    - Temperature, one chart per sensor.
    - Humidity, one chart per sensor.

- Total Active Power for all devices and PDUs in the rack
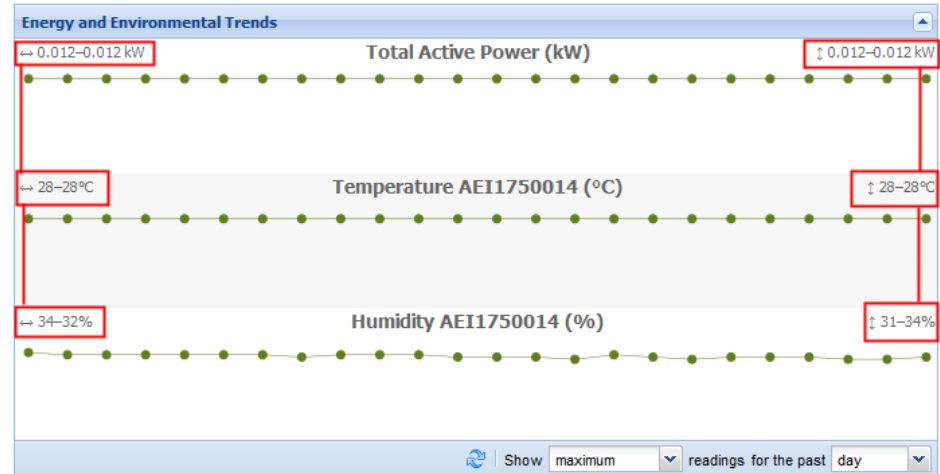
Rack IT Devices

The IT Devices section of the Smart Rack view contains a list of all devices that are connected to one or more outlets or circuits.. If a device does not have any associated outlets or circuits, it will not appear in this list. Devices without associated outletsor circuits do still appear in the tree view.

Devices that have associated circuits display the current and active power of the circuit. You cannot control power to circuits.

The outlets associated with each device display beneath the IT device. There is a checkbox for each outlet, to select it for power control operations.

- Each outlet shows a Trend chart showing the active power trend.

  Note: In Internet Explorer 7 and 8, click Load Chart to view the trend chart.

145

- Each device shows an Active Power reading, per device, and per outlet.
- Outlets that are powered on display in black.
- Outlets that are powered off display in gray.

► To change the active power display:

1. At the bottom of the IT Devices section, select the readings and time period to include in the fields.

2. Trend: minimum, maximum or average readings. Not available for past hour readings.

3. For the past: hour, day, week, month.

► To perform power control on devices:

1. Select the checkboxes for each outlet associated with a device. All outlets are grouped beneath the device.

   To select all devices in a rack, select the top checkbox.

2. Choose Power Control > On, Power Control > Off, or Power Control > Cycle.

   Note: Power Off and Power Cycle operations on this page do not use graceful shutdown, even if it is enabled for a selected device.

Rack Details

The Configure Rack Details button on the Smart Rack view opens a dialog changing the rack name, location, external key, and capacity, and editing for user permissions on this rack.

► To access rack details configuration:

1. Click the Configure Rack Details button.

2. In the dialog that appears:

   - Enter a new rack name, location, external key, or capacity. See *Set a Capacity* (on page 86) for details on this field.

- View and change the roles and permissions assigned for users of this rack. See **Assign Roles within a Data Center** (on page 77) for more details.

  - Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object. rack.

  - Select the role to allow in the Roles list. Click OK.

PDU Elements - Rack Smart View and Rack PDU Smart View

The PDU Elements section appears in both the rack and rack PDU smart views.

This section contains a list of all outlets in the rack, or all outlets on the PDU, respectively.

Note: Circuit breaker information is in the rack PDU's Readings section.
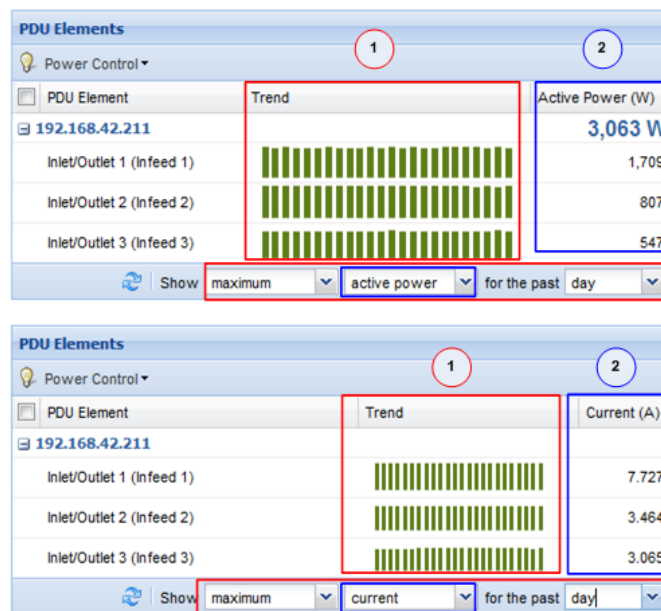
Key	Description
1	The trend chart's topics is selected in the blue outlined field: active power or current. Data included in the trend chart is filtered by the minimum/maximum/average selection, and the time period selection fields outlined in red.
2	Last column shows the latest poll data for either Active Power or Current, as selected in the field outlined in blue.
	The min/max/average and time period selections do not affect this reading.
	Active Power (W): Latest poll reading is shown.
	Current (A): Latest poll reading is shown.

- Each outlet shows a Trend chart showing the active power trend, or the current (amps) trend.

  Note: In Internet Explorer 7 and 8, click Load Chart to view the trend chart.

- Outlets that are powered on display in black.
- Outlets that are powered off display in gray.
- Apparent Power, Voltage, and Unutilized Capacity columns also display in the Rack PDU Elements section. These columns do not display at the rack level.

▶ **To change the trend chart display:**

The minimum/maximum/average setting and the time period setting change what data is included in the small trend charts. The last column always displays the latest poll data.

1. At the bottom of the PDU Elements section, select the readings and time period to include in the fields.

2. Trend: minimum, maximum or average readings. Not available for past hour readings.

3. For the past: hour, day, week, month.

4. Select either Active Power or Current in amps.

▶ **To perform power control on outlets:**

1. Select the checkboxes for each outlet.

   To select all outlets in a rack, select the top checkbox.

2. Choose Power Control > On, Power Control > Off, or Power Control > Cycle.

   Note: Power Off and Power Cycle operations on this page do not use graceful shutdown, even if it is enabled for a selected device.

3 Phase PDU Outlet Readings for Raritan PX1

Power IQ uses the following algorithm to convert three line readings into one outlet reading for current and voltage only. This algorithm applies only to 3 phase PX1 inline meters.

In the algorithm, "LineX_Readings" is a list of all the readings for a given time period.

```
MAX = MAX(MAX(Line1_Readings), MAX(Line2_Readings),
MAX(Line3_Readings))

AVG = MAX(AVG(Line1_Readings), AVG(Line2_Readings),
AVG(Line3_Readings))

MIN = MAX(MIN(Line1_Readings), MIN(Line2_Readings),
MIN(Line3_Readings))
```

PDUs with Fuses

Most Raritan PDUs monitor load at the internal PDU circuit breaker. Some PDUs have fuses instead of circuit breakers.

If a PDU has fuses, information about them displays in Power IQ with the "Circuit Breaker" label.

PX models with an F1 suffix have a fuse instead of a circuit breaker.

- PX2-4656V-F1
- PX2-4863V-F1
- PX2-2496-F1
- PX2-1496-F1
- PX2-4464I2-F1M2
- PX2-4496I2V-F1
- PX2-4656V-F1
- PX2-4863V-F1

PDU Connectivity Health Statuses

These statuses may appear in the mouse-over text when your mouse hovers over the Health column for a PDU on the PDU listings page. The statuses also appear in the Health section of the PDU smart view.

Status	Explanation
OK	Most recent poll of the target PDU was successful.
New	The system has not yet completed a successful scan or poll of the PDU. This is typical for systems that have been recently added.

Status	Explanation
Unknown	The system has not yet completed a successful scan or poll of the PDU. This is typical for systems that have been recently added.
Lost Communication	This status indicates thatPower IQ can no longer collect power data from the PDU. Most PDUs are managed via the SNMP protocol, and in this case, Power IQ can't communicate with the PDU over SNMP. See **Troubleshooting Connectivity Health** (on page 151).
Degraded	This status indicates certain non-critical aspects of the poll failed. The issue is most commonly caused when data-buffered data retrieval is enabled in Power IQ but is configured with a "read" SNMP community string instead of a "write" community string. In this case, Power IQ can still perform a poll, but it won't be able to enable data buffering and set the appropriate sample rate on PDUs that support data buffering, such as Raritan PX. Other possible causes of this error are incompatibility issues with Raritan PX running older firmware revisions, or if Power IQ is unable to persist sensor readings data to CSV file.
Poll incomplete	Certain aspects of the scan or poll failed, such as retrieving the model name, persisting outlet sensor data to CSV file, or retrieving information via SNMP. This can be due to an incompatibility with this version of the PDU or because the SNMP is misconfigured or the agent is disabled on the target PDU. ▪ Make sure the PDU's SNMP settings are correct. See **Editing PDUs under Power IQ Management** (on page 22).
Application error	If the PDU is associated with a dynamic plugin, an index mapping may have failed to resolve. Check the dynamic plugin log for mapping resolution errors. If the PDU is not associated with a dynamic plugin, this indicates an unexpected application error. Contact Raritan Technical Support: http://www.raritan.com/support/contact-support
No auth	This indicates invalid or missing credentials. ▪ Correct the PDU's credentials. See **Editing PDUs under Power IQ Management** (on page 22).
No contact	This indicates that Power IQ was unable to communicate with the PDU over any of the supported

Status	Explanation
	management protocols and so can't discover and manage the PDU. The most often used protocol is SNMP, but a few PDU models are managed using other protocols like HTTP. There are a number of possible root causes for this.
	This may indicate that the IP address is incorrect.
	▪ Correct the PDU's IP address. See *Editing PDUs under Power IQ Management* (on page 22).
Badadmcred	This indicates that the PDU was configured with an invalid administrative username or password. SNMP communication is still possible and Power IQ can manage the PDU, but firmware upgrades will not work.
Missing credentials	This indicates invalid or missing credentials.
	▪ Correct the PDU's credentials. See *Editing PDUs under Power IQ Management.* (see "*Editing PDUs under Power IQ Management*" on page 22)
Unmanageable	This indicates that Power IQ contains no plug-in capable of managing the PDU. The target PDU is not supported by this version of Power IQ, or the plug-in requires a proxy index and one was not specified.
	▪ Specify an appropriate proxy index if one is required but was not specified.
	▪ Make sure Power IQ supports the PDU. See the list of supported PDUs at http://www.raritan.com/resources/power-iq-rack-pdu-support/
	▪ Create a dynamic plugin for the PDU. See *Dynamic Plugins* (on page 219).

Troubleshooting Connectivity Health

A PDU's Lost Communication or No Contact connectivity health status may be caused by one of these common problems. Troubleshoot using the following checklist.

Cause	Solution
The user has configured Power IQ with the wrong community string for the PDU.	Verify that Power IQ is configured with the correct SNMP community string.
The user has configured Power IQ with the wrong IP address for the PDU.	Verify that Power IQ is configured with the correct IP address.
There is an actual network connectivity issue	▪ Make sure the required ports are open between Power IQ and the PDU. See *Ports*

Cause	Solution
between Power IQ and the target PDU.	**Open Between Power IQ and PDUs** (on page 5). ▪ Verify that there aren't any other network issues preventing communication between Power IQ and the target PDU.
The PDU is powered off or not connected to the network.	Confirm that the PDU is powered on and is responding to requests over the network. For example, responding to ICMP echo or PING requests.
SNMP support is disabled on the PDU.	Some PDUs allow the SNMP agent to be started and stopped through the PDU's management interface. Verify that SNMP is running on the PDU and that it is responding to SNMP requests by running SNMP diagnostics from Power IQ or through 3rd party tools.
The configured SNMP timeout and retry value are insufficient for your use case. For example, managing remote PDUs over a WAN and due to network latency or bandwidth limitations, the default SNMP settings result in a large number of SNMP timeouts.	If you suspect that the default SNMP settings used by Power IQ are insufficient it may be possible to correct the issue by modifying the default SNMP settings used by Power IQ. See **Advanced Thread Pooling Settings** (on page 17).
The SNMP agent on the target PDU is not responding to requests. One possible reason is that the PDU's processor is busy handling other tasks and is temporarily unable to respond to SNMP requests.	Verify that SNMP is running on the PDU and that it is responding to SNMP requests by running SNMP diagnostics from Power IQ or through 3rd party tools. If the SNMP agent on the PDU is the issue, restarting the SNMP agent on the PDU or rebooting the PDU may correct the problem.

Trend Chart Settings in Smart Views

The large trend charts at the top of each smart view are configurable.

▶ **To change the trend chart settings:**

1. At the bottom of the trend charts section, select the readings and time period to include in the fields.

2. Trend: minimum, maximum or average readings. Not available for past hour readings.

3. For the past: hour, day, week, month.

Actions Menu in Smart Views

Smart views for rack PDUs and facilities objects include an Actions menu in the top right corner.
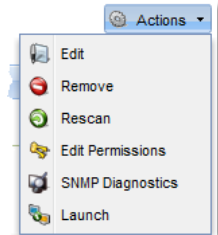
- Choose Actions> Edit to open the edit page for PDU credentials. See *Editing PDUs under Power IQ Management* (on page 22)
- Choose Actions> Remove to delete the PDU from Power IQ. The PDU and all data collected from it are deleted when you remove a PDU. Click Remove PDU(s) and Data to confirm.
- Choose Actions> Rescan to poll the PDU.
- Choose Actions> Edit Permissions to view and change the roles and permissions assigned for users of this PDU. See *Assign Roles within a Data Center* (on page 77) for more details.
  - Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object.
- Choose Actions> SNMP Diagnostics to run SNMP walk on the PDU.
- Choose Actions> Launch to open the web interface for Dominion PX PDUs only. See *Launch the Web Interface for a Dominion PX PDU* (on page 156).

Using the PDUs Tab

The PDUs tab contains a list of all PDUs added to Power IQ, even if they have not been mapped in the EDM. See *Creating Your EDM* (on page 117).

The PDUs list can be configured to meet your needs:

- *Filter the PDUs List* (on page 154)
- *Configure the Number of PDUs in the List* (on page 155)

Filter the PDUs List

You can customize your view of the PDUs list by using filters, sorting, and hiding or displaying columns of data.

See *Customizing Your View of PDUs, Devices, and Events* (on page 65).

▶ **To filter the PDUs list:**

In the PDUs tab, all PDUs in the system display in a list.

Most columns of data contain a filter criteria selection. Click the arrow in the column header to open the options. Filter is the last option.

- Most columns can be filtered by entering a search term in the column's filter.

  - Label, Name, Location, Manufacturer, Model, Firmware, Belongs To are filtered by search terms.

  - Belongs To refers to the PDUs parent object in the EDM. For example, a PDU probably belongs to a Rack object in the EDM. To check, look for the level directly above the PDU in the Data Centers tab hierarchy.

- Filter by PDU health: In the Health column filter, select the health statuses you want to view, Good, Warning or Critical, then select the source for each status, either Connectivity or Active Events. Select multiple options for each as needed.

- Filter by power readings, including Current (Amps), Active Power (Watts), or Apparent Power (VA): In the Current, Active Power or Apparent Power column filter, enter the number of amps, watts, or volt amperes in the Greater Than (>), Less Than (<) or Equal To (=) field to view only PDUs with readings in the correct range.

  - If a PDU has multiple line readings in the Current column, all values are shown separated by commas. When filtering by Greater Than (>), the highest number is used. When filtering by Less Than (<), the lowest number is used.

- Filter by inlet temperature: In the Inlet Temperature (C) column filter, enter the number of degrees Celsius in the Greater Than (>), Less Than (<) or Equal To (=) field to view only PDUs with inlet temperature sensor readings in the correct range.

  - The inlet temperature shown is the maximum reading for all inlet-positioned temperature sensors associated with the PDU.

- Filter by PDU Type: Types of PDU include rack PDUs, and facilities objects managed by dynamic plugin, such as CRACs or Floor PDUs. Add the Type column by selecting the checkbox.

Configure the Number of PDUs in the List

You can configure how many PDUs appear at a time in the PDUs list. This preference is set per user.
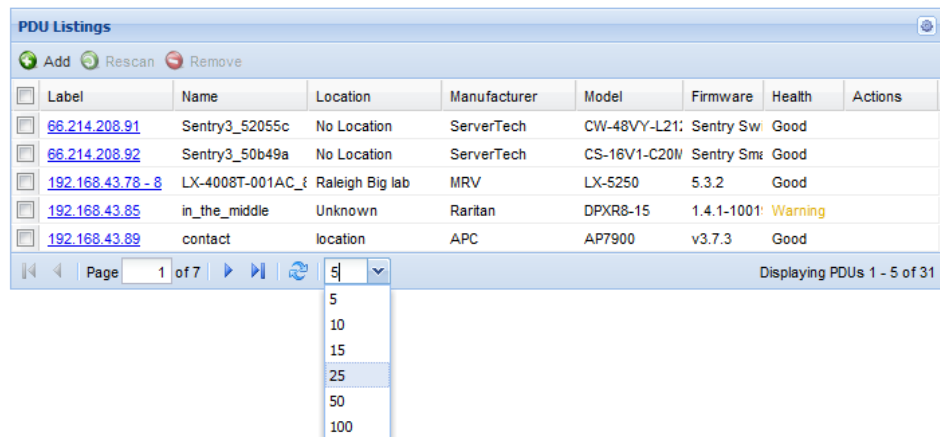
You can configure the default number of PDUs that appear in the list, and you can change the number of PDUs that appear at any time from the PDUs list.

▶ **To configure the default number of PDUs in the list:**

1. Click your user name link in the top right corner of the page, next to the Logoff link.

2. In the User Information page, click the Prefs tab.

3. Enter the number of PDUs to list in the Grid Rows field.

4. Click Save.

▶ **To change the number of PDUs in the list:**

1. In the PDUs tab, select the number of PDUs to display from the number drop-down list at the bottom of the page. The list refreshes.

Export the PDUs List to CSV

Export the PDU list to create a CSV file containing all the data listed in the grid on the PDUs tab.

The exported file contains the same columns as the page in Power IQ. If you have applied filters, the same filters will apply to the exported information.

The export PDUs CSV file is not the same as the file used for importing PDUs into Power IQ. See **Adding PDUs in Bulk with CSV Files** (on page 24).

▶ **To export the PDUs list to CSV:**

1. In the PDUs tab, click the Export/Save icon 🔲 in the upper right corner of the grid.

2. Save or open the file using the dialog that appears.

Launch the Web Interface for a Dominion PX PDU

You can launch the web interface for a Dominion PX PDU in Power IQ.

Users must have identical credentials on Power IQ and on the target Raritan product, and be logged in to Power IQ with those credentials for single sign on to succeed. Single sign on must be enabled in Settings > Single Sign On. See **Enabling Single Sign On for Raritan PDUs** (see "**Enabling Single Sign On for Raritan Products**" on page 106).

▶ **To launch the web interface for a Dominion PX:**

1. In the PDUs tab, select a Dominion PX PDU.

2. Hover your mouse on the Actions column, then click the center icon to go directly to this PDU in a new window. If single sign on is not enabled, log in.

Search for PDUs

Use the Quick Search tool at the top of the Power IQ interface to search for a PDU.

Type the name or IP address of a PDU into the Quick Search field. If a match is found, Power IQ displays that PDU's smart view.

Note: When searching by name, the whole name of the PDU must be entered. Search is case sensitive.

Chapter 10　Facilities Objects

Power IQ can manage your data center's facilities objects, including CRACs, UPSs, Floor PDUs, Standalone Meters, and Power Panels.

You can work with these objects in Power IQ the same way you work with rack PDUs. The PDUs tab, which lists all rack PDUs, also contains all facilities objects.

When you flag your facilities objects as part of your data center's total power, Power IQ calculates your Power Usage Effectiveness (PUE). See **PUE - Power Usage Effectiveness** (on page 210).

Note: Screenshots of smart pages are for illustration purposes only, and do not contain real, polled data.

In This Chapter

Adding Facilities Objects to Power IQ Management

You can add facilities objects to Power IQ using the dynamic plugins function. The process for adding facilities objects is:

1. Create a dynamic plugin capable of managing your object. See **Dynamic Plugins** (on page 219).

2. Add the object using the Add a PDU function. See **Adding PDUs to Power IQ Management** (on page 20). If you use a custom mapping dynamic plugin, see **Adding PDUs with Custom Dynamic Plugins** (on page 28).

3. Make sure the object is included in your enterprise data model (EDM), which displays in the Data Centers tab. Objects must be in the EDM for inclusion in PUE calculations and Dashboard charts. See **Enterprise Relationships and the EDM** (on page 114). See also **Organizing Facilities Objects in the Data Center Browser** (on page 159).

Organizing Facilities Objects in the Data Center Browser

Some facilities objects you want to manage in Power IQ, such as floor PDUs, power panels, and UPSs may provide power to multiple locations.

Objects may only have one location in the hierarchical Data Centers browser, so associate the object in the enterprise data model using it's physical location. Standalone meters may be placed where it best helps you understand their data.

▶ **For example:**

- A floor PDU is physically located on Floor A, but provides power to several locations, not all on that floor. Organize the floor PDU on Floor A.

CRACs in the Data Center Browser

You can add a Computer Room Air Conditioner (CRAC) as a node in the Data Centers browser. Place the CRAC in the EDM in the location where it manages air, rather than the physical location of the CRAC controls.

- For example:
  - A CRAC serves Rooms 1, 2, and 3 of your data center. Organize the CRAC in the EDM at the Floor level that contains these rooms.

CRACs

Computer Room Air Conditioners (CRAC) refers to any HVAC system that manages the temperature or humidity of a computer room. It does not refer to a standalone raised-floor unit that sits on the data center floor.

CRAC Smart View

Power IQ gathers power readings from the CRAC's inlet and inlet lines.

Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** *(on page 219).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

Power IQ displays all information gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated CRAC smart view includes:

- *CRAC Energy Trends* (on page 160)
- *CRAC Readings* (on page 161)
- *CRAC Details* (on page 162)

CRAC Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

CRAC energy trends show a trend line for two readings.

- Active power
- Energy
- Current for each inlet pole
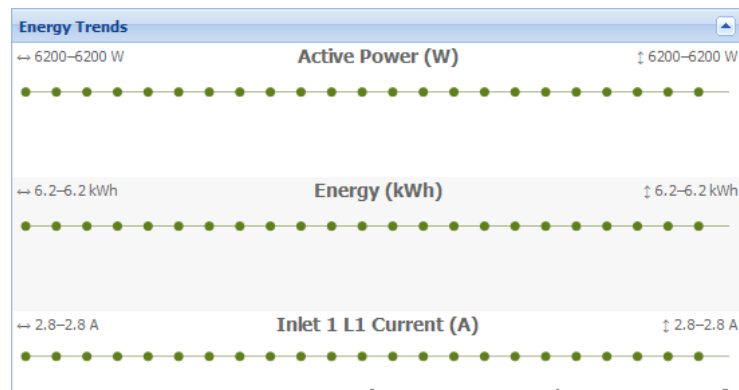
CRAC Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

CRAC readings include the inlet and the inlet lines.

- CRAC Inlet Readings shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy.

- CRAC Inlet Line Readings for each line shows the Voltage, Current, and Unutilized Capacity

- The status at the bottom of the Readings section shows the latest reading time.

Readings

Inlet Readings

PDU Element	Voltage (V)	Current (A)	Active Pow...	Apparent P...	Power Factor	Energy (Wh)
Inlet 1	206	1.9	133.0	226.0	0.59	3,406,842

Line Readings

PDU Element		Voltage (V)	Current (A)	Unutilized Capacity (A)
⊟ **Inlet 1**				
L1		208	0	N/A
L2		206	0	N/A
L3		206	1.9	N/A

Latest reading taken 5 minutes ago

CRAC Details

Details are the fourth section in the smart view.

Floor PDUs

Floor PDUs refers to an intelligent floor PDU system with inlets, panels, and branch circuits.

Floor PDUs Smart View

Power IQ gathers power readings from the FPDU inlets, panel inlets, circuits, and circuit poles.

The mapping of the inlets to panels to circuits and circuit poles is achieved through your dynamic plugin configuration.

Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** *(on page 219).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated FPDU smart view includes:

- *FPDU Energy Trends* (see "*Floor PDU Energy Trends*" on page 164)
- *FPDU Elements* (see "*Floor PDU Elements*" on page 167)
- *FPDU Readings* (see "*Floor PDU Readings*" on page 165)
- *FPDU Details* (see "*Floor PDU Details*" on page 168)

Floor PDU Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Floor PDU energy trends include a trend line for several types of readings.

- Active Power

- Energy

- Current for each line of the master inlet, if applicable. If the FPDU does not have a master inlet, trend line for current does not display.

Floor PDU Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Floor PDU readings come from the inlets, panel inlets, circuits and circuit poles. floor PDUs come in many different configurations. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase floor PDU

- 1 master inlet with 3 lines
- 2 panels
- Each panel has a panel inlet with 3 lines, and 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The master inlet of this floor PDU has three lines.	

Readings

Inlet Readings

PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fac...	Energy (Wh)
Inlet 1	121	13	240.0	480.0	0.5	11,520

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
Inlet 1			
L1	121	11	N/A
L2	122	12	N/A
L3	123	13	N/A

Panel Readings: Panel 1

Below the master inlet, the panel inlets display, grouped by panel. Panel readings are collapsed by default, see Panel 1 in the image.

This floor PDU's Panel 2 has one panel inlet with three lines.

Below the line readings for the panel inlet, the circuit readings display.

This floor PDU's Panel 2 has 2 circuits, each with 3 circuit poles.

Panel Readings: Panel 1

Panel Readings: Panel 2

Inlet Readings

PDU Ele...	Voltage ...	Current ...	Active P...	Appare...	Power ...	Energy ...
Inlet 1	211	21.3	62.0	124.0	0.5	2,882

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacit...
Inlet 1			
L1	211	21.1	N/A
L2	212	21.2	N/A
L3	213	21.3	N/A

Circuit Readings

Circuit	Ordina...	Voltag...	Curre...	Active...	Appar...	Power...	Energ...
Panel2...	1	211	21.3	31.0	62.0	0.5	1441.0
Panel2...	2	221	22.3	32.0	64.0	0.5	1442.0

Circuit Pole Readings

Ordinal ▲	Phase	Name	Voltage (V)	Current (A)
Circuit 1: Panel2_Circuit1				
1	A	Panel2_Circu...	211	21.1
2	B	Panel2_Circu...	212	21.2
3	C	Panel2_Circu...	213	21.3

166

Floor PDU Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The floor PDU's circuits are grouped by panel if mapped accordingly. The Elements section is blank for floor PDUs that do not have circuits.

The default Elements view for floor PDU includes this information:

- PDU Element: circuits grouped by panel

- IT Device: IT devices associated with circuits include a link to the IT device page.

- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.

- Active Power (W): latest poll reading for active power. The last column can be changed from latest poll reading for active power (W) to latest poll reading for current (A) by selecting Current from the drop-down list below the PDU Elements section.

- Apparent Power, Voltage, and Unutilized Capacity

Floor PDU Details

Floor UPS

Floor UPS refers to an intelligent, standalone Uninterruptible Power Supply (UPS) device. Rack UPS is not supported.

Floor UPS Smart View

Power IQ gathers power readings from the Floor UPS inlets and inlet lines, circuits, and circuit poles.

The mapping of the circuit poles to circuits is achieved through your dynamic plugin configuration.

Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** *(on page 219).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Floor UPS smart view includes:

- *Floor UPS Energy Trends* (on page 169)
- *Floor UPS Elements* (on page 171)
- *Floor UPS Readings* (on page 169)
- *Floor UPS Details* (on page 171)

Floor UPS Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Floor UPS energy trends includes a trend line for active power.
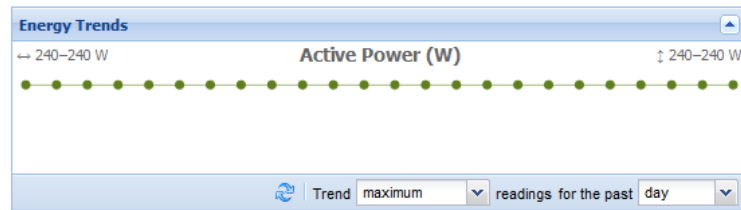
Floor UPS Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

This sample smart view shows one possible configuration of a three-phase Floor UPS

- 1 inlet with 3 lines
- 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The inlet of this Floor UPS has three lines.

Readings come from the whole inlet, and from each line for three-phase inlets.

Below the inlet and line readings, the circuit and circuit pole readings display.

This Floor UPS has 2 circuits.

Circuit1 has 3 circuit poles.

Readings

Inlet Readings

PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fa...	Energy (Wh)
Inlet 1	121	1.3	240.0	480.0	0.5	11,520

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
⊟ **Inlet 1**			
L1	121	1.1	N/A
L2	122	1.2	N/A
L3	123	1.3	N/A

Circuit Readings

Circuit	Ordinal ▲	Voltage ...	Current ...	Active P...	Appare...	Power F...	Energy (...
Circuit1	1	111	11.3	31.0	62.0	0.5	1,441
Circuit2	2	121	12.3	32.0	64.0	0.5	1,442

Circuit Pole Readings

Ordinal ▲	Phase	Name	Voltage (V)	Current (A)
⊟ **Circuit 1: Circuit1**				
1	A	Circuit1_Pole1	111	11.1
3	B	Circuit1_Pole2	112	11.2
5	C	Circuit1_Pole3	113	11.3
⊞ **Circuit 2: Circuit2**				

Floor UPS Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Floor UPS includes this information:

- PDU Element: circuits

- IT Device: IT devices associated with circuits include a link to the IT device page.

- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.

- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.

- Apparent Power, Voltage, and Unutilized Capacity

Floor UPS Details

Details are the fourth section in the smart view.

Power Panel

Power Panel refers to a single intelligent power panel on a wall that may contain inlets, circuits and circuit poles.

Anything with multiple panels should be added as a floor PDU, not a power panel.

Power Panels Smart View

Power IQ gathers power readings from the Power Panel's inlets, circuits, and circuit poles.

The mapping of the panels to circuits and circuit poles is achieved through your dynamic plugin configuration.

Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** *(on page 219).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Power Panels smart view includes:

- *Power Panels Energy Trends* (on page 173)
- *Power Panels Elements* (on page 175)
- *Power Panels Readings* (on page 173)
- *Power Panels Details* (on page 175)

**Power Panels Energy Trends**

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Power panel energy trends include a trend line for several types of readings.

- Active Power
- Energy
- Current, when the power panel has inlet poles
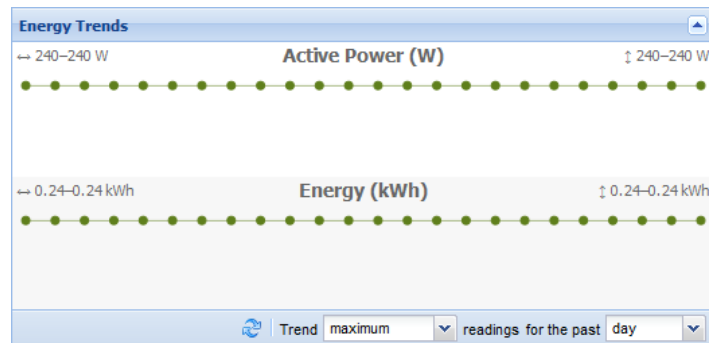
Power Panels Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Power Panel readings come from the inlets, circuits, and circuit poles. Power panels come in many different configurations. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase Power Panel.

- 1 inlet with 3 lines
- 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The inlet of this Power Panel has three lines.

Readings come from the whole inlet, and from each line for three-phase inlets.

Below the inlet and line readings, the circuit and circuit pole readings display.

This Power Panel has 2 circuits.

Circuit1 has 3 circuit poles.

Readings

Inlet Readings

PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fa...	Energy (Wh)
Inlet 1	121	1.3	240.0	480.0	0.5	11,520

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
⊟ Inlet 1			
L1	121	1.1	N/A
L2	122	1.2	N/A
L3	123	1.3	N/A

Circuit Readings

Circuit	Ordinal ▲	Voltage ...	Current ...	Active P...	Appare...	Power F...	Energy (...
Circuit1	1	111	11.3	31.0	62.0	0.5	1,441
Circuit2	2	121	12.3	32.0	64.0	0.5	1,442

Circuit Pole Readings

Ordinal ▲	Phase	Name	Voltage (V)	Current (A)
⊟ Circuit 1: Circuit1				
1	A	Circuit1_Pole1	111	11.1
3	B	Circuit1_Pole2	112	11.2
5	C	Circuit1_Pole3	113	11.3
⊞ Circuit 2: Circuit2				

Power Panels Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Power Panels includes this information:

- PDU Element: circuits

- IT Device: IT devices associated with circuits include a link to the IT device page.

- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.

- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.

- Apparent Power, Voltage, and Unutilized Capacity

Power Panels Details

Details are the fourth section in the smart view.

Standalone Meters

Standalone Meters refers to a standalone power meter that may be used throughout the data center.

Standalone Meters Smart View

Power IQ gathers power readings from the Standalone Meter's circuits and circuit poles.

The mapping of the circuits and circuit poles is achieved through your dynamic plugin configuration.

Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** *(on page 219).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Standalone Meter smart view includes:

- *Standalone Meter Energy Trends* (on page 177)
- *Standalone Meter Elements* (on page 179)
- *Standalone Meter Readings* (on page 178)
- *Standalone Meter Details* (on page 179)

**Raritan.**

Standalone Meter Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Standalone Meter energy trends include a trend line for several types of readings.

- Active Power

- Current: one trend line for single phase circuits and one trend for each line of three-phase circuits
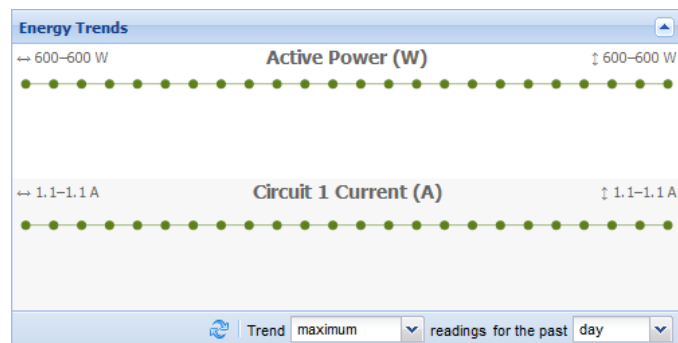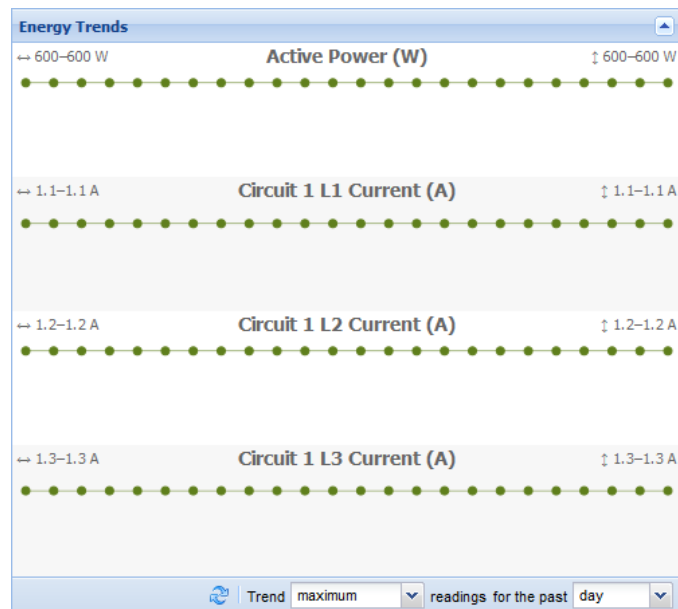
Standalone Meter Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Standalone Meter readings come from the circuits and circuit poles. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase Standalone Meter.

- 1 circuit with 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

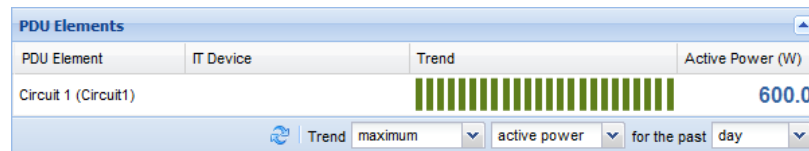| The circuit of this Standalone Meter has 3 circuit poles. Readings come from the whole circuit, and from each line for three-phase circuits.	

Standalone Meter Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Standalone Meters includes this information:

- PDU Element: circuits

- IT Device: IT devices associated with circuits include a link to the IT device page.

- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.

- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.

Standalone Meter Details

Details are the fourth section in the smart view.

Chapter 11 Sensors

When you add a PDU to Power IQ, the attached sensors are discovered.

You can view the list of sensors attached to a PDU in the PDU's smart view. See *Rack PDU Smart View* (on page 137).

Power IQ automatically associates your sensors into the EDM when their PDU is in the EDM. See *Automatically Associate Sensors in the EDM* (on page 121).

You can change this automatic association to place a sensor in the EDM at any room, row, aisle, or rack level. View your sensors in the EDM hierarchy in the Data Centers tab. See *Creating Your EDM* (on page 117).

Once associated in the EDM, you can access the sensor smart view. In the smart view, you can edit sensor label and position. The sensor smart view also has a configurable trend line. See *Sensor Smart View* (on page 180).

In This Chapter

Sensor Smart View

Once a sensor is associated in the EDM, you can access the smart view.

All environmental sensor smart views contain:

- *Sensor Environmental Trends* (on page 181)

A sensor smart view may contain the following options, depending on the sensor type:

- *Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors* (on page 181)
- *Naming Environmental Sensors* (on page 182)

Sensor Environmental Trends

The top section of the sensors smart view is a trend line. Configure the trend time period using the field below the trend.
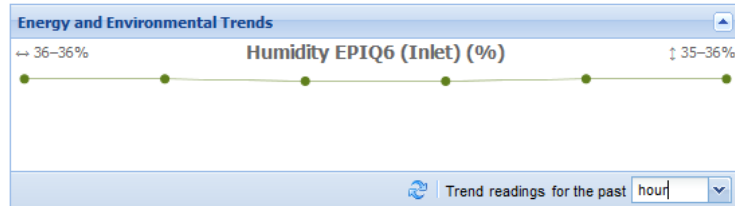
Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors

You can specify whether a sensor is inlet or outlet located or if the sensor is for outside air. By default, Power IQ considers all environmental sensors to be inlet located.

Sensors are editable only when included in the EDM. See *Creating Your EDM* (on page 117).

All sensor types can be included in Cooling charts on the dashboard. See *Cooling Chart Widget* (on page 90).

▶   **To specify inlet or outlet location for environmental sensors:**

- In the sensors smart view, select the Sensor Location: Inlet, Outlet, or Outside Air.

Naming Environmental Sensors

Environmental sensors have sensor labels that you can change in Power IQ.

The following PDUs support naming environmental sensors, depending on model: APC, Eaton, Baytech, Liebert, Raritan, Servertech, Sinetica.

Sensor names cannot include only white space characters. The maximum name length is 256 characters. The maximum name length for PX1 sensors is 33 characters.

Sensor labels must be unique. During polling, if Power IQ finds two sensors of the same type with the same name, the sensor readings for those sensors are not saved. Power IQ adds an error message to the audit log.

SNMP read and write access to the PDU is required to name sensors. See **Adding PDUs to Power IQ Management** (on page 20).

▶ **To name environmental sensors:**

- In the sensors smart view, enter a unique name in the label field, then click Save.

Sensor			
Label:	HumiditySensor 1 Inlet		
Type:	HUMIDITY		
Sensor Location:	⦿ inlet	○ outlet	○ outside air
Ordinal:	1		
PDU:	192.168.42.50		
			✔ Save

Sensors Connected to PX1 and PX2 PDUs

Raritan Dominion PX1 and PX2 PDUs support environmental and contact closure sensors, which you can poll through Power IQ.

The sensors must be setup and configured correctly via PX1 or PX2 before they will work correctly with Power IQ.

See the online help for your PX model PDU here:

http://www.raritan.com/support/dominion-px/

http://www.raritan.com/support/px2/

States of Managed Sensors

An environmental sensor shows the state after being managed.

Available sensor states vary depending on the sensor type -- numeric or discrete sensors. For example, a contact closure sensor is a discrete (on/off) sensor so it switches between three states only -- unavailable, alarmed and normal.

Note: Numeric sensors use numeric values to indicate the environmental or internal conditions while discrete (on/off) sensors use alphabetical characters only to indicate the state changes.

Sensor state	Applicable to
unavailable	All sensors
alarmed	Discrete sensors
normal	Discrete sensors
ok	Numeric sensors
below lower critical	Numeric sensors
below lower non-critical	Numeric sensors
above upper non-critical	Numeric sensors
above upper critical	Numeric sensors

Note: The state change of a contact closure sensor occurs only if the sensor enters the new state for at least 1 consecutive sample.

"unavailable" State

The *unavailable* state means the connectivity to the sensor is lost.

The Raritan PX pings all managed sensors at regular intervals in seconds. If it does not detect a particular sensor for three consecutive scans, the *unavailable* state is displayed for that sensor.

When the communication with a contact closure sensor's processor is lost, all detectors (that is, all switches) connected to the same sensor module show the "unavailable" state.

Note: When the sensor is deemed unavailable, the existing sensor configuration remains unchanged. For example, the ID number assigned to the sensor remains associated with it.

The Raritan PX continues to ping unavailable sensors, and moves out of the *unavailable* state after detecting the sensor for two consecutive scans.

"normal" State

This state indicates the sensor is in the normal state.

For a contact closure sensor, usually this state is the normal state you have set.

- If the normal state is set to Normally Closed, the *normal* state means the contact closure switch is closed.
- If the normal state is set to Normally Open, the *normal* state means the contact closure switch is open.

For a Raritan's floor water sensor, the normal state must be set to Normally Closed, which means no water is detected.

Note: See Configuring a Contact Closure Sensor for information on setting the normal state or dip switch.

"alarmed" State

This state means a discrete (on/off) sensor is in the "abnormal" state.

Usually for a contact closure sensor, the meaning of this state varies based on the sensor's normal state setting.

- If the normal state is set to Normally Closed, the *alarmed* state means the contact closure switch is open.
- If the normal state is set to Normally Open, the *alarmed* state means the contact closure switch is closed.

For a Raritan's floor water sensor, the normal state must be set to Normally Closed, which means no water is detected. The *alarmed* state indicates that the presence of water is detected.

Note: See Configuring a Contact Closure Sensor for information on setting the normal state or dip switch.

Tip: A contact closure sensor's LED is lit after entering the alarmed *state. If the sensor module has two channels for connecting two switches, two LEDs are available. Check which contact closure switch is in the "abnormal" status according to the channel number of the LED.*

"ok" State

Only a numeric sensor shows this state. This state means the sensor reading is within the acceptable range as indicated below:

Lower Non-Critical threshold <= Reading < Upper Non-Critical threshold

Note: The symbol <= means smaller than (<) or equal to (=).

"below lower critical" State

This state means a numeric sensor's reading is below the lower critical threshold as indicated below:

Reading   <   Lower Critical Threshold

"below lower non-critical" State

Only a numeric sensor shows this state.

This state means the sensor reading is below the lower non-critical threshold as indicated below:

Lower Critical Threshold <= Reading < Lower Non-Critical Threshold

Note: The symbol <= means smaller than (<) or equal to (=).

"above upper non-critical" State

Only a numeric sensor shows this state.

This state means the sensor reading is above the upper non-critical threshold as indicated below:

Upper Non-Critical Threshold <= Reading < Upper Critical Threshold

Note: The symbol <= means smaller than (<) or equal to (=).

"above upper critical" State

This state means a numeric sensor's reading is above the upper critical threshold as indicated below:

Upper Critical Threshold   <=   Reading

Note: The symbol <= means smaller than (<) or equal to (=).

Chapter 12   Power Control

Power control is only available for PDUs that support this feature.

Power IQ must have valid SNMP write access to the PDU for power control to work.

In This Chapter

Enable or Disable Power Control

Only authorized users can control power. See **Role Definitions** (see "**Power IQ Role Definitions**" on page 74).

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.

2. In the Power Control Settings box, select the "Enable power control" checkbox to enable power control.

3. Click Save Power Control Settings.

Configure Power Control Options

▶ **To configure power control options:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.

2. In the Power Control Settings box:

   a. Select the "Enable power control" checkbox to enable power control.

   b. Select the "Require reason message for power control operations" checkbox to require users to log a reason for all power control operations.

   c. Select the "Allow ad hoc power control for rooms, aisles, rows, and racks" to allow authorized users to control power at the room, aisle, row and rack levels of the data center.

    d.   Select the "Allow scheduled power control" checkbox to allow authorized users to schedule power control tasks.

3.   Click Save Power Control Settings.

Control Power to Outlets in a Data Center

You must enable power control. See **Enable or Disable Power Control** (on page 186).

Power control is available at the outlet and IT device outlet group level, unless you also enable higher levels, such as all outlets in a rack, row, aisle, or room. See **Configure Power Control Options** (on page 186).

You must be assigned a role that permits power control. See **Power IQ Role Definitions** (on page 74).

For details about controlling power in the Smart Rack and Smart PDU views, see **IT Devices - Smart Rack View** (see "**Rack IT Devices**" on page 145) and **PDU Elements   - Smart Views** (see "**PDU Elements - Rack Smart View and Rack PDU Smart View**" on page 147).

> Warning: Graceful shutdown is not supported when controlling power from the Smart Rack or Smart PDU pages, which are accessed by clicking the rack or PDU in the EDM/Data Centers tab. Use the right-click option on the rack or PDU in the EDM, or the power control options in the Devices tab for graceful shutdown.

▶ To control power in the Data Centers tab:

1.   In the Data Centers tab, select the data center level, such as a rack, that contains the outlets you want to control.

2.   Select the checkboxes of the outlets you want to control in the IT Devices or PDUs section.

3.   Click Power Control > On or Power Control > Off.

4.   If required, enter a reason message for the power control operation, and click OK to confirm.

▶ To control power with right-click in the Data Centers tab:

1.   In the Data Centers tab, right-click an IT device, or higher level, if enabled, then select On or Off.

2.   If required, enter a reason message for the power control operation, and click OK to confirm.

▶ To control power in the PDUs tab:

1.   In the PDUs tab, select a PDU, then click View.

2. Select the checkboxes of the outlets you want to control in the Readings section.

3. Click Power Control > On, Power Control > Off, or Power Control > Cycle.

4. If required, enter a reason message for the power control operation, and click OK to confirm.

▶ **To control power in the Devices tab:**

1. In the Devices tab, select a device.

2. Click Power Control > On or Power Control > Off.

3. If required, enter a reason message for the power control operation, and click OK to confirm.

Control Power to Devices in a Group

You can manually control power to devices in a group, or schedule a task to run a power control operation at a specified time.

▶ **To control power to devices in a group manually:**

1. In the Devices tab, choose Activities > Device Groups.

2. Select the checkbox for the device group you want to control power to.

3. Click Power Control > On or Power Control > Off.

   - All devices in the group are powered on or off sequence specified in the group settings.

   - Devices are powered off in sequence, and powered on in the reverse sequence.

   - See *Create Device Groups for Power Control* (on page 196).

   - Devices in the group that are configured with graceful shutdown will be shutdown when a power off operation is selected here. The configured graceful shutdown delay is used. See *Configuring Graceful Shutdown* (on page 190).

▶ **To control power to devices in a group via a scheduled task:**

See *Add a Power Control Task* (on page 189).

Scheduling Power Control

You can schedule power control for device groups only.

View Power Control Task Results

View the results of power control tasks that have been scheduled.

Note: Make sure that power control and scheduled power control are enabled. See *Enable or Disable Power Control* (on page 186).

► **To view power control task results:**

1. In the Devices tab, choose Activities > View Task Results. The Power Scheduling Task Results page opens.

2. Click a task name link to view the results.

Add a Power Control Task

Schedule a power control task to control power to a device group at a specified time. You can schedule a task that runs only once, or that recurs on a regular schedule.

You must create device groups before you add power control tasks. See *Create Device Groups for Power Control* (on page 196).

► **To add a power control task:**

1. In the Devices tab, choose Activities > Add New Task. The New Power Scheduling Task page opens.

2. Select Power On or Power Off. If Graceful Shutdown is configured for a device in the device group, a power-off task will use graceful shutdown automatically, unless you select the Skip Graceful Shutdown checkbox in the next step.

3. Select the Skip Graceful Shutdown checkbox to force a hard shutdown for all devices in the device group, even if graceful shutdown is enabled.

4. Select the Leave Outlets On checkbox to leave outlets powered on in cases where devices have been powered off using graceful shutdown.

5. Select the Device Group for the power control operation.

6. Specify when the task should run.

   ▪ To schedule a task that runs only once, select the Date from the calendar in the Run Once section.

   ▪ To schedule a task that recurs, select the checkboxes for the days of the week the task should run in the Recurring section.

   ▪ For both types, select the time the task should run in the Hour and Minute fields.

7. Select the Active checkbox to allow this task to run. Deselect this checkbox to stop the task from running.

8. Click Save.

Configuring Graceful Shutdown

You can configure Power IQ to send a graceful shutdown command to a server before powering off outlets. Power IQ allows you to define a set of system-wide shutdown commands with credentials to use across multiple devices. Power IQ supports both SSH and NetRPC commands to shutdown either Unix or Windows servers.

▶ **Process for Configuring Graceful Shutdown in Power IQ:**

1. Enable power control. See **Enable or Disable Power Control** (on page 186).

2. Prepare your servers for graceful shutdown: check open ports, define accounts for authentication, test authentication methods. See **Open Ports for Graceful Shutdown** (on page 194) and **Preparing Servers for Graceful Shutdown** (on page 194).

3. Add the shutdown commands to Power IQ. See **Add Shutdown Commands** (on page 191).

4. Enable graceful shutdown for the server, known as an IT Device in Power IQ, specify the command and wait time, and test the connection. See **Enable Graceful Shutdown for an IT Device** (on page 192).

5. To shutdown servers, use the power control functions.

    a. Add a power control task to schedule the power off for a device group. See **Add a Power Control Task** (on page 189).

        OR

    b. Power off an individual outlet. See **Control Power to Outlets in a Data Center** (on page 187).

Add Shutdown Commands

Add shutdown commands if you want to enable graceful shutdown to occur on servers before Power IQ switches off outlets. Graceful shutdown will occur both when you manually power outlets off or when a scheduled power control task runs.

You can test the commands you configure when you enable graceful shutdown for a particular device. See *Enable Graceful Shutdown for an IT Device* (on page 192).

▶ **Add shutdown commands using Windows Remote Shutdown**

Windows Remote Shutdown is the most common choice for shutting down Windows systems.

1. In the Devices tab, choose Activities > Shutdown Commands. The Add New Shutdown Command page opens.

2. Click Add.

3. Select Using Windows Remote Shutdown and click Next.

4. In the Name field, enter a name to describe this shutdown command. This name appears in the list of shutdown commands to be selected when you enable graceful shutdown for a server. See *Enable Graceful Shutdown for an IT Device* (on page 192).

5. In the Login field, enter the username of the account to be authenticated on each server to be shutdown.

    ▪ Login can include letters, digits, underscores, dots, and hyphens.

6. In the Password and Password Confirmation fields, enter the password for the username in the Login field.

7. In the Comment field, enter the message to display to users of the server when it is shutdown.

8. Click Add.

▶ **Add shutdown commands using SSH:**

SSH is the most common choice for shutting down Linux, Unix, or other systems:

1. In the Devices tab, choose Activities > Shutdown Commands. The Add New Shutdown Command page opens.

2. Click Add.

3. Select SSH and click Next.

4. In the Name field, enter a name to describe this shutdown command. This name appears in the list of shutdown commands to be selected when you enable graceful shutdown for a server. See *Enable Graceful Shutdown for an IT Device* (on page 192).

5. In the Login field, enter the username of the account to be authenticated on each server to be shutdown.

    ▪ Login can include letters, digits, underscores, dots, and hyphens.

6. Enter the appropriate credentials for the account specified in the Login field. See **Basic Configuration for SSH Shutdown** (on page 194)for more details on authentication. The following options are valid.

    a. Password and Password Confirmation

    b. Private Key

    c. Private Key and Passcode and Passcode Confirmation

7. In the Command field, enter the command. See **Sample SSH Shutdown Commands** (on page 195) for examples.

8. Click Add.

Enable Graceful Shutdown for an IT Device

Enable graceful shutdown for an IT Device if you want Power IQ to send a shutdown command that you configure to a server before powering it off.

You must add the shutdown commands before enabling graceful shutdown. See **Add Shutdown Commands** (on page 191).

▶ **To enable graceful shutdown for an IT device:**

1. In the Data Centers tab, select a device that requires graceful shutdown to be enabled.

2. Make sure the IP address for the device is completed in the IP Address field.

3. Expand the Graceful Shutdown section of the IT Device details page and select the Graceful Shutdown checkbox.

4. Select the command to send to the server from the Shutdown Command list. You must add commands to Power IQ before selecting a command here. See **Add Shutdown Commands** (on page 191).

5. In the Shutdown Wait field, enter the number of seconds Power IQ should wait for the shutdown to complete before powering off the associated outlet.

6. Click Test Connection. Power IQ attempts to connect to the device using the selected command. If you see a success message, click Save. If you see an error message, click View Log in the dialog to troubleshoot the failure.

7. Click Save to save all changes.

Disable Graceful Shutdown for an IT Device

There are two methods for disabling graceful shutdown for an IT Device.

▶ **Remove the IT device from the shutdown command details page:**

1. In the Devices tab, choose Activities > Shutdown Commands.

2. Select the shutdown command that you want to disable for the IT device.

3. Select the IT device in the Devices Using Shutdown Command list and click Remove.

4. Click Yes to confirm. The command is removed from the IT device and graceful shutdown is disabled.

▶ **Disable graceful shutdown from the Data centers tab:**

1. In the Data Centers tab, select a device that requires graceful shutdown to be disabled.

2. Expand the Graceful Shutdown section of the IT Device details page and deselect the Graceful Shutdown checkbox.

3. Click Save.

View the IT Devices Using a Shutdown Command

View the shutdown command details to see a list of IT Devices using each shutdown command.

▶ **To view the IT devices using a shutdown command:**

1. In the Devices tab, choose Activities > Shutdown Commands.

2. Select the shutdown command whose usage you want to view and click Edit.

3. The list of IT devices that are using the shutdown command displays below the command details.

Remove a Shutdown Command from Power IQ

When you remove a shutdown command from Power IQ, you can assign a different command to the IT devices that were using the removed command. Or, you can disable graceful shutdown for those devices.

▶ **To remove a shutdown command from Power IQ:**

1. In the Devices tab, choose Activities > Shutdown Commands link.

2. Select the command you want to remove from Power IQ and click Remove.

3. If the command is being used by any IT devices, a dialog appears. an option and click

a. Select Remove Command from Devices and Disable Graceful Shutdown, and click OK to remove the command from Power IQ and not assign a different shutdown command to the IT devices.

OR

b. Select Assign Another Shutdown Command to Devices, and then select a different shutdown command from the list, and click OK, to assign a different shutdown command to the IT devices.

Preparing Servers for Graceful Shutdown

Servers must be configured to allow the shutdown commands to run when you enable graceful shutdown from Power IQ.

Open Ports for Graceful Shutdown

Servers that will receive graceful shutdown commands from Power IQ must have the following open ports.

▶ **Unix/Linux:**

- TCP 22: For SSH commands only. Custom SSH ports are not supported.

▶ **Windows:**

- TCP 139: NetBIOS Session Service, for Windows systems only.
- TCP 445 : For NetRPC commands only.

Basic Configuration for SSH Shutdown

▶ **Open Ports**

- Open port 22.

▶ **Authentication for SSH:**

- Power IQ can send a shutdown command via SSH to systems that share an authentication method, including the following methods.
  - common user directories
  - common username and password
  - common username and password (users managed by a common LDAP server)
  - common username and encrypted key: Append the public key file as a string to the `~/.ssh/authorized_keys` file of the user on each machine to be shut down.

- The user must have permission to shut down the machines using the authentication method.
- Each authentication method must be tested from the command line.

► Shutdown Commands:

There are two types of shutdown commands that you can use in Power IQ.

1. A call to the native shutdown command, which varies by Unix type

   OR

2. A common shutdown script that carries out a backup

   - Each method must be tested from the command line of each machine to be shut down

   - The command has 30 minutes to complete before Power IQ stops trying. If the time expires, Power IQ closes the SSH connection, logs an error, and does NOT power off the outlet.

   - If the command returns stderr, Power IQ assumes a failure. Power IQ logs stdout and stderr.

   - Error details are written to the Power IQ log.

Sample SSH Shutdown Commands

Resources for information on writing SSH shutdown commands:

http://www.unix.com/man-page/OpenSolaris/1m/shutdown/

► Sample Linux command:

/sbin/shutdown -h now

► Sample OpenSolaris command:

sudo -E /usr/sbin/shutdown -y -i5 -g5

Basic Configuration for Windows Remote Shutdown

NetRPC shutdown commands can be used to shutdown Windows machines remotely.

▶ **Open ports:**

Open port 445.

▶ **Authentication:**

The Windows Remote Shutdown command requires a user account whose security policy allows shutdowns from a remote system.

Each server that will receive graceful shutdown commands must accept the user account's username and password.

▶ **Windows Server Configuration:**

RPC commands must be enabled on each Windows server that you will shutdown via Power IQ.

When Will Graceful Shutdown Abort?

If there is any error between beginning to connect with the server and the server returning from the shutdown script with a non-zero code, that is, no errors in the script, then the attempt is marked as failed and the outlet task does not proceed.

Create Device Groups for Power Control

Create a group of devices when you need to perform a power control task on the whole group. You can control power to the group manually, or by scheduling a power control task to run at a certain time. See *Control Power to Outlets in a Data Center* (on page 187) and *Scheduling Power Control* (on page 188).

Create a Device Group

▶ **To create device groups for power control:**

1. Make sure power control and scheduled power control is enabled. See *Enable or Disable Power Control* (on page 186) and *Configure Power Control Options* (on page 186).

2. In the Devices tab, select the devices you want to add to the group.

3. Click Add to Device Group > Create a new device group.

4. In the "Create a new device group" dialog, enter a name for the group, then click "Create device group".

![Raritan logo]

5. The group is created, and the selected devices are added. A success message displays. Click "View device group" to open the device group details, where you can set the default power control delays and sequence of devices for power control operations. See *Configure the Power Control Settings for a Device Group* (on page 197).

Add Devices to an Existing Device Group

Once groups have been created, you can add devices to the group in the Devices tab.

1. In the Devices tab, select the devices you want to add to the group.

2. Click Add to Device Group, and the list of groups that have been created displays beneath the "Create a new group" option. Select the group you want to add the devices to.

Add Devices to a Group in the Data Centers Tab

You can add one device or all devices within a data center, row, rack, and so on, to a group in the Data Centers tab.

▶ **To add devices to a group from the Data Centers tab:**

1. In the Data Centers tab, select a device to add to the group. To add all devices from a section of the data center, select the room, or aisle, or rack. You can select any level, up to and including the data center.

2. Right-click the selected level, select "Add devices to a device group", then select the group. To add a group, select "Create a new device group", enter a device group name then click "Create device group."

Configure the Power Control Settings for a Device Group

Configure each device group to set the default power control delay and the sequence of devices for power control operations.

▶ **To configure the power control settings for a device group:**

1. In the Devices tab, choose Activities > Device Groups.

2. Click a device group Name link. The Edit Device Group page opens.

3. Set the Default Power On Delay (sec), which is the number of seconds that Power IQ delays after powering on each device in the sequence of devices in a group. These settings are the default power-on delay for all new devices you add to the group.

4. Set the sequence for power control operations. Select a device, then click Up, Down, Top, Bottom, and Move To to arrange the device list in the sequence that power control operations should occur.

   ▪ Devices will power off in the sequence set.

- Devices will power on in the REVERSE sequence set.

Remove a Device from a Group

▶ **To remove a device from a group:**

1. In the Devices tab, choose Activities > Device groups.

2. Click the device group Name link.

3. Select the device you want to remove, then click Remove. The device is removed from the group, but not removed from Power IQ.

Set a Different Power On Delay for a Device

Power IQ will follow the default delay setting for power-on sequences, unless you specify a different delay setting for a device. Delays are for power-on sequences only. The delay occurs after each power-on operation completes.

1. In the Devices tab, click a device group Name link in the Device Groups column. The Edit Device Group page opens.

2. Select the device in the Devices in This Group list, then double-click the Power On Delay value and enter a new value in the field.

Chapter 13 Analytics

In This Chapter

What are Power IQ Analytics?

The Analytics tab allow you to create and view custom reports based on Power IQ's knowledge of your data center and the power measurements it takes.

Reports are created as a way to organize charts. See **Adding Reports to the Analytics Page** (on page 201).

Each report can contain one or more charts. There are two chart types: Device and Health. See **Creating a Chart** (on page 203).

- Device charts show power measurements of your devices. See **Device Chart Settings** (on page 203).

- Health charts show connectivity and event statuses of your PDUs. See **PDU Health Chart Settings** (on page 208).

This list contains some examples of the types of information you can include in charts:

- The Active Power consumed by Test Rack #2 over the past hour.

- How many Kilowatt Hours were used by Rows A, B and C in the Data Center last month.

- If power costs $0.062 per kWh, what did the IT server room cost to power last year?

- What is the health status of all PDUs in the system, based on connectivity and events received?

You must configure an Enterprise Data Model before using Analytics. The Enterprise Data Model populates the Data Center tab with a hierarchical representation of your data center. See **Enterprise Relationships** (see "**Enterprise Relationships and the EDM**" on page 114).
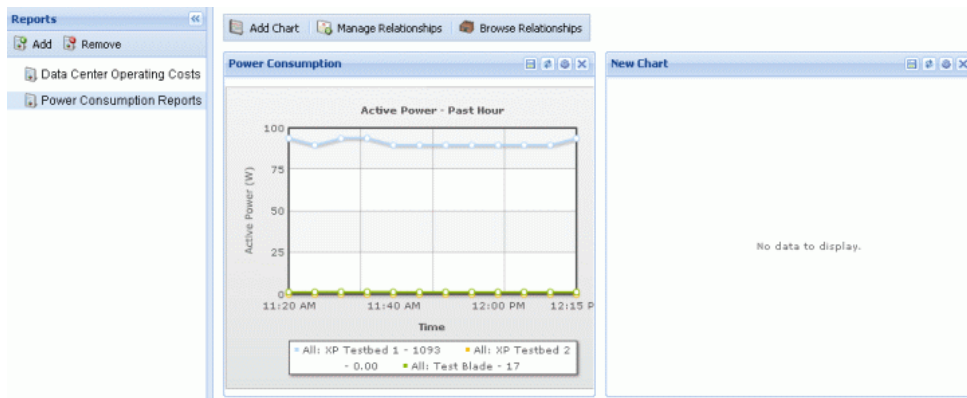
Adding Reports to the Analytics Page

The analytics page can include multiple report pages. A report page is a collection of one or more charts. Creating multiple reports is a good way to organize the Analytics information by category or specific need.

▶ **To add a report to the Analytics page:**

1. Click Add in the Reports column and enter a name for the report.

2. In the Reports toolbar, select the Share This Report checkbox to make the report and charts public.

▶ **To view a report:**

- In the Analytics tab, select a report in the Reports column. The report opens in the main section of the page.

- If the report has been shared by another user, you cannot edit it. Shared reports are marked as "Shared by username."

Sharing Reports on the Analytics Page

Choose to share a report when you want to make it public. Sharing reports gives other Power IQ users access to the report, and the charts it contains.

Users must have the View and the Create Reports and Charts role assigned to view your shared reports.

Reports that are shared are marked in the list as "You are sharing." Reports that have been shared by other users are marked as "Shared by username."

The data that displays in a report is based on each individual user's permissions in Power IQ. If another user does not have permission to see information about a rack or datacenter, for example, that you have shared a report about, the user will not see the data.

Users that you share a report with cannot edit your report. You cannot edit reports that you did not create.
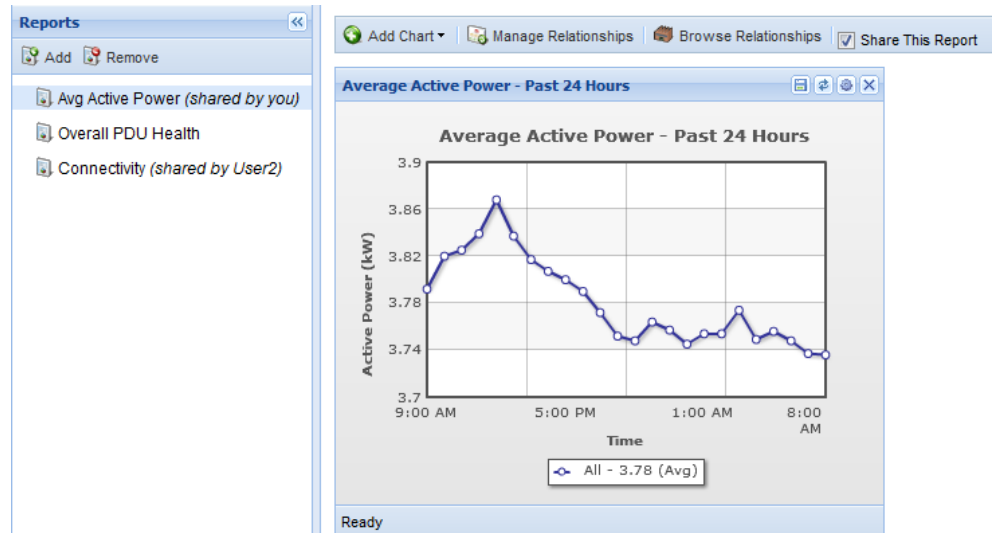
► **To share reports on the Analytics page:**

1. In the Analytics tab, select a report on the left side of the page.

2. In the Reports toolbar, select the Share This Report checkbox to make the report and charts public.

► **To make reports private on the Analytics page:**

1. In the Analytics tab, select a report on the left side of the page.

2. In the Reports toolbar, deselect the Share this Report checkbox to remove the report from public view.

Creating a Chart

You must add a report before you can create a chart. See ***Adding Reports to the Analytics Page*** (on page 201).

▶ **To create a chart:**

1. In the Analytics tab, select a report on the left side of the page.

2. Click Add Chart, then select Device Chart or Health Chart.

- Device charts show power measurements of your devices. See ***Device Chart Settings*** (on page 203).

- Health charts show connectivity and event statuses of your PDUs. See ***PDU Health Chart Settings*** (on page 208).

  You can change the location of any chart by clicking on the title bar of the chart and dragging it to its new position.

Configuring Charts

Configure a chart to select the data you want to analyze.

Charts created in the Analytics tab can only be viewed in the Analytics tab. Charts configured in the Dashboard tab can be viewed in the Dashboard tab, or in a Dashboard slide show. See ***Dashboard*** (on page 79).

- For device chart details, see ***Device Chart Settings*** (on page 203).

- For PDU health chart details, see ***PDU Health Chart Settings*** (on page 208).

Device Chart Settings

A device chart displays power measurements for the devices in your data centers. Devices must be mapped to rack PDU outlets or circuits in the EDM before the data can be charted. See ***Creating Your EDM*** (on page 117).

You can configure a device chart on the Analytics tab or on the Dashboard tab.

To chart facilities objects, see ***Facilities Chart Widget*** (on page 99)

▶ **To configure device chart settings:**

1. In the Analytics tab, select a Report. The charts contained in the Report open. On the chart you want to configure, click the Settings icon 🌐. See ***Creating a Chart*** (on page 203) for details on adding a new chart.

   OR

In the Dashboard tab, add a device chart widget, then click the Settings icon ⚙ in the widget. See **Device Chart Widget** (on page 83).

2. The Device Chart Settings dialog appears.

3. In the Measurement field, select the type of measurement you want to analyze from the drop-down list.

   ▪ The measurement is represented on the y-axis of the chart.

   ▪ See **Device Chart Measurements** (on page 207).

4. In the Time Selection section, select Period or Range.

   ▪ Select Period to show constantly updated measurement, such as power consumption over the Past hour, Past week, Past month, and so on. Select the time period from the drop-down list. See **What's the difference between "Past" and "Last" time periods?** (on page 206)

   ▪ Select Range to show measurements from a custom Start Date and End Date. Select the start and end dates using the calendar dialogs.

   ▪ The time selection is represented on the x-axis of the chart.

5. In the Granularity field, if available, select the level of granularity of data to chart. Hourly will show 1 data point per hour for the time period the chart includes, when the time period is 24 hours or longer. Poll Interval will show 1 data point per poll interval for the time period the chart includes.

   ▪ The Poll Interval must be set to 5 minutes or longer to use Poll Interval granularity.

6. In the Line Configuration field, select an option to determine how many lines are on a chart, and how the lines are configured.

   ▪ Select "Manually define lines" to choose the data for each line individually. You can add data from different sections of the data center to the same chart with this option. See **Manually Define Individual Device Chart Lines** (on page 205). Click the Individual Lines (Advanced) tab to configure the lines.

   ▪ Select "Automatically define lines" then select a node from your enterprise data model in the Show field to show 1 line of data in the chart. Select the "One line per child" checkbox to show 1 line of data per child of the location selected in the Show field. For example, 1 line per child of a data center may show 1 line per room. Parent-child relationships are determined by the structure of your enterprise data model, as configured in the Data Centers tab.

Note: Humidity and Temperature measurements cannot be represented as one line per child. To chart one line per humidity or temperature sensor, use "Manually define lines."

7. In the External Key field, enter the external key of the PDU to filter the chart's data by that value.

8. In the Custom Fields 1 and 2, which may be renamed in your system, enter a PDU custom field value to filter the chart's data by that value.

9. Select Minimum, Maximum, or Average to specify whether you want the lowest values, highest values, or an average of the data for the measurement you selected. Min/Max/Average is not available for all measurements.

10. Click View Matching PDUs to view the list of PDUs to be included in the chart data.

11. The text in the Name field displays as the chart title. Select the Auto Name checkbox to allow the name to configure automatically, based on the criteria of the chart. Deselect the Auto Name checkbox to enter a name manually.

12. The Include Legend checkbox is enabled by default, and a chart legend for the data will be included. Deselect the Include Legend checkbox to remove the legend.

   ▪ Removing the legend can make a chart more readable, depending on how many lines of data are included.

13. Click OK to save the settings and view the chart.

Manually Define Individual Device Chart Lines

You can manually define individual device chart lines to choose the data for each line individually.

You can add data from different sections of the data center to the same chart with this option.

▶ **To manually define individual device chart lines:**

See *Device Chart Settings* (on page 203) to start the chart configuration. In the Chart Settings, select "Manually define lines" to enable the Individual Lines (Advanced) tab.

1. In the Individual Lines (Advanced) tab, select a line in the Lines column.

   ▪ By default there is one line, called Power IQ, that represents the whole system.

2. In the "Select what you want to see on this line" field, click the browse button, then select the data center node you want to chart on this line. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node to save the line.

3. To add more lines, click Add, then select the line and repeat step 2 to configure it.

4. To filter a line to a more granular level, select the line in the Lines column, then enter your criteria in the fields in the Filter by Device Properties section.

   ▪ For example, to configure a chart that includes 1 line per rack or row for a certain customer, add 1 line for each rack or row, then enter the name of the customer in the Customer Name field of each line.

   ▪ Note: Filtering for Device Type, Customer, Custom Field 1 and Custom Field 2 will include any match that includes your search term, not just exact matches. For example, "ABC" will include "ABC" and "ABC123".

5. The text in the Name field displays as the line name in the legend of the chart, when legends are enabled. Select the Auto Name checkbox to allow the name to configure automatically, based on the criteria of the line. Deselect the Auto Name checkbox to enter a name manually.

6. Click the Chart Settings tab to finish the other chart configurations. See **Device Chart Settings** (on page 203).

7. Click Save.

What's the difference between "Past" and "Last" time periods?

- A Past measurement indicates the selected period of time up to the current moment.

  For example: If you view a device chart on Tuesday, and the period is set to Past Week, the chart includes data from last Tuesday through this Tuesday.

- A Last measurement indicates the most recent completed period of time.

  For example: If you view a device chart on Tuesday, and the period is set to Last Week, the chart includes data from last Sunday through last Saturday. The chart shows the last full week.

Device Chart Measurements

Device charts can be configured for many kinds of measurements.

▶ **Power Reading Charts:**

- Active Power (W)
- Current (amp)
- IT Energy (kWh)
- CO2 Footprint (CO2 Kg)
- IT Energy Cost ($ or other currency)
- Total Energy Including Cooling (kWh)
- Total Energy Cost Including Cooling ($ or other currency)

▶ **Temperature Charts:**

Measurement taken as degrees Celsius or Fahrenheit, based on system setting in Settings > Application Settings > Language and Locale Settings.

- Inlet Temperature
- Outlet Temperature
- Outside Air Temperature

▶ **Humidity Charts:**

Measurement taken as percentage humidity.

- Inlet Humidity (%)
- Outlet Humidity (%)
- Outside Air Humidity (%)

▶ **Air Flow and Pressure Charts:**

Measurements taken as meters per second for air flow, and pascals for air pressure.

- Air Flow (m/s)
- Air Pressure (Pa)

PDU Health Chart Settings

A PDU health chart displays connectivity and event statuses of your PDUs.

You can configure a PDU health chart on the Analytics tab or on the Dashboard tab.

▶ **To configure device chart settings:**

1. In the Analytics tab, select a Report. The charts contained in the Report open. On the chart you want to configure, click the Settings icon ⚙. See **Creating a Chart** (on page 203) for details on adding a new chart.

   OR

   In the Dashboard tab, add a PDU health chart widget, then click the Settings icon ⚙ in the widget. See **PDU Health Chart Widget** (on page 84).

2. The Health Chart Settings dialog appears.

3. Click the Settings icon ⚙.

4. Enter a name for the chart in the Title field in the Basics section.

5. In the Data From field, select All to include all PDUs in the system in the chart. Select Data Center or other section of the data center to filter the next field's selections. For example, select Racks to filter the Contained In field to include the racks in your system.

6. In the Contained In field, select the location of the PDUs you want to include in the Health chart.

7. In the Options section, select the health measurement.

   ▪ Select Overall Health to view a health chart that combines connectivity and active events to create an overall health status of the selected PDUs.

   ▪ Select Event Health Only to exclude connectivity from the health status.

   ▪ Select Connectivity Health Only to exclude active events from the health status.

8. Click Save.

Overall PDU Health

Overall health in a PDU Health Chart comprises both connectivity health and active events health. The overall health is determined based on these criteria:

- Critical: Red - A PDU is in critical overall health if either its connectivity health is critical or its active events health is critical. The overall health is critical even when only one of these categories is critical.

- Warning: Yellow - A PDU is in warning level overall health if either its connectivity health is warning, or its active events health is warning, but neither is critical. This could indicate a warning level active event and good connectivity.

- Good: Green - A PDU is in good overall health if both its connectivity health is good and its active events health is good. This indicates no unsuccessful polls, and no active warning or critical severity events.

Exporting Charts

Export a chart to save the chart data to a .CSV file.

▶ **To export a chart:**

1. In the Analytics tab, select a Report.

2. The charts contained in the Report open. Click the Export icon 🖫 in the chart.

3. Use the dialog that appears to save the file.

Chapter 14 PUE - Power Usage Effectiveness

Power Usage Effectiveness (PUE) is the ratio of the total amount of power used by a data center to the power delivered to actual IT equipment. An ideal PUE is 1.0.

$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

Power usage for anything that is not a computing device, such as lighting and cooling, is considered facility power usage.

Power IQ measures total power and IT power based on the flags set for each inlet, outlet or circuit. Flags indicate whether the kilowatt hours measured count toward total power, IT power, both, or neither. See *Set PUE Flags* (on page 211) and *What PUE Flags Does Power IQ Set Automatically?* (on page 212)

Power IQ sums up the measured values on a daily and monthly basis, then uses the values to calculate PUE. Both daily and monthly PUE calculations are offered. Power IQ does a rollup of daily measurements on the first day of each month, using the previous month's data, to create a monthly PUE calculation for each data center. You can adjust the monthly sums for total power and IT power as needed after the rollup.

All data represents the PUE flags and EDM configuration as set when the data was collected.

Power IQ displays the PUE calculations in several ways.

- *List PUE Calculations and Adjustments* (on page 213): a list of the monthly PUE calculations for each data center that enables you to enter offset values to adjust the monthly total power and IT power readings.
- *PUE Trend Chart Widget* (on page 96): a dashboard chart that shows PUE calculations over time.
- *Latest PUE Reading Gauge Widget* (on page 97): a dashboard gauge that shows your latest PUE reading and where it falls within the thresholds set.

In This Chapter

Requirements for PUE

PUE calculations can begin once your system is set up to include:

- Enterprise data model (EDM) is configured and includes the objects you want to flag as part of the PUE calculation. See *Enterprise Relationships* (see "*Enterprise Relationships and the EDM*" on page 114)

- Objects are flagged as Total Power and IT Power. See *Set PUE Flags* (on page 211)

Set PUE Flags

You must identify the sources of IT power and total power using flags. Power IQ uses the flags to determine which readings to use in the PUE calculation.

IMPORTANT: When setting Total Power, make sure not to flag the same power more than once. Set the flag at the highest level source only.

▶ **Total Power:**

- Set the flag for Total Power if the object supplies power to the data center. Avoid double-flagging Total Power in the stream. For example, flagging Total Power on a standalone meter AND the inlet to a downstream floor PDU would double-flag the same energy.

  - Best practice is to measure Total Power at the main line in to the data center. For example, if you have a standalone meter, flag it as Total Power.

  - Another method is to search for circuits of your Power IQ managed facilities objects, such as floor PDUs, power panels, UPS, and so on, and flag the highest level sources as Total Power.

  - Power IQ does not automatically flag Total Power.

▶ **IT Power:**

- Set the flag for IT Power if the object supplies power for computing purposes only.

  - Outlets on Rack PDUs

  - Inlets on Rack PDUs without outlet meters

  - Power IQ automatically flags rack PDUs as IT Power.

- See ***What PUE Flags Does Power IQ Set Automatically?*** (on page 212)

▶ **To set PUE flags:**

1. In the PUE tab, use the search criteria to list the objects you want to flag.

   - Type: Circuits, Outlets, or Inlets.

   - Filter by Node: Select an EDM node.

   - Flagged as Total: Filters objects by their Total Power flag status.

   - Flagged as IT: Filters objects by their IT Power flag status.

2. Click Search.

3. In the search results list, select the checkboxes under the Total and IT columns for each object to flag it.

   Note: Use the All Total and All IT icons to automatically flag all objects in the search results, or to remove a flag from all objects in the search results.

What PUE Flags Does Power IQ Set Automatically?

Power IQ does not automatically flag for Total power.

Power IQ automatically sets some PUE flags for IT power.

When you upgrade to 4.1 or later:	
Object	**Flagged as IT Power**
Rack PDU or inline meter with outlets	outlets
Rack PDU and inline meter without outlets	inlets

When you add a new object :	
Object	**Flagged as IT Power**
Rack PDU or inline meter with outlets	outlets
Rack PDU or inline meter without outlets	inlets
Floor PDU, Power Panel, Standalone Meter, UPS, CRAC ▪ Note: These facilities objects are added as PDUs, and supported using Dynamic Plugins. See ***Dynamic Plugins*** (on page 219).	none

List PUE Calculations and Adjustments

The PUE tab displays the monthly rollup PUE calculations for each data center. Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. You can adjust the monthly values for Total Power and IT Power for the month.

Adjustments can be positive or negative Kilowatt hours.

Daily values are not displayed, and they cannot be adjusted.

Adjustments made will affect all PUE charts in the dashboard that use monthly data.

▶ **To list PUE calculations and adjustments:**

1. In the PUE tab, choose Activities > List PUE Calculations. The list includes a line for each month of data for each data center in your EDM.

2. Enter the number of Kilowatt hours for adjustments to Total Power or IT Power in the fields provided. Use a "-" sign to make a negative adjustment to the number of hours.

   ▪ Total kWh Adj: Adjustment to Total Power

   ▪ IT kWh Adj: Adjustment to IT Power

PUE Calculations

Month	Data Center	Total kWh	Total kWh Adj	IT kWh	IT kWh Adj	PUE
Jul 2013	Unassigned Data C...	720801	1500	720539	-1000	1

Chapter 15 Maintenance Tasks

In This Chapter

Downloading Daily Sensor Readings

Storage of daily raw readings in CSV files can be enabled or disabled. When enabled, depending on your configuration, Power IQ can store up to 8 days of CSV files. See **Configure Raw Sensor Readings Storage** (on page 10).

The daily sensor readings CSV file includes the state of the circuit breakers for applicable Dominion PX PDUs. The circuit breaker state is recorded to this file only once every polling interval, even if you enable buffered data retrieval under Polling Options.

Sensor readings include internal sensors and temperature, humidity, airflow, air pressure, and contact closure sensors.

See **Configuring Remote Storage of Archive Files** (on page 113) for details on automatic remote storage of sensor reading archives.

▶ **To download daily sensor readings:**

1. In the PDUs tab, choose Activities > Download PDU Sensor Readings. The Sensor Readings Archives page opens.

   ▪ The option is hidden when storage for sensor readings files is disabled. See **Configure Raw Sensor Readings Storage** (on page 10).

2. Click a filename link to download an archive of the sensor readings taken on that day. Filenames include the date of the readings. Or, click Download Latest Readings to download the current sensor readings CSV file.

Note: To delete an archived file, select the checkbox next to the filename, then click Remove.

▶ **To download daily sensor readings via script:**

You can set up an external program to download the latest sensor readings file each day.

Example using `wget`:

```
wget-1.10.2.exe -t 3 --http-user=[username]
--http-passwd=[password] --no-check-certificate
https://[hostname]/sensor_readings_csvs/latest
```

Example using `curl`:

```
curl --user [username]:[password]
https://[hostname]/sensor_readings_csv/latest >
latest-csv-archive.zip
```

Upgrading Power IQ Firmware

When new firmware is released, you can upgrade Power IQ to receive the latest in features and functionality.

See the Release Notes for any special instructions on upgrading.

▶ **To upgrade Power IQ firmware:**

1. In the Settings tab, click Software Upgrades in the Appliance Administration section. The Upgrade page opens.

2. Click Browse, select the firmware file (usually a *.bin file).

3. Click Upload. The new firmware uploads to the application.

Shutting Down and Restarting Power IQ

You can shut down and power off or restart Power IQ.

▶ **To shut down and power off Power IQ:**

• In the Settings tab, click System Shutdown in the Appliance Services section.

   The Power IQ shuts down and powers off.

▶ **To restart Power IQ:**

• In the Settings tab, click System Restart in the Appliance Services section.

   The Power IQ restarts.

Accessing Audit Logs

Power IQ Web Client audit logs can be viewed in a browser, or exported to a file for viewing or storage.

> Warning: Audit logs are automatically deleted from the system after 3 calendar months. If you need to maintain a complete audit trail, export logs regularly and store the files outside Power IQ.

▶ **To access audit logs:**

1. In the Settings tab, click Audit Log in the Application Administration section.

2. The Audit Log Entries page opens.

▶ **To export audit logs to a text file:**

1. In the Settings tab, click Audit Log in the Application Administration section.

2. Click the Download Audit Logs link. All audit log entries are exported to a text file.

3. Save the file.

Chapter 16 Appliance Administration

In This Chapter

Allow HTML Widgets on Dashboard

The Dashboard tab can include your custom HTML portlets as a widget. HTML portlets may have security implications. You must allow them before you can add an HTML widget to the Dashboard tab.

► **To allow HTML widgets on dashboard:**

1. In the Settings tab, click Application Settings in the Appliance Settings section.

2. In the Display Settings section, select the "Allow user-created HTML portlets on the dashboard" checkbox.

3. Click Save.

Display a Logo on Every Page

Upload your company logo to display it on every page in Power IQ. This is useful for branding a dashboard presentation.

Logos must not exceed 150 pixels wide, 48 pixels high, or 512KB in size.

For details on adding a logo to the dashboard, see *Image Widget* (on page 87).

► **To display a logo on every page:**

1. In the Settings tab, click Application Settings in the Appliance Administration sections.

2. In the Display Settings box, select the "Show a custom uploaded logo" checkbox.

3. Click Browse to select the logo file, then click Open.

   ▪ If the file does not meet the logo criteria, error messages display. Edit the image as needed, then upload again.

4. Click Save Display Settings. The logo appears in the top right corner of every page in Power IQ.

Configuring the System Clock

Power IQ uses the system clock to time-stamp events and data records. Set the system clock as soon as possible to keep an accurate record of events.

Using an NTP server is recommended to keep the system clock synchronized between Power IQ and the PDUs it manages.

Important! You must use the same NTP server for Power IQ and all Dominion PX PDUs managed to get accurate readings from PX.

Configuring NTP Server Settings

The Configure Time Servers table lists the NTP servers Power IQ contacts to get date and time information. NTP must be enabled first.

Power IQ attempts to retrieve the date and time from the first server on the list. If this attempt fails, it proceeds down the list and attempts to contact the second server, then the third, and so on.

▶ **To enable NTP and configure NTP servers:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.

2. In the Time Settings box, click the arrow to expand the NTP Settings

3. Select the Enable NTP checkbox.

4. Click Add.

5. Type the time server's IP address in the Time Server field then click OK.

6. Click Save Time Settings.

▶ **To edit NTP server settings:**

1. Select the server in the table and click Edit.

2. Type the time server's IP address in the Time Server field

3. Click Save Changes.

▶ **To remove an NTP server:**

1. Select the server in the table.

2. Click Remove.

3. Click Yes in the confirmation message.

Configuring the System Clock Manually

▶ **To configure the system clock manually:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.

2. In the Time Settings section, select the Time Zone Power IQ server resides in from the Time Zone drop-down list.

3. Select the date and time using the tools in the "Set time manually" fields. Select the date from the pop-up calendar. Select the 24-hour time from the drop-down list.

4. Click Save Time Settings.

Dynamic Plugins

The dynamic plugins feature enables you to add data collection support for external PDUs and facilities objects that Power IQ does not support by default.

For a full list of supported devices, go to http://www.raritan.com/resources/power-iq-managed-devices-support

http://www.raritan.com/resources/power-iq-rack-pdu-support/

Dynamic plugins work by mapping SNMP OIDs to Power IQ's database, so that Power IQ can find and retrieve data from the device.

There are two types of dynamic plugins, structured and custom. See *Types of Dynamic Plugins: Structured and Custom* (on page 221)

The following device types are supported in each type of dynamic plugin:

- CRAC
- Floor PDU
- Floor UPS
- Power Panel
- Rack PDU
- Standalone Meter

Limitations of Dynamic Plugins

Buffered data retrieval is not supported for PDUs added with dynamic plugins.

Plugins Created Before Power IQ Release 4.1

All dynamic plugins created before Power IQ release 4.1 were structured dynamic plugins. Upon upgrade, the dynamic plugin type for these existing plugins will be set to "Rack PDU". You cannot change the type, but the rest of the dynamic plugin can be edited.

Types of Dynamic Plugins: Structured and Custom

There are two types of dynamic plugins: structured and custom.

The structure of the PDU's SNMP MIB typically determines whether a structured or a custom dynamic plugin is most appropriate.

Generally, if the MIB you are working with supports it, you should choose the structured dynamic plugin option.

▶ **Structured dynamic plugin:**

A structured dynamic plugin is derived from hierarchically structured MIBs. Typically the values are organized in tables in the MIB. For example, a hierarchical MIB for a rack PDU typically has separate tables for elements such as inlets, circuit breakers, and outlets.

In a structured dynamic plugin, you define mappings that represent a series of OID values to be collected. You do not have to provide a mapping for every single SNMP OID that you want Power IQ to collect. If the MIB supports values that can be retrieved that indicate the number of inlets, outlets, circuits, and so on, it is possible to create a structured dynamic plugin that is capable of managing a variety of PDU models. This is not possible with a custom dynamic plugin.

▶ **Custom dynamic plugin:**

A custom dynamic plugin requires a mapping for every desired reading. For example, you would map values for outlet 1 voltage, outlet 1 current, outlet 2 voltage, outlet 2 current. You must manually specify each object id you want Power IQ to collect, and then map each object id into the Power IQ PDU/electrical device data model.

Custom dynamic plugins are useful when:

- You want to monitor a PDU that does not use SNMP for remote communication. These PDUs may use Modbus or Bacnet protocols for remote communication. You can monitor these PDUs with an SNMP gateway. The SNMP gateway gives the ability to convert Modbus, or other protocols, to SNMP. The custom dynamic plugin can use a combination of the SNMP OIDs and hard-coded values mapped to the data model of the PDU type to support your specific PDU. See **SNMP Gateways and Custom Mappings** (see "**SNMP Gateways and Custom Dynamic Plugins**" on page 267)
- The device's MIB does not contain data in tables, also known as a "flat" or "unstructured" MIB.

Mappings for Each PDU Type

CRAC Mappings

A CRAC may contain inlets and inlet poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Mappings:**
- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy

Floor PDU Mappings

A Floor PDU may contain inlets, inlet poles, power panels, panel inlets, panel inlet poles, circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Floor PDU Mappings:**

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Panel Index
- Panel Name
- Panel Inlet Index
- Panel Inlet Apparent Power
- Panel Inlet Active Power
- Panel Inlet Power Factor
- Panel Inlet Energy
- Panel Inlet Voltage
- Panel Inlet Current
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name

- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Floor UPS Mappings

A Floor UPS (Uninteruptible Power Supply) may contain inlets, inlet poles, circuits, and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Floor UPS Mappings:**

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Power Panel Mappings

A Power Panel may contain inlets, inlet poles, circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Power Panel Mappings:**

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Rack PDU Mappings

A Rack PDU may contain inlets, inlet poles, circuit breakers, outlets, and outlet poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Rack PDU Mappings:**
- PDU Name
- PDU Firmware
- Inlet Index
- Inlet Active Power
- Inlet Apparent Power
- Inlet Current
- Inlet Power Factor
- Inlet Voltage
- Inlet Energy
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Circuit Breaker Index
- Circuit Breaker Current
- Circuit Breaker Name
- Circuit Breaker State
- Outlet Index
- Outlet Active Power
- Outlet Apparent Power
- Outlet Name
- Outlet Power Control
- Outlet Power Factor
- Outlet State
- Outlet Voltage
- Outlet Energy
- Outlet Current
- Outlet Pole Index

- Outlet Pole Current: not displayed in Power IQ, but data is rolled up to provide Outlet Current. Use this mapping if your PDU does not provide Current data at the Outlet level.

- Outlet Pole Voltage: not displayed in Power IQ, but data is rolled up to provide Outlet Voltage. Use this mapping if your PDU does not provide Voltage data at the Outlet level.

- External Temperature and Humidity Sensors: See *External Temperature and Humidity Sensor Mappings for Rack PDUs* (on page 229)

Standalone Meter Mappings

A Standalone Meter may contain circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Standalone Meter Mappings:**

- Circuit Index

- Circuit Apparent Power

- Circuit Active Power

- Circuit Power Factor

- Circuit Voltage

- Circuit Current

- Circuit Energy

- Circuit Pole Index

- Circuit Pole Name

- Circuit Pole Phase

- Circuit Pole Position

- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.

- Circuit Pole Voltage

- Circuit Pole Current

External Temperature and Humidity Sensor Mappings for Rack PDUs

External temperature and humidity sensor mappings are available for rack PDUs only. Examine your MIB to determine how the external sensor data is arranged and choose the correct mapping.

▶ **Generic sensor mappings:**

Generic sensor mappings do not include the "temperature" or "humidity" term in the mapping. Generic sensor mappings are useful when you have an OID to determine the type of sensor, and all sensor data is encoded in a single MIB table.

For extra details when mapping sensors in a custom dynamic plugin, see *Generic Sensor Mappings for Custom Dynamic Plugins* (on page 231).

- External Sensor Index: external_sensor_index

- External Sensor Type: external_sensor_type

- External Sensor Name: external_sensor_name

- External Sensor Value: external_sensor_value

- External Sensor Unit: external_sensor_unit

- External Sensor Scale Factor: external_sensor_decimal_digits

    - The "decimal digits" mapping works as a multiplier. Use this mapping when the MIB table contains multiple sensor types and each type has a different scaling. If the scalings are the same, using a multiplier as needed will work, and the multiplier is applied to all sensors.

▶ **Sensor specific mappings for temperature:**

Use a sensor-specific mapping for temperature when all temperature readings are isolated in separate MIB tables from other sensor types, or the MIB table contains both temperature and humidity readings in each row, or a single MIB table contains both temperature and humidity readings (one reading per row) but there is no column OID that indicates the sensor type.

Note: Sensor specific mappings for temperature cannot be used in custom dynamic plugins. Use the generic sensor mappings instead.

- Temperature Sensor Index: external_sensor_temperature_index
- Temperature Sensor Name: external_sensor_temperature_name
- Temperature Sensor Value: external_sensor_temperature_value
- Temperature Sensor Unit: external_sensor_temperature_unit

▶ **Sensor specific mappings for humidity:**

Use a sensor-specific mapping for humidity when all humidity readings are isolated in separate MIB tables from other sensor types, or the MIB table contains both temperature and humidity readings in each row, or a single MIB table contains both temperature and humidity readings (one reading per row) but there is no column OID that indicates the sensor type.

Note: Sensor specific mappings for humidity cannot be used in custom dynamic plugins. Use the generic sensor mappings instead.

- Humidity Sensor Index: external_sensor_humidity_index
- Humidity Sensor Name: external_sensor_humidity_name
- Humidity Sensor Value: external_sensor_humidity_value

Temperature Unit Configuration Precedence

For flexibility to support many kinds of MIB structures, there are several ways of indicating what unit temperature readings are displayed in.

They will be applied in the following order of precedence:

1. If external_sensor_unit (generic) or external_sensor_temperature_unit (specific) mappings are configured and corresponding Temperature Unit (Celsius) and Temperature Unit (Farhrenheit) metadata types are configured then the unit information retrieved from the SNMP agent of the target PDU will be used to determine temperature unit.

2. If a Temperature Unit metadata type is configured then it will be used to determine the temperature reading units.

≡€ Raritan.

3. If no other means to determine temperature reading units is available then Celsius will be assumed.

Generic Sensor Mappings for Custom Dynamic Plugins

In custom dynamic plugins, only the generic sensor mappings are supported.

The generic sensor mappings can be used to identify both external temperature and humidity sensors. Mappings specific to temperature and humidity are not required for custom dynamic plugins because you have the ability to control each OID that is collected, and you can hard code any value that is not available through the MIB. If the MIB does not provide a sensor type value, you must hard code it.

- External Sensor Index: external_sensor_index: Not supported for custom dynamic plugins.

- External Sensor Type: external_sensor_type

- External Sensor Name: external_sensor_name

- External Sensor Value: external_sensor_value

- External Sensor Unit: external_sensor_unit

  - For temperature only, to specify Fahrenheit or Celsius. The unit for humidity is always assumed to be a percentage. When all readings are given in the same unit, it's easier to set the Temperature Unit metadata value.

  - This mapping is needed only in the unlikely case that a MIB gives some temperature readings in Fahrenheit and some in Celsius. If so, you must define this mapping for all temperature and humidity sensors identified, because the plugin requires the same total number of mappings for each data model element. For example, if a plugin has 5 external sensor name mappings defined, then it must have exactly 0 or 5 unit mappings defined.

- External Sensor Scale Factor: external_sensor_decimal_digits

  - This mapping must be used when the MIB table contains multiple sensor types and each type has a different scaling. If the scalings are the same, using a multiplier as needed will work, and the multiplier is applied to all sensors.

Wildcard Index Mappings - Structured Dynamic Plugins Only

Wildcard index mappings are valid for structured dynamic plugins only.

When a MIB has related OIDs grouped together and in a sequential order, but not in perfectly structured tables, wildcard index mappings can help you make the information work in a structured dynamic plugin.

Use a wildcard index mapping when you need an index and the relevant stock index mappings have already been used, or do not make sense. See Wildcard Index Mapping Example

▶ **Wildcard index mappings:**

- Wildcard Index 1
- Wildcard Index 2
- Wildcard Index 3
- Wildcard Index 4

Wildcard Index Mapping Example

Wildcard index mappings are useful for creating a structured dynamic plugin when the MIB is not logically organized into tables. A wildcard index mapping can be used as a substitution value in any structured dynamic plugin mapping.

For example, a structured MIB that supports outlet names and outlet current will typically have an outlet table where each row contains one outlet's name and its current (amperage) reading. However, imagine a scenario where the MIB supports outlet names and outlet current, but these values are not accessible through a table. Instead the values are organized as consecutive OIDs in the MIB.

► For example:

The MIB's outlet name OIDs:

- 1.3.6.1.4.1.999.1.2.1
- 1.3.6.1.4.1.999.1.2.2
- 1.3.6.1.4.1.999.1.2.3
- 1.3.6.1.4.1.999.1.2.4

The MIB's outlet current OIDs:

- 1.3.6.1.4.1.999.1.2.5
- 1.3.6.1.4.1.999.1.2.6
- 1.3.6.1.4.1.999.1.2.7
- 1.3.6.1.4.1.999.1.2.8

The last octet of the OID is the "index" for that value. The index values for the outlet name OIDs are: 1,2,3,4. The index values for the outlet current OIDs are: 5,6,7,8.

With a single 'outlet_index' mapping, you could not collect both outlet name and outlet current. To solve this problem, you can use a wildcard index to generate a second series of index values needed, so that both sets of values can be collected.

Structured Dynamic Plugins

Requirements for Structured Dynamic Plugins

- MIB file for the device you want to manage. See ***Find the MIB File*** (on page 234).
- Ability to correctly identify OIDs in a MIB file.

Find the MIB File

To add a PDU using dynamic plugins, you must have the MIB file for the PDU.

▶ **To find the MIB file:**

MIBs are usually available in one of the following locations.

- The product interface. For example, Raritan's Dominion PX PDUs have a menu option to save the MIB file. Note: PX PDUs are supported. You do not need to add dynamic plugins for Raritan PDUs.
- The product's website.
- The product's technical support department.

Use a MIB Browser

A MIB browser is useful when creating your dynamic plugins.

iReasoning MIB Browser free personal edition is suggested.

Go to http://ireasoning.com/download.shtml

Identify the OIDs for Mapping

Power IQ provides the ability to map OIDs for many components, attributes, and details of power devices. Power IQ can collect and display data from the device based on the mappings you provide.

OIDs are documented in a product's MIB file.

In SNMP, the object identifier (OID) that uniquely identifies the make and model of an SNMP-managed device is the MIB-II System Object Identifier, commonly referred to as "sysObjectID", which is 1.3.6.1.2.1.1.2.0.

Within Power IQ, the value for "sysObjectID" is referred to as the "PDU System OID".

For example, the sysObjectID or "PDU System OID" for a Raritan model PX PDU is "1.3.6.1.4.1.13742.4". The "PDU System OID" is commonly used as the prefix for additional OIDs used to retrieve PDU attribute and component information.

See **Mappings for Each PDU Type** (on page 222) for lists of values that you can map from your PDU to Power IQ.

For each feature that you want to map, you must find the OID, and enter it in the mapping form to create the dynamic plugin. See **Create a Structured Dynamic Plugin** (on page 235).

Create a Structured Dynamic Plugin

Select the data you want to collect from your PDU and add the OID mappings for it to create the structured dynamic plugin.

When adding OIDs, you can use variables to simplify data entry and reduce errors. You must use the correct formatting, which is validated when you save the plugin. See **OID Variables and Format** (on page 238) for details.

For a full list of available data you can map, see **Mappings for Each PDU Type** (on page 222).

For help with mapping external sensors on rack PDUs, see **External Temperature and Humidity Sensor Mappings** (see "**External Temperature and Humidity Sensor Mappings for Rack PDUs**" on page 229).

▶ **To add a dynamic plugin:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.

2. Click Add, then click the type of device: CRAC, Floor PDU, Floor UPS, Power Panel, Rack PDU, Standalone Meter. Do not select Custom when using a structured MIB to create the plugin. See **Create a Custom Mapping Dynamic Plugin** (on page 243).

   ▪ For environmental sensor aggregators, use Rack PDU.

   ▪ Type cannot be changed once the dynamic plugin is created.

3. The new dynamic plugin page displays.

4. Enter a name to identify this dynamic plugin, in the Name field.

   ▪ Lowercase letters and underscores only.

5. Enter a description to identify this dynamic plugin in the Description field.

6. Enter the manufacturer of the device you want to add using this dynamic plugin in the Manufacturer field.

7. The Model field can be used as a filter to specify a specific model number string, when the "PDU Model OID" returns more than one model number. This is useful when the MIB supports multiple different models and it is not possible to design a single dynamic plugin capable of supporting them all.

8. Phase: Select Automatic to allow Power IQ to determine the phase of the device by counting the number of poles on the inlets. Or, make a selection to hard-code the phase as Single Phase or Three Phase.

9. Check the Always Use SNMPv1 checkbox if the target device only supports SNMPv1. Leave the checkbox blank to use the default, SNMPv2 communication.

10. In the Metadata section, enter the value used in the MIB to indicate each status or control value. Common MIB value pairs are Yes/No, On/Off, 1/2. See **Metadata for Circuit Breakers and Outlets** (on page 239) for details.

    ▪ Circuit Breaker State OK

    ▪ Circuit Breaker State Tripped

    ▪ Outlet State On

    ▪ Outlet State Off

    ▪ Outlet Power On

    ▪ Outlet Power Off

11. Enter values for the Sensors Metadata. These values work with external sensor mappings. See **Metadata for Sensors** (on page 240).

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

12. Enter the PDU System OID and PDU Model OID for the devices that will use this dynamic plugin. See **OID Variables and Format** (on page 238) for details. Required. See step 7 for the Model filtering field, if you expect multiple models to be returned.

13. To add features of the PDU, select an item from the "Add another mapping" drop-down list, then click Add. These links contain the list of supported mappings for each device type.

   - **CRAC Mappings** (on page 222)
   - **Floor PDU Mappings** (on page 223)
   - **Floor UPS Mappings** (on page 225)
   - **Power Panel Mappings** (on page 226)
   - **Rack PDU Mappings** (on page 227)
   - **Standalone Meter Mappings** (on page 228)
   - **Wildcard Index Mappings - Structured Dynamic Plugins Only** (on page 232)

14. For each mapping you add, enter the OID. If the MIB does not have an OID for an Index item, enter an integer value. See **Index Mapping Format** (on page 242) for details about mapping indices.

   Some mappings require extra information, below the main mapping field.

   a. Start and Step for Index mappings:

      - Some MIBs number indices starting at a number other than 1, and in increments greater than 1. If your MIB shows this, enter the starting number in the Start field, and the increment in the Step field.

   b. Multipliers for measurement mappings:

- Power IQ expects power readings to be in the following units: Amps, Volts, Watts, VoltAmps, Degrees Fahrenheit/Celsius, and so on.

- Many MIBs report power readings in different units than what Power IQ requires. The multiplier field is used to scale the retrieved readings to the units required. For example, if the MIB reports readings in KiloWatts a multiplier value of 1000 must be specified to scale KiloWatts to Watts. A value of 5KW reported by the SNMP agent is converted to 5000 Watts when the multiplier is applied.

15. When you've finished with mappings, click Create Plugin.

16. Add the PDU that uses the dynamic plugin. See ***Adding PDUs to Power IQ Management*** (on page 20).

    See ***Check PDUs Added with Dynamic Plugins*** (on page 263).

OID Variables and Format

When creating mappings in Power IQ, you can use a variable to represent some OIDs, when the number is part of another OID. For example, many OIDs contain the PDU System OID.

The following variables are supported.

OID	Variable
PDU System OID	{pdu_system_oid}
PDU Proxy Index	{proxy_index}
Circuit Breaker Index	{circuit_breaker_index}
Inlet Index	{inlet_index}
Inlet Pole Index	{inlet_pole_index}
Outlet Index	{outlet_index}
Outlet Pole Index	{outlet_pole_index}
Panel Index	{panel_index}
Panel Inlet Index	{panel_inlet_index}
Panel Inlet Pole Index	{panel_inlet_pole_index}
Circuit Index	{circuit_index}
Circuit Pole Index	{circuit_pole_index}
Sensor Indexes	{external_sensor_index}
	{external_sensor_temperature_index}
	{external_sensor_humidity_index}

OID	Variable
Wildcard Indexes	{wildcard_one_index}
	{wildcard_two_index}
	{wildcard_three_index}
	{wildcard_four_index}

▶ **To use a variable in an OID:**

To use a variable in an OID, substitute the variable text for the numbers. You must use the curly brackets before and after, and the period after the final bracket. Follow the examples in the table.

OID with variable substitution	Fully Expanded OIDs
{pdu_system_oid}.1.1.13.0	PDU Name for a PX1: 1.3.6.1.4.1.13743.4.1.1.13.0
{pdu_system_oid}.1.1.1.0	PDU Firmware for a PX1 1.3.6.1.4.1.13743.4.1.1.1.0
{pdu_system_oid}.1.2.2.1.7.{outlet_index}	Outlet Active Power OIDs for an 8-outlet PX1 1.3.6.1.4.1.13742.4.1.2.2.1.7.1 1.3.6.1.4.1.13742.4.1.2.2.1.7.2 1.3.6.1.4.1.13742.4.1.2.2.1.7.3 1.3.6.1.4.1.13742.4.1.2.2.1.7.4 1.3.6.1.4.1.13742.4.1.2.2.1.7.5 1.3.6.1.4.1.13742.4.1.2.2.1.7.6 1.3.6.1.4.1.13742.4.1.2.2.1.7.7 1.3.6.1.4.1.13742.4.1.2.2.1.7.8

Metadata for Circuit Breakers and Outlets

> ▶ **Circuit Breaker State and Outlet State metadata:**

The dynamic plugin uses the Circuit Breaker State and Outlet State metadata values to interpret values retrieved from a target PDU during polling. The values entered must be based on information in the target PDU's MIB.

For example, if the MIB indicates that an integer value of 1 indicates that an outlet is ON, and 2 indicates that an outlet is OFF, you must specify those values in the metadata section so that Power IQ can interpret the 1 as ON, and the 2 as OFF when those values are retrieved in polling.

> ▶ **Outlet Power metadata:**

The dynamic plugin uses the Outlet Power metadata values when performing outlet power control on a target PDU. Some MIBs will use the same value to indicate both the outlet state and power control operations. Some MIBs use different values. All four Outlet State and Power metadata values must be configured properly for outlet power control to work.

Metadata for Sensors

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

In the Metadata for sensors, the fields work together with the mappings you add to determine your sensor types, and the units used to interpret readings. See *External Temperature and Humidity Sensor Mappings for Rack PDUs* (on page 229) for details. See *External Temperature and Humidity Sensor Mappings Example Screenshots* (on page 259) for examples.

- Humidity Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the humidity sensor type.

- Temperature Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the temperature sensor type.

- Temperature Unit: set the value to C or F to hard code the units used to interpret readings, when the MIB does not have sensor reading unit information, or when Temperature Unit (Celsius)/Temperature Unit (Fahrenheit) values are not found in this metadata section. This field is only used when a units value is not specified on a per reading basis using the external_sensor_unit (generic) or external_sensor_temperature_unit (specific) mappings.

- Temperature Unit (Celsius) and Temperature Unit (Fahrenheit): These fields work with the external_sensor_unit, or external_sensor_temperature_unit mappings. Your readings unit is determined by a match between the value specified here, and the value returned from the MIB for either external_sensor_unit or external_sensor_temperature_unit.

Index Mapping Format

Structured dynamic plugins use index mappings to determine the number of PDU elements that a particular PDU has. PDU elements are inlets, inlet poles, circuit breakers, outlets, and so on.

There are 2 options for specifying a index mapping values.

- Specify an SNMP OID whose retrieved value indicates the PDU element's count.
- Specify a hard-coded integer value to indicate the PDU element's count

The advantage of specifying an OID value that the dynamic plugin can use to retrieve the PDU element count is that a single dynamic plugin is capable of supporting a variety of different PDU models with different numbers of inlets, inlet poles, circuit breakers, outlets, and so on.

If the MIB does not support OIDs that can be used to find the count, you must provide a hard-coded integer value. In this case, the dynamic plugin will likely only work for a specific model. You may also need to specify a Model name filter to ensure the dynamic plugin is only used with the appropriate model type.

▶ **To specify a count object OID for index mappings:**

Find a count object in the MIB that specifies the number of a particular component, such as outlets, that the target PDU has. Specify the OID for the count as the value of the index.

When an OID is a scalar object, that is, not part of a table, add a ".0" to the end of the OID.

For example, the Raritan PX MIB supports an "outletCount" object with an OID of 1.3.6.1.4.1.13742.4.1.2.1.

Add a ".0" to the end of the OID to arrive at an OID of 1.3.6.1.4.1.13742.4.1.2.1.0.

Power IQ can then use this OID to perform an SNMP get request for the number of outlets on a specific PDU.

To map this value in the dynamic plugin, enter "1.3.6.1.4.1.13742.4.1.2.1.0" in the Outlet Index field.

Custom Mapping Dynamic Plugins

Requirements for Custom Mapping Dynamic Plugins

▶ **For custom mappings based on flat MIBs:**

- MIB file for the device you want to manage. See *Find the MIB File* (on page 234).

- Ability to correctly identify OIDs in a MIB file.

▶ **For custom mappings based on SNMP-gateway managed devices:**

- A SNMP gateway device that converts Modbus/Bacnet to SNMP

- A list of the registers for the PDU you want to manage. See *Find the Modbus Register List* (on page 243).

- Ability to correctly convert the registers to SNMP OIDs, using your SNMP-gateway device

Find the Modbus Register List

To add a Modbus device using a custom mapping dynamic plugin, you must have the register list for the device.

▶ **To find the Modbus register list:**

Modbus register lists are usually available in one of the following locations.

- The product's user guide

- The product's website.

- The product's technical support department.

Create a Custom Mapping Dynamic Plugin

▶ **To create a custom mapping dynamic plugin:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.

2. Click Add, then click Custom. Do not select the type of device now.
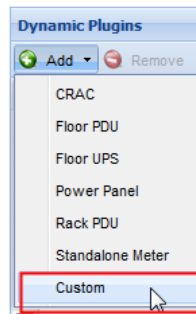
3. The new dynamic plugin page displays.

4. Enter a name to identify this dynamic plugin, in the Name field.

   - Lowercase letters and underscores only.

   - Tip for SNMP gateway use cases: When you have multiple devices using the same gateway, include proxy information in the name. This will help you identify the correct plugin when adding devices. See Proxy ID field.

5. Enter a description to identify this dynamic plugin in the Description field.

6. Enter the manufacturer of the device you want to add using this dynamic plugin in the Manufacturer field.

7. The Model field can be used as a filter to specify a specific model number string, when the "PDU Model OID" returns more than one model number. This allows you to create a dynamic plugin for a specific model, even when multiple models are contained in the MIB.

8. Check the Always Use SNMPv1 checkbox if the target PDU only supports SNMPv1. Leave the checkbox blank to use the default, SNMPv2 communication.

9. In the Metadata section, enter the value used in the MIB to indicate each status or control value. Common MIB value pairs are Yes/No, On/Off, 1/2. See **Metadata for Circuit Breakers and Outlets** (on page 239) for details.

   - Circuit Breaker State OK

   - Circuit Breaker State Tripped

   - Outlet State On

- Outlet State Off
- Outlet Power On
- Outlet Power Off

Metadata	
Circuit Breaker State OK:	1
Circuit Breaker State Tripped:	2
Outlet State On:	ON
Outlet State Off:	OFF
Outlet Power On:	ON
Outlet Power Off:	OFF

10. Enter values for the Sensors Metadata. These values work with external sensor mappings. See **Metadata for Sensors** (on page 240).

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

11. In the Mappings section, select the type of device: CRAC, Floor PDU, Floor UPS, Power Panel, Rack PDU, Standalone Meter.

- Type cannot be changed once the plugin is created.

Mappings	
Type:	Floor PDU
PDU Name:	
System OID:	
Proxy ID:	
Model ID:	
PDU Firmware:	

12. Enter the device's name in the PDU Name field.

13. Enter the System OID for the PDU.

- For SNMP gateway use cases, enter the gateway's System OID.

14. The Proxy ID field is used to identify PDUs in daisy chained configurations, or managed by a serial device. In an SNMP gateway use case, use this field to assign a proxy id to each PDU managed by the gateway. Best practice is to start with 1 for gateways, entering a unique proxy id for each PDU managed through the gateway.

15. Enter the PDU Model OID for the PDU that will use this dynamic plugin. **Required.** See step 7 for the Model filtering field, if the MIB you are working with supports multiple models and you want this custom mapping to apply to a specific model. Hard code a value if the MIB does not provide a value.

16. Enter an OID for the firmware version in the PDU Firmware field.

17. Enter or import Custom Mappings. See *Sensor Mappings* (on page 248).

18. Enter Sensor Multipliers. See *Sensor Multipliers* (on page 254).

19. When you've finished with mappings and multipliers, click Create Plugin.

20. Add the PDU that uses the dynamic plugin. See *Adding PDUs to Power IQ Management* (on page 20).

   See *Check PDUs Added with Dynamic Plugins* (on page 263).

Metadata for Circuit Breakers and Outlets

> ▶ **Circuit Breaker State and Outlet State metadata:**

The dynamic plugin uses the Circuit Breaker State and Outlet State metadata values to interpret values retrieved from a target PDU during polling. The values entered must be based on information in the target PDU's MIB.

For example, if the MIB indicates that an integer value of 1 indicates that an outlet is ON, and 2 indicates that an outlet is OFF, you must specify those values in the metadata section so that Power IQ can interpret the 1 as ON, and the 2 as OFF when those values are retrieved in polling.

> ▶ **Outlet Power metadata:**

The dynamic plugin uses the Outlet Power metadata values when performing outlet power control on a target PDU. Some MIBs will use the same value to indicate both the outlet state and power control operations. Some MIBs use different values. All four Outlet State and Power metadata values must be configured properly for outlet power control to work.

Metadata for Sensors

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

In the Metadata for sensors, the fields work together with the mappings you add to determine your sensor types, and the units used to interpret readings. See **External Temperature and Humidity Sensor Mappings for Rack PDUs** (on page 229) for details. See **External Temperature and Humidity Sensor Mappings Example Screenshots** (on page 259) for examples.

- Humidity Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the humidity sensor type.

- Temperature Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the temperature sensor type.

- Temperature Unit: set the value to C or F to hard code the units used to interpret readings, when the MIB does not have sensor reading unit information, or when Temperature Unit (Celsius)/Temperature Unit (Fahrenheit) values are not found in this metadata section. This field is only used when a units value is not specified on a per reading basis using the external_sensor_unit (generic) or external_sensor_temperature_unit (specific) mappings.

- Temperature Unit (Celsius) and Temperature Unit (Fahrenheit): These fields work with the external_sensor_unit, or external_sensor_temperature_unit mappings. Your readings unit is determined by a match between the value specified here, and the value returned from the MIB for either external_sensor_unit or external_sensor_temperature_unit.

Sensor Mappings

Sensor mappings are used in the custom dynamic plugin to identify each power sensor, or data point, you want Power IQ to support for your PDU.

Sensor mappings can be entered manually, by entering and selecting values. Or, you can create a CSV file with the information formatted correctly, and import the file.

To understand sensor mappings, and view instructions for manual entry, see:

- *Object Identifier* (on page 249)
- *Data Model Element* (on page 249)
- *Sensor Type* (on page 251)
- *Custom Dynamic Plugin Example Screenshots* (on page 256)

To see instructions and an example of the CSV file for importing mappings, see:

- *Sensor Mapping CSV Import File Structure* (on page 253)

To see rules that apply to mappings, see:

- *Additional Custom Mapping Rules* (on page 255)

Object Identifier

The object identifier is the SNMP OID for the sensor, such as an attribute or reading, you want to collect.

In some cases, when an OID is not available in the MIB, you can hard code a value.

Valid values:

- SNMP OID for the sensor

OR

- A hard-coded value for some sensor types. See ***Sensor Type*** (on page 251).

Hard code a value when an OID is not available in the MIB. You can hard code circuit pole phase, circuit pole position on a panel, names, and any sensor type where a positive decimal number value would be returned. Hard coding for numeric values makes sense in some cases, such as voltage. Some other numeric values, such as active power, may be hard coded but will not result in meaningful data.

Data Model Element

The data model element specifies where this sensor is associated in the model of the PDU.

Each device type support different data model elements. The data model elements have hierarchical parent-child relationships. See ***Data Model Elements by PDU Type*** (on page 250).

You must identify the precise association of each sensor.

▶ **To identify the data model element:**

1. In the list of data model elements, find the data model element you want to associate a sensor type with. See ***Data Model Elements by PDU Type*** (on page 250).

2. Append the number of the element to the end of each element's name. Leave one space between elements.

▶ **Example:**

An amperage sensor for pole 3 on circuit 10 of a Floor PDU's second panel.

```
panel2 circuit10 circuitpole3
```

Data Model Elements by PDU Type

Data model elements have hierarchical parent-child relationships.

▶ **Rules for all PDU types:**

- A panel may directly contain inlets and circuits or circuitpoles
- An inlet may contain inletpoles
- An outlet may contain outletpoles
- A circuit may contain circuitpoles

▶ **CRAC**

- inlet
- inlet inletpole

▶ **FLOOR_PDU**

- inlet
- inlet inletpole
- panel
- panel inlet
- panel inlet inletpole
- panel circuit
- panel circuit circuitpole
- panel circuitpole
- circuit
- circuit circuitpole
- circuitpole

▶ **FLOOR_UPS**

- inlet
- inlet inletpole
- circuit
- circuit circuitpole

▶ **POWER_PANEL**

- inlet
- inlet inletpole
- circuit
- circuit circuitpole
- circuitpole

▶ **RACK_PDU**

- inlet
- inlet inletpole
- circuitbreaker
- outlet
- outlet outletpole
- externalsensor

▶ **STANDALONE_METER**

- circuit
- circuit circuitpole

Sensor Type

The sensor type identifies the type of reading expected from the sensor.

Valid values	Valid for these data model elements	Valid hard coded value in Object Identifier Field
▪ active_power	▪ inlet, inletpole, outlet, circuit, circuitpole	▪ positive decimal number
▪ apparent_power	▪ inlet, outlet, circuit	▪ positive decimal number
▪ current	▪ inlet, outlet, circuit, any pole	▪ positive decimal number
▪ decimal_digits	▪ external sensor	▪ positive decimal number used to scale external sensor readings
▪ name	▪ outlet, circuit, circuitpole, circuitbreaker	▪ name of the data model element
▪ phase	▪ circuitpole	▪ L1, L2, L3 ▪ A, B, C ▪ X, Y, Z ▪ 1,2,3 ▪ See **Set Phase Labels for Circuit Pole Phase** (on page 268).
▪ position	▪ circuitpole	▪ Number greater than 0. ▪ Specifies the circuit pole position on the panel.
▪ power_control	▪ outlet	▪ Hard coding not supported for power control.
▪ power_factor	▪ inlet, outlet, circuit	▪ positive decimal number between 0 - 1. ▪ Example: Power factor 98% is hard coded as .98. 100% is 1.0.
▪ state	▪ outlet, circuit breaker	▪ Hard coded value must match the configured metadata value. ▪ See **Metadata for Circuit Breakers and Outlets** (on page 239).
▪ type	▪ externalsensor	▪ Example: T for Temperature, H for Humidity. ▪ Hard coded value must match the configured metadata value for Humidity Sensor Type or Temperature Sensor Type. ▪ See **Metadata for Sensors** (on page 240).

Valid values	Valid for these data model elements	Valid hard coded value in Object Identifier Field
▪ unit	▪ externalsensor	▪ Example: C for Celsius. ▪ Hard coded value must match the configured metadata value for Temperature Unit (Celsius) or Temperature Unit (Fahrenheit). ▪ See **Metadata for Sensors** (on page 240).
▪ value	▪ externalsensor	▪ decimal number
▪ voltage	▪ inlet, outlet, circuit, any pole	▪ positive decimal number
▪ watt_hour	▪ inlet, panelinlet, circuit, outlet	▪ positive decimal number

Sensor Mapping CSV Import File Structure

To include sensor mappings for a custom dynamic plugin, you may import a CSV file containing the information, instead of entering and selecting the information manually.

These links include instructions and valid values for each column:

- **Object Identifier** (on page 249)
- **Data Model Element** (on page 249)
- **Sensor Type** (on page 251)

▶ **To import the sensor mapping CSV file:**

1. In the custom plugin form, click Import in the Sensor Mappings section.

2. Select the file and click Upload. If the file validates, the entries appear in the fields.

► **The structure of the CSV file:**

- One line per sensor mappinig
- No header row
- Each line has only the value columns, in the following order

Column 1:	Column 2:	Column 3:
Object Identifier	Data Model Element	Sensor Type

► **Example:**

A	B	C
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.25	Circuit1	active power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.24	Circuit1	watt hour
HVAC Feed	Circuit1	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.7	Circuit1 CircuitPole1	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.8	Circuit1 CircuitPole2	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.9	Circuit1 CircuitPole3	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.6	Circuit1 CircuitPole4	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.10	Circuit1 CircuitPole1	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.11	Circuit1 CircuitPole2	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12	Circuit1 CircuitPole3	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12	Circuit1 CircuitPole4	voltage
A	Circuit1 CircuitPole1	phase
B	Circuit1 CircuitPole2	phase
C	Circuit1 CircuitPole3	phase
N	Circuit1 CircuitPole4	phase
HVAC Feed Pole1	Circuit1 CircuitPole1	name
HVAC Feed Pole2	Circuit1 CircuitPole2	name
HVAC Feed Pole3	Circuit1 CircuitPole3	name
HVAC Feed Neutral Pole	Circuit1 CircuitPole4	name

Sensor Multipliers

Power IQ expects power readings to be in the following units: Amps, Volts, Watts, VoltAmps, Degrees Fahrenheit/Celsius, and so on.

Many MIBs report power readings in different units than what Power IQ requires. The multiplier field is used to scale the retrieved readings to the units required.

► **To enter sensor multiplier mappings:**

1. In the custom dynamic plugin form, click Add to add a row to the Sensor Multipliers list.

   - The list has three fields for each entry.

   - Double-click the Data Element and Sensor Type fields to access a drop-down list of values.

   - Double-click the Multiplier field to access a text field.

Data Element	Sensor Type:	Multiplier Value:
Select the data model element this multiplier is used on.	Select the sensor type this multiplier is used on.	Enter the decimal value the dynamic plugin will use to normalize the readings into units supported by Power IQ.
▪ circuit ▪ circuit_breaker ▪ circuit_breaker_pole ▪ inlet ▪ inlet_pole ▪ outlet ▪ outlet_pole ▪ external_sensor ▪ external_sensor_humidity ▪ external_sensor_temperature ▪ panel_inlet ▪ panel_inlet_pole	▪ active_power ▪ apparent_power ▪ current ▪ power_factor ▪ voltage ▪ watt_hour ▪ value	▪ For example: If an active power sensor OID returns a value of 5 kilowatts, enter a multiplier of 1000 to normalize to 5000 watts.

Additional Custom Mapping Rules

When creating your plugin, remember these additional rules to ensure your plugin validates, and that you get the best possible data collection.

- Make sure you correctly map the phase of your circuit poles to the phase of the building.

- Add inlet poles in order (A, B, C).

- In a group of like elements, for example, inlet_poles, each element must have the same type of sensors mapped, and must indicate the same total number of the element.

  - Example: If an inlet_pole has voltage mapped, than all inlet_poles for that plugin must have voltage mapped.

  - Example: If there are mappings for 3 voltage sensors for 'inlet_pole' then there must be exactly 3 current sensors configured, or 0 current sensors if current readings are not desired or available.

- For a given sensor type and data model element, all mappings must be OIDs or hard-coded. A mix is not permitted.

Showing Accurate Circuit Pole Positions

To show accurate circuit pole positions, add the OIDs for each pole to the custom mapping in the correct order, or hard code the circuit pole positions in the custom mapping.

Custom Dynamic Plugin Example Screenshots

This custom dynamic plugin example shows a Babel Buster SNMP gateway managing a Schneider PowerLogic PM710 standalone meter.

Mappings

Type:	Standalone Meter
PDU Name:	raleigh_panel2_meter
System OID:	1.3.6.1.4.1.3815.2.2.2.1
Proxy ID:	1
Model ID:	PM710
PDU Firmware:	v2.36

Sensor Mappings

➕ Add   ➖ Remove   ⟳ Load

Object Mapping	Data Model Element	Sensor Type
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.25	circuit1	active_power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.24	circuit1	watt_hour
HVAC Feed	circuit1	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.7	circuit1 circuitpole1	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.8	circuit1 circuitpole2	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.9	circuit1 circuitpole3	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.10	circuit1 circuitpole1	voltage

Object Mapping	Data Model Element	Sensor Type
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.11	circuit1 circuitpole2	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12	circuit1 circuitpole3	voltage
A	circuit1 circuitpole1	phase
B	circuit1 circuitpole2	phase
C	circuit1 circuitpole3	phase
HVAC Feed Pole1	circuit1 circuitpole1	name
HVAC Feed Pole2	circuit1 circuitpole2	name

Object Mapping	Data Model Element	Sensor Type
HVAC Feed Pole1	circuit1 circuitpole1	name
HVAC Feed Pole2	circuit1 circuitpole2	name
HVAC Feed Pole3	circuit1 circuitpole3	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.26	circuit1	apparent_power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.22	circuit1	power_factor

257

Sensor Multipliers

Data Model Element	Sensor Type	Multiplier
circuit	active_power	100
circuit	watt_hour	1000
circuit	apparent_power	100
circuit	power_factor	0.0001
circuit_pole	current	0.1
circuit_pole	voltage	0.1

Add   Remove

Cancel   Update Plugin

External Temperature and Humidity Sensor Mappings Example Screenshots

▶ **If temperature and humidity sensor information is available in a single table AND there is a way to uniquely determine the type of the sensor:**

If temperature and humidity information is available is a single table AND there is an OID that can be queried to determine the type of the sensor, use the generic set of external_sensor_* mappings to collect sensor data.

For example, a PX1 192.168.45.236 has environmental sensor data available in a single table called 'externalSensors'. There is an OID 'externalSensorType' that determines the type of each sensor. In this scenario, the generic set of external_sensor_* mappings can collect the environmental sensor data.

MIB for the PX1:

Sensor Metadata and Mappings Using the PX1 MIB:

Humidity Sensor Type:	11
Temperature Sensor Type:	10
Temperature Unit:	C
Temperature Unit (Celsius):	7
Temperature Unit (Fahrenheit):	

Mappings

PDU System OID:	1.3.6.1.4.1.13742.4
PDU Model OID:	{pdu_system_oid}.1.1.12.0
External Sensor Index:	{pdu_system_oid}.3.1.0
	Start: 1 Step: 1
External Sensor Type:	{pdu_system_oid}.3.3.1.2.{external_sensor_index}
External Sensor Value:	{pdu_system_oid}.3.3.1.41.{external_sensor_index}
	Multiplier: 1
External Sensor Unit:	{pdu_system_oid}.3.3.1.16.{external_sensor_index}
External Sensor Scale Factor:	{pdu_system_oid}.3.3.1.17.{external_sensor_index}
Add Another Mapping:	Select mapping...

Cancel   Update Plugin

► **If there is no OID to determine the sensor type, but there are separate OIDs for temperature and humidity sensor values:**

When the temperature and humidity sensor information is available in a single table AND there is no OID to determine the sensor type, BUT there are separate OIDs for temperature and humidity sensor values, use the temperature_sensor_* and humidity_sensor_* mappings to collect sensor data.

For example, an APC 192.168.42.216-1 has one environmental probe that has both temperature and humidity sensors. The information is available in a single table and there are separate OIDs for temperature and humidity readings. In this scenario, the temperature_sensor_* and humidity_sensor_* mappings can collect the sensor data.

MIB for the APC:

Sensor Metadata and Mappings Using the APC MIB:

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	F
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

Mappings

PDU System OID:	1.3.6.1.4.1.318.1.3.4.6
PDU Model OID:	1.3.6.1.4.1.318.1.1.26.2.1.8.{proxy_id}
Humidity Sensor Index:	1.3.6.1.4.1.318.1.1.26.10.1.0
	Start: 1 Step: 1
Humidity Sensor Name:	1.3.6.1.4.1.318.1.1.26.10.2.2.1.3.{external_sensor_humidity_index}
Humidity Sensor Value:	1.3.6.1.4.1.318.1.1.26.10.2.2.1.10.{external_sensor_humidity_index}
	Multiplier: 1
Temperature Sensor Index:	1.3.6.1.4.1.318.1.1.26.10.1.0
	Start: 1 Step: 1
Temperature Sensor Name:	1.3.6.1.4.1.318.1.1.26.10.2.2.1.3.{external_sensor_temperature_inde
Temperature Sensor Value:	1.3.6.1.4.1.318.1.1.26.10.2.2.1.7.{external_sensor_temperature_inde
	Multiplier: 0.1

Adding PDUs with Custom Dynamic Plugins

When adding a PDU that uses a custom dynamic plugin, use the same Add a PDU feature as any other addition. See **Adding PDUs to Power IQ Management** (on page 20).

When Power IQ detects that there is at least one custom dynamic plugin configured, a Plugin drop-down field displays.

- Automatic: Use Automatic to allow Power IQ to determine the correct plugin for the PDU you are adding. Automatic attempts to find an exact match between the PDU and the plugin for SysObjectID, PDU Model name, and Proxy ID.

  - If there is no exact match, but several dynamic plugins are eligible to manage the PDU, based on sysObjectID, then Power IQ selects from among the eligible plugins. If automatic mode does not select the desired dynamic plugin, delete the PDU and add it again, selecting the specific custom dynamic plugin from the list.

- Or, select the specific custom dynamic plugin from the list.

Check PDUs Added with Dynamic Plugins

After you add a PDU using a dynamic plugin, you should check the data collected to verify accuracy.

▶ **To check PDUs added with dynamic plugins:**

1. In the PDUs tab, click the PDU link. The PDU details page opens.

2. Examine the page to verify that all the data you created mappings for is available. If you do not see data you expected, check your mappings.

3. Check power measurement values to make sure that multipliers were entered correctly.

4. If you see issues, check all mappings and the log file to troubleshoot.

▶ **To access the dynamic plugins log:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.

2. Click View Log.

View PDUs Using a Dynamic Plugin

When a dynamic plugin is in use, you can view the PDUs that are associated with it.

▶ **To view PDUs using a dynamic plugin:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.

2. All dynamic plugins display in a list. In the PDU Count column, the number link shows how many PDUs use this dynamic plugin. Click the link to view a list of the PDUs associated with the plugin.

Troubleshooting Dynamic Plugins

For each scenario, check the Dynamic Plugin Log file to help troubleshoot errors.

▶ **Add PDU fails with error "Unmanageable", or PDU connectivity is "Unmanageable":**

The wrong PDU System OID, or the wrong PDU Model OID is specified in the dynamic plugin.

- Dynamic Plugin Log file excerpt sample when PDU System OID is wrong:

```
  2011-05-12 13:44:40,394 INFO
[DiscoverTask-192.168.100.100] PduDiscovery:
supportsSystemObjectId: target
sysObjectId=1.3.6.1.4.1.13742.4

  2011-05-12 13:44:40,450 INFO
[DiscoverTask-192.168.100.100] PduDiscovery:
supportsSystemObjectId: no dynamic plugin capable of
managing PDU w/ sysObjectID 1.3.6.1.4.1.13742.4
```

- Dynamic Plugin Log file excerpt sample when PDU Model OID is wrong:

```
  2011-05-12 12:23:36,836 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.1.120.0,

  2011-05-12 12:23:36,836 WARN
[DiscoverTask-192.168.100.100] PduDiscovery:
getModelName: failed to retrieve model name

  2011-05-12 12:23:36,837 INFO
[DiscoverTask-192.168.100.100] PduDiscovery: discover:
Model Name not Found
```

▶ **Information on PDU details page is wrong or missing:**

If adding the PDU is successful, but information on the PDU details page is missing or wrong, an incorrect OID for outlet active power may be specified in the dynamic plugin, for example.

- Dynamic Plugin Log file excerpt sample when Outlet Active Power is wrong:

```
  2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.1,
```

```
   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.2,

   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.3,

   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.4,

   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.5,

   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.6,

   2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.7,

   2011-05-12 14:14:24,648 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.8,

   2011-05-12 14:14:24,648 WARN  [PollScheduler
Scheduler-10 Pool-fiber09] SnmpOutletCollector: collect:
failed to retrieve data for mapping symbol
'outlet_active_power'
```

▶ Add PDU fails with error "Application Error" or PDU connectivity is "Application Error":

The dynamic plugin encountered an unexpected error that it cannot recover from while attempting to add the PDU to Power IQ. The PDU health shows as Critical in this case, if the PDU is added.

When the PDU state is "Application Error", this may indicate that one or more index mappings is failing to resolve. Check the dynamic plugin log output formapping resolution errors.

When to Delete and Rediscover a PDU Using a Dynamic Plugin

Certain changes, either to a PDU, or to a plugin, may require you to delete and rediscover the PDU.

- Change mapping and PDU enters "Application Error" state.
- Change mapping and the new mapping is not reflected in the PDU's details or smart page. For example, changes to multiplier, sensor unit, number of circuit poles.

SNMP Gateways and Custom Dynamic Plugins

The custom dynamic plugin works with SNMP-gateway devices to convert other protocols, such as Modbus or Bacnet, to SNMP. The SNMP gateway allows you to get the information you need to monitor an inteligent power device that does not have an SNMP agent. Examples of SNMP gateways include Control Solutions Babel Buster SPX and FieldServer DCC1075 gateways.

For example, Modbus can communicate data about your PDU. Each piece of data has a 16-bit integer register, and each register has an address. A Modbus register address is similar to an SNMP OID. Each uniquely identifies a data point.

A SNMP-gateway works with Modbus devices in a serial master-slave setup. The gateway device polls the slave devices, reads the register data back, and stores it into the gateway device. The gateway makes the register data available as SNMP OIDs.

Configuring the SNMP Gateway

Configuring your SNMP gateway device to prepare for creating a custom dynamic plugin should include:

- Getting the Modbus register list for the PDU you want to monitor from the PDU manufacturer.
- Configuring the gateway with the necessary registers to allow for data collection. This may include mappings for line to line voltages, active power, apparent power, power factor, pole current, and other types supported by Power IQ.
- Using your gateway to convert the registers to SNMP OIDs.
- Understanding the units that each data point is reported in. The register list will specify the scaling factor for each value. For example, watts or kilowatts, degrees or degrees multiplied by 100.

Set Phase Labels for Circuit Pole Phase

Specify how circuit pole phases are labeled in Power IQ.

▶ **To set phase labels for circuit pole phase:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.

2. In the Language and Locale Settings, select your Phase Label preference.

   - A, B, C

   - L1, L2, L3

   - X, Y, Z

   - 1, 2, 3

3. Click Save Locale Settings.

Set Fahrenheit or Celsius Temperature

Specify your system temperature unit to Fahrenheit or Celsius. This setting is used wherever temperatures are shown in Power IQ.

▶ **To display temperatures in Fahrenheit or Celsius:**

Temperature settings are global in Power IQ.

1. In the Settings tab, click Application Settings in the Appliance Administration section.

2. In the Language and Locale Settings, set Temperature Unit to Celsius or Fahrenheit.

3. Click Save Locale Settings.

Chapter 17 Upgrading Dominion PX PDUs

Upgrading Dominion PX PDUs managed by Power IQ consists of three steps.

- Uploading Dominion PX firmware to Power IQ
- Creating an upgrade plan to distribute the firmware to Dominion PX PDUs.
- Executing the plan.

You can use the plans immediately or save them for later.

Warning: Never downgrade a Dominion PX to a lower version number. Downgrading causes damage to the PDU.

In This Chapter

Plan a New Upgrade

Bulk upgrade plans are only applicable to Dominion PX PDUs.

▶ **To plan a new upgrade:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.

2. Click "Plan a New upgrade." The upgrade planning wizard starts.

3. Enter a name for the plan and click Continue.

4. A summary of plan options appears at the top of the page. Continue adding details of your upgrade plan at the bottom of the page, or click the links in the summary list to add details.

5. In the Choose Firmware Version section, you can add a new firmware file or select a previously uploaded firmware file. Firmware files are .BIN files. If the file is zipped, unzip and upload the .BIN file.

   - To add a new file, click the Upload a New File tab, then click Browse to select the file. Enter comments. Click Upload. The file is automatically selected for the plan.

   - To select a previously uploaded file, click the Available Files tab, then select a file from the list, and click Continue.

6. All PX PDUs available for the upgrade appear in a list. Select the checkboxes for the PDUs you want to upgrade, then click Selected PDUs to add them to the "PDUs selected to this upgrade" list at the bottom of the page. Or, click All PDUs to add all available PX PDUs to the list.

    ▪ To remove PDUs from the plan, click Selected PDUs or All PDUs in the bottom list. Only PDUs in the bottom list will be upgraded.

7. Click Continue. Click the Plan Options link in the summary at top.

8. On the Plan Options page, edit the plan name, if needed, and set other preferences.

    a. Select the "Abort on failure" checkbox if you want Power IQ to cancel all remaining upgrades in the plan if an upgrade failure occurs. This could help prevent an upgrade problem from affecting other Dominion PX PDUs in the plan.

    b. Select the "Allow simultaneous rollouts" checkbox if you want Power IQ to upgrade the firmware of multiple Dominion PX PDUs at once. This makes batch upgrades faster by allowing up to 25 upgrades to run at the same time.

9. Click Continue. Review the summary of the plan. Click Add Comment if you want add notes to the plan. Click Add or Remove PDUs if you want to edit the list of PDUs to upgrade.

10. Click Save. The completed plan summary page opens.

11. Click Start Upgrade to execute the plan immediately. The upgrade starts, and the status page displays. You can also execute the saved plan later. See *Execute a Saved Upgrade Plan* (on page 271).

    ▪ See *View Status of Upgrade Plans in Progress* (on page 272) for details on checking upgrades in progress.

    ▪ See *View Completed Upgrade Plans* (on page 272) for details on checking completed upgrades.

View Saved Upgrade Plans

View saved upgrade plans to verify and edit their details before executing a plan.

▶ **To view saved upgrade plans:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.

2. Click "View saved plans." All plans display in a list.

3. Click the Plan name link to view the details and edit if needed.

Edit a Saved Upgrade Plan

Saved upgrade plans can be edited to change details, add or remove PDUs, or change the firmware version.

▶ **To edit a saved upgrade plan:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.

2. Click "View saved plans." All plans display in a list.

3. Click the Plan name's link to view the details.

4. Click the blue links in the plan summary to edit the plan. Or, scroll down to click Edit and use the wizard to edit.

   See *Plan a New Upgrade* (on page 269) for details of plan settings.

Execute a Saved Upgrade Plan

Once a plan is saved, execute it to start the upgrade process.

▶ **To execute an upgrade plan:**

1. In the PDUs tab, choose Activities >Upgrade Firmware.

2. Click "View saved plans." All plans display in a list.

3. Click the Plan name link for the plan you want to execute.

4. Click Start Upgrade to execute the plan.

   ▪ See *View Status of Upgrade Plans in Progress* (on page 272) for details on checking upgrades in progress.

   ▪ See *View Completed Upgrade Plans* (on page 272) for details on checking completed upgrades.

Upgrade Timing

Each PX PDU upgrade takes approximately 5-10 minutes.

If you select "Allow simultaneous rollouts" in the plan options, 25 upgrades will begin simultaneously, and each batch of 25 will take approximately 10 minutes.

View Status of Upgrade Plans in Progress

Upgrade plans in progress have 3 possible statuses.

- Init: Rebooting the PDU
- Login: Logging in to the PDU
- Verify: Verifying the new firmware version on the PDU

▶ To view status of upgrade plans in progress:

The status page for plans in progress displays when you execute the plan. You can return to the status page at any time, even after the plan has finished.

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View saved plans." All saved plans display in a list.
3. Click the Status link for the plan you executed to view the status page.

View Completed Upgrade Plans

When a plan has been executed, you can view details of the plan status and results of each PDU included in the plan.

▶ To view completed upgrades:

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View previously completed upgrades." All completed plans display in a list.
3. Click the Plan name link to view the details.

   - If the plan completed successfully, a success message displays at the top of the plan details.
   - The list of PDUs included in the plan includes a Success or Failure message.
   - Click the "View detailed upgrade status messages" link for more information about each PDU.

Manage Firmware Versions

You can upload different versions of firmware for use in upgrade plans, and view previously uploaded firmware.

Firmware files are .BIN files. You can download firmware versions from the Raritan website, in the Support section. If the file is zipped, unzip and use only the .BIN file.

▶ **To view uploaded firmware versions:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.

2. Click Manage Firmware Versions. This link is not available if you do not have any uploaded firmware files. The Manage Firmware Versions page opens.

3. All firmware versions previously uploaded appear in a list.

▶ **To delete a firmware version:**

- Select the checkbox for the firmware version you want to delete, then click Delete.

▶ **To upload a new firmware version:**

1. Scroll down to the Upload New Firmware File section.

2. Click Browse to select the .BIN file.

3. Enter comments in the Comment box.

4. Click Upload. The file is added to the list and will be available to select when creating a new upgrade plan. See *Plan a New Upgrade* (on page 269).

273

Chapter 18 Support and Licensing

In This Chapter

Support Connections

A support connection allows Raritan technical support to access your Power IQ to diagnose a problem.

You should open a support connection only when Raritan technical support requests one.

Prerequisites for Support Connections

1. The Power IQ device must be able to use DNS to resolve `poweriq-access.raritan.com`. The DNS server must be able to do name resolution for external host names.

2. The Power IQ device must be able to make an outbound HTTPS request on port 443 to `poweriq-access.raritan.com`. You may have to require your firewall to allow this connection.

3. The Power IQ device must be able to make an outbound SSH request on port 22 to `poweriq-access.raritan.com`. You may have to require your firewall to allow this connection.

Create a Support Connection

Make sure your Power IQ device meets the prerequisites before creating a support connection. See *Prerequisites for Support Connections* (on page 274).

▶ **To create a support connection:**

1. In the Settings tab, click Get Support in the Appliance Services section.

2. Click Start. A log appears.

3. Make sure the final line of the log includes this text: `support connection initialization complete.`

4. Contact Raritan Technical Support with your Appliance ID number. The Appliance ID number is on the Settings tab, in the Appliance Information section. For example: e3b123f8-669e-4007-97bf-ca9d85c431f8. Raritan Technical Support uses his number to identify your support connection.

Stop a Support Connection

Once Raritan technical support has finished using the support connection, you can stop it. Stopping the support connection will close the SSH connection from your Power IQ device to `poweriq-access.raritan.com.`

► **Stop a support connection:**

1. In the Settings tab, click Get Support in the Appliance Services section.

2. Click Stop.

Save Support Logs

If you have trouble creating a support connection, the support logs may help Technical Support find the problem.

► **To save support logs:**

1. In the Settings tab, click Get Support in the Appliance Services section.

2. Click Save, then save the file using the dialog that appears.

Licensing

Power IQ requires a license. Licenses allow you to add a certain number of rack PDUs and facilities objects to Power IQ. You may need more than one license file to be allowed to add your full number of PDUs.

View Licenses

The licenses that you have uploaded to Power IQ are available to view.

► **To view licenses:**

1. If you have not already done so, get a Power IQ license file by contacting Raritan Customer Support.

2. In the Web Client, click Admin > Appliance Settings. The Settings window opens.

3. Click Product Licensing in the Application Administration panel.

4. Click Add in the Licenses section.

- Use the browse function to locate and add the license file. The Licenses list contains all license files that you have uploaded to Power IQ.

Feature	The feature that is allowed by this license.
Type	Initial: A required license to activate Power IQ and set the initial PDU capacity allowed. Incremental: A secondary license type that allows you to add to the initial license's PDU capacity.
Count	The number of PDUs that you can add to Power IQ under this license.
Licensee	Your company name.

▶ **To view licensing summary:**

- Licensing Summary contains information about how many PDUs your combined licenses allow you to add to Power IQ.

Customer Name	Your company name.
PDU License Capacity	The total number of PDUs allowed by all your licenses.
PDU Licenses Available	The number of PDUs remaining that you are allowed to add.

Add a License File

If this is your first time logging in and you need to add a license file, see **Connecting to Power IQ** (on page 6). Once you add a license file and log in for the first time, you can follow the instructions in this topic to add or remove license files as needed.

▶ **To add a license file:**

1. If you have not already done so, get a Power IQ license file by contacting Raritan Customer Support.

2. In the Web Client, click Admin > Appliance Settings. The Settings window opens.

3. Click Product Licensing in the Application Administration panel.

4. Click Add in the Licenses section.

5. Use the browse function to locate and add the license file.

Licenses are .LIC files. Repeat this step to add incremental licenses if needed.

> *Note: Your license file can be retrieved from the Raritan web site after you have activated your registration. To activate your registration, click the link in the "Thank you for registering" email from Raritan and create your user account. Once you create your account, look for a "Your Raritan software license key is available" email containing a link to your license file download page.*

6. If you see error messages AND you're unable to use Power IQ or to add the total licensed number of PDUs, contact Raritan Technical Support. There may be a problem with your license file.

License Count Rules for Rack PDUs and Facilities Objects

Your license count defines how many rack PDUs you can add to Power IQ under your purchased license.

Different types of facility objects count against your license count at higher rates.

CRAC	5
Floor PDU	5
Floor UPS	5
Power Panel	5
Standalone Meter	1

Appendix A ODBC Access

Power IQ's ODBC interface allows ODBC compliant applications access to the power data of managed devices. For example, an ODBC compliant reporting application like Crystal Reports can access Power IQ data to create customized reports.

- The Power IQ ODBC server listens on TCP Port 5432

- Roll-up tables summarize data over one hour, twenty four hours, and one month. Upon summarization, detailed readings are purged. For example, when you create a daily roll-up, the hourly poll data is purged from the database. You can configure the data retention settings. See **Configuring Data Rollup Retention** (on page 109).

- Power IQ ODBC Interface is backed by an PostgreSQL database.

In This Chapter

Configuring ODBC Access to Power IQ

Specify the IP addresses that you authorize to make connections to the database.

▶ To enable ODBC access to Power IQ:

1. Click ODBC Access in the Data Management section. The ODBC Access page opens.

2. Click Add, then double-click the 0.0.0.0/0 addresses to enter edit mode and type the ODBC network address with the mask in CIDR format.

   - CIDR format example: 192.168.43.0/24 instead of 192.168.43.0 and 255.255.255.0.

   - Use the network mask value to specify a single address or a range of addresses.

   - Use the default value 0.0.0.0/0 to allow access from all IP addresses.

3. Repeat to add new addresses as needed. Select an address and click Remove to remove authorization from the address.

4. Click Save when all authorized addresses have been added. The Power IQ database restarts.

    After the restart, ODBC compliant applications are allowed to access the database from the authorized IP addresses.

ODBC Client Configuration

1. ODBC Client must install and configure a suitable PostgreSQL driver. PostgreSQL drivers are available at http://www.postgresql.org/ftp/odbc/versions/msi/.

2. ODBC Client must configure Power IQ as a ODBC Data Source with the following credentials:

Database Name	raritan
User ID	odbcuser
Password	raritan
Port Number	5432
Server	Power IQ IP Address

Timezone Configuration for ODBC Data

ODBC tables use the Power IQ® system time setting, which is EST/EDT. This setting is converted to your selected timezone when you are using the Power IQ web interface, but this conversion is not applied to ODBC connections.

The time data available via the ODBC connection can be changed on a per session basis. By using a specific SQL statement to adjust the client session, you can run reports and view information in the desired timezone.

This link contains documentation on setting the timezone for the database using an SQL statement. Use the "SET SESSION ...." syntax, because Power IQ ODBC users do not have super user privileges.

http://www.postgresql.org/docs/9.2/static/sql-set.html

Advanced Reporting with Database and Reporting Programs

Create advanced reports and charts with reporting programs such as SQL report writer, Crystal Reports, and Microsoft Access. Follow these instructions to use Microsoft Access.

ODBC Access must be enabled. See *Configuring ODBC Access to Power IQ* (on page 278).

You must install a PostgreSQL driver first. See Install and Configure a PostgreSQL Driver

Install and Configure a PostgreSQL Driver

You must install and configure a PostgreSQL driver before you can use Microsoft® Access® to create table reports of your Power IQ™ data.

▶ **To install and configure a PostgreSQL driver:**

1. Configure Power IQ to allow ODBC access from your client IP address. See *Configuring ODBC Access to Power IQ* (on page 278).

2. Go to http://www.postgresql.org/ftp/odbc/versions/msi/ and download the latest driver .zip file. Run the .msi file contained in the .zip to install the driver on your client.

3. Go to Control Panel > Administrative Tools > Data Sources (ODBC).

4. Click Add then select the driver, PostgreSQL Unicode, and click Finish.

5. In the dialog that appears, enter the Power IQ database information:

   - Database: raritan
   - Server: Power IQ IP address
   - User Name: odbcuser
   - Description: Enter a name for this data source
   - SSL Mode: disable
   - Port: 5432
   - Password: raritan

6. Click Test. If the test is successful, click Save.

7. Click OK.

Link Database Tables in Microsoft® Access®

Use Microsoft Access to create links between the Power IQ database tables you want to query. See *Correlated Fields in ODBC Tables* (on page 282) for details on which Power IQ tables can be linked.

These instructions refer to Access 2003. Other versions may vary.

▶ **To link database tables in Microsoft Access:**

Note: You only have to link database tables once in Microsoft Access, and the links are retained. You do not have to repeat this task each time you want to create queries or run reports.

1. Choose File > New then select Blank Database.

2. Name the file and click Create.

3. In the dialog that appears, Tables is selected by default in the Object list. Click New.

4. Select Link Table and click OK.

5. In the dialog that appears, select ODBC Databases in the "Files of type" list.

6. In the dialog that appears, click the Machine Data Source tab, select the ODBC driver you installed, and click OK.

7. A list of all ODBC tables appears. Select the table you want to link and click OK.

8. Select the unique record identifier for the table and click OK. The unique record identifier is typically the first item in the list. See the table details in this guide to check. See *Power IQ ODBC Schema* (on page 282).

9. The linked table appears in the list. Repeat these steps to add other tables you want to query.

10. Identify the relationships between the linked tables.

    a. Choose Tools > Relationships.

    b. Select all the tables in the list and click Add. The tables appear with lists of their fields. Resize the tables to view the field names.

    c. Link the fields that relate by dragging and dropping a field from one table to the field it relates to in another table. See the Microsoft Access help on "Define relationships between tables" for details.

Note: Fields that have relationships are marked as "foreign key relationships" in the ODBC schema. See **Power IQ ODBC Schema** *(on page 282) view the lists of fields. See* **Correlated Fields in ODBC Tables** *(on page 282) for details and an example.*

Correlated Fields in ODBC Tables

To find how tables in Power IQ relate to each other, look for the foreign key reference fields in each table. The tables are listed in this help. See *Power IQ ODBC Schema* (on page 282).

▶ **Example - the relationship between the PDUOutlets table and the PDUs table:**

The PDUOutlets table has a relationship to the PDUs table, via the PDUID field in the PDUOutlets table.

PDUID	Integer	Foreign key reference to PDUs table

See *PDUOutlets* (on page 284) and *PDUs* (on page 282).

Both tables contain a field called PDUID. Link these fields in Microsoft® Access® to enable these tables to be queried together. See *Link Database Tables in Microsoft® Access®* (on page 281).

Power IQ ODBC Schema

Power IQ makes a number of its data views available through the ODBC interface.

PDUs

The PDUs view contains information about the PDU device.

Field	Type	Notes
ID	Integer	Unique PDU number
Caption	VarChar (64)	PDU Name
Description	TEXT	MIB II SysDescr
IPAddress	inet	IP Address
PDUType	VarChar (64)	Rack PDU or facilities objects
ProxyIndex	Integer	Subtending unit ID applicable only to daisy-chained and console server connected PDU units
NameFormat	VarChar (64)	
ModelName	TEXT	PDU Model
Manufacturer	TEXT	PDU Manufacturer

Field	Type	Notes
Location	TEXT	MIB II SysLocation
Contact	VarChar (256)	Contact name
PDUName	TEXT	PDU Name
Firmware	TEXT	PDU Firmware version
Serial Number	TEXT	PDU Serial Number
CurrentStatus	TEXT	PDU overall health status: Good, Warning, or Critical
EventHealth	TEXT	PDU active events health status: Good, Warning, or Critical
ConnectivityHealth	TEXT	PDU connectivity health status: OK, LostComm, NoContact, NoPlugin, and others.
PrimaryOwnerName	VarChar (64)	Owner name
PrimaryOwnerContact	VarChar (256)	MIB II SysContact
InletTemperature	Float	Temperature at the inlet of the PDU. Latest reading in Celsius from the first temperature sensor attached to the PDU
External Key	TEXT	An external key, such as asset tag number, associated with the PDU.
Custom Field 1	TEXT	A custom field for the user to specify.
Custom Field 2	TEXT	A custom field for the user to specify.
Current	Float	Latest line current reading for the PDU, or the maximum of the line currents for three-phase PDUs
RatedVoltage	TEXT	The PDU's rated voltage.
RatedAmps	TEXT	The PDU's rated current.
RatedVoltAmps	TEXT	The PDU's rated volt-amps.

Field	Type	Notes
DefaultAssetStripConnectedLEDColor	VarChar	The color of the LED in hex when asset is connected.
DefaultAssetStripDisconnectedLEDColor	VarChar	The color of the LED in hex when asset is disconnected.

PDUOutlets

The PDUOutlets view shows the outlets associated with a PDU.

Field	Type	Notes
PDUOutletsID	Integer	Unique outlet number
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	PDU outlet number
OutletName	VarChar(64)	Outlet name
OutletState	VarChar(64)	Outlet state
ITDeviceID	Integer	Associated IT Device ID foreign key
PDUOutletNumber	Integer	PDU outlet number
OutletRatedAmps	Integer	The rated amps of the outlet

PDUCircuitPoles

Field	Type	Notes
PDUCircuitPoleID	Integer	Unique circuit pole ID
PDUCircuitID	Integer	Foreign key reference to PDUCircuits table
PDUPanelID	Integer	Foreign key reference to PDUPanels table
PDUID	Integer	Foreign key reference to PDUs table
CircuitPoleOrdinal	Integer	The circuit pole's number
Phase	VarChar(64)	The circuit pole's phase

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PDUCircuits

Field	Type	Notes
PDUCircuitID	Integer	Unique circuit ID
PDUID	Integer	Foreign key reference to PDUs table
PDUPanelID	Integer	Foreign key reference to the PDUPanels table
CircuitOrdinal	Integer	Circuit number on the PDU
CircuitName	VarChar (64)	Name of the circuit
RatedAmps	Integer	Rated amps of the circuit

PDUCircuitBreakers

The PDUCircuitBreakers view shows the circuit breakers associated with a PDU.

Field	Type	Notes
PDUCircuitBreakersID	Integer	Unique CB Number
PDUID	Integer	Foreign key reference to PDUs table
CircuitBreakerOrdinal	Integer	Circuit breaker number on the PDU
CircuitBreakerState	Integer	0 (closed) 1 (open) 3 (unknown)
CircuitBreakerLabel	VarChar(64)	Label assigned to a CB
CircuitBreakerRating	Integer	The rated amps of the circuit breaker in amps
CircuitBreakerRatedAmps	Integer	The rated amps of the circuit breaker in amps

PDULines

Field	Type	Notes
PDULinesID	Integer	Primary key for the table.
PDUInletsID	Integer	Foreign key reference to PDUInlets table

Field	Type	Notes
PDUID	Integer	Foreign key reference to PDUs table
LineNumber	Integer	The inlet line number on the PDU

PDUInlets

Field	Type	Notes
PDUInletsID	Integer	Primary key for the PDUInlets table.
PDUID	Integer	Foreign key reference to PDUs table
InletNumber	Integer	The number of the inlet on the PDU.
InletRatedAmps	Integer	The rated amps on the inlet.
PDUPanelID	Integer	Foreign key reference to PDUPanels
Source	Boolean	Whether main inlet

PDUPanels

Field	Type	Notes
PDUPanelID	Integer	Unique ID for each panel
PDUID	Integer	Foreign key reference to PDUs table
PanelOrdinal	Integer	The panel's number on the floor PDU.
PanelName	VarChar (255)	The panel's name, only for floor PDU panels, not standalone power panels.

PDUReadings

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUInletReadings table. See

The PDUReadings view shows the raw power data collected from PDUs. A data record is added for each PDU polled. This data is summarized hourly in a PDUReadingsRollup view, and the readings in this view are purged.

Field	Type	Notes
PDUReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
Time	Timestamp with Timezone	Local timestamp
ActivePower	Real	Active power drawn by PDU
ApparentPower	Real	Apparent power drawn by PDU
WattHour	Real	Cumulative watt-hours consumed by the PDU, if available for the PDU
MaxActivePower	Real	Maximum active power drawn by PDU
MinActivePower	Real	Minimum active power drawn by PDU
MaxApparentPower	Real	Maximum apparent power drawn by PDU
MinApparentPower	Real	Minimum apparent power drawn by PDU

PDUInletReadings

A PDU can have multiple inlets. To get a total reading for the PDU, you must to request the values for all inlets on a PDU.

Field	Type	Notes
PDUInletReadingsID	bigint	Unique ID for each reading
PDUID	Integer	Foreign key reference to

Field	Type	Notes
		PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	Inlet number on the PDU
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage at the inlet
MinVoltage	Real	Minimum voltage reading over the sample period. Applies to devices with data buffering enabled.
MaxVoltage	Real	Maximum voltage reading over the sample period. Applies to devices with data buffering enabled.
Current	Real	Current (Amps) drawn by the inlet
MinCurrent	Real	Minimum current (Amps) reading over the sample period. Applies to devices with data buffering enabled.
MaxCurrent	Real	Maximum current (Amps) reading over the sample period (applies to devices with data buffering enabled.
PowerFactor	Real	Power factor of the inlet
MinPowerFactor	Real	Minimum power factor reading over the sample period. Applies to devices with data buffering enabled)
MaxPowerFactor	Real	Maximum power factor reading over the sample period. Applies to devices with data buffering enabled.
ActivePower	Real	Active power (Watts) drawn by the inlet

Field	Type	Notes
MinActivePower	Real	Minimum active power (Watts) reading over the sample period. Applies to devices with data buffering enabled.
MaxActivePower	Real	Maximum active power (Watts) reading over the sample period. Applies to devices with data buffering enabled.
ApparentPower	Real	Apparent power (VA) drawn by the inlet
MinApparentPower	Real	Minimum apparent power (VA) reading over the sample period (applies to devices with data buffering enabled)
MaxApparentPower	Real	Maximum apparent power (VA) reading over the sample period. Applies to devices with data buffering enabled.
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the inlet, if available for the PDU
WattHours	Real	Cumulative watt-hours consumed by the inlet, if available for the PDU

PDUInletReadingHourlyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Primary key for the table
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table

289

Field	Type	Notes
InletNumber	Integer	The number of the inlet on the PDU.
Time	Timestamp	Local timestamp
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval

Field	Type	Notes
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUInletReadingDailyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Primary key for the table
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	The number of the inlet on the PDU.
Time	Timestamp	Local timestamp

Field	Type	Notes
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval

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Field	Type	Notes
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUInletReadingMonthlyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp	Local timestamp for the first day of the month over which the rollup was calculated.
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval

Field	Type	Notes
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Active power drawn by the inlet in Watts
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Apparent power (VA) drawn by the inlet
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the inlet, if available for the PDU
WattHours	Real	Cumulative watt-hours consumed by the inlet, if available for the PDU

PDUOutletReadings

The PDUOutletReadings view shows the raw power data collected from PDU outlets. A data record is added for each outlet polled. This data is summarized hourly in a PDUOutletReadingsRollup view, and the outlet records in this view are purged.

Field	Type	Notes
PDUOutletReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	PDU outlet number
Time	Timestamp with Timezone	Local timestamp
CurrentAmps	Real	Amps drawn by the outlet
ActivePower	Real	Active power drawn by the outlet
ApparentPower	Real	Apparent power drawn by the outlet
WattHour	Real	Cumulative watt-hours consumed by the outlet, if available for the PDU
MaxCurrentAmps	Real	Maximum amps drawn by the outlet
MinCurrentAmps	Real	Minimum amps drawn by the outlet
MaxActivePower	Real	Maximum active power drawn by the outlet
MinActivePower	Real	Minimum amps drawn by the outlet
MaxApparentPower	Real	Maximum apparent power drawn by the outlet
MinApparentPower	Real	Minimum apparent power drawn by the outlet
Voltage	Real	Voltage drawn by the outlet
MinVoltage	Real	Minimum voltage reading

Field	Type	Notes
MaxVoltage	Real	Maximum voltage reading
PowerFactor	Real	Power factor of the outlet
MinPowerFactor	Real	Minimum power factor
MaxPowerFactor	Real	Maximum power factor
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the outlet, if available for the PDU

PDULineReadings

The PDULineReadings view shows the power data collected from PDU current-carrying lines. A data record is added for each line polled. Single-phase PDUs have 1 line. Three-phase PDUs have 3 lines. This data is summarized hourly in a PDULineReadingsRollup view, and the line readings in this view are purged.

Field	Type	Notes
PDULineReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign Key Reference To PDUs table
InletNumber	Integer	Inlet number on the PDU
LineNumber	Integer	Line number on this PDU
Time	Timestamp with Timezone	Local timestamp
CurrentAmps	Real	Amps drawn on this line
UnutilizedCapacity	Real	Available amps remaining on this line
MaxCurrentAmps	Real	Maximum amps drawn on this line
MinCurrentAmps	Real	Minimum amps drawn on this line
Voltage	Real	Voltage for the line

Field	Type	Notes
MinVoltage	Real	Minimum voltage reading over the sample period. Applies to devices with data buffering enabled.
MaxVoltage	Real	Maximum voltage reading over the sample period. Applies to devices with data buffering enabled.

PDUCircuitReadings

Field	Type	Notes
PDUCircuitReadingsID	Big Integer	Unique circuit number
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Circuit number on the PDU
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage drawn by the circuit
MinVoltage	Real	Minimum voltage reading
MaxVoltage	Real	Maximum voltage reading
Current	Real	Amps drawn by the circuit
MinCurrent	Real	Minimum amps drawn by the circuit
MaxCurrent	Real	Maximum amps drawn by the circuit
UnutilizedCapacity	Real	Available amps remaining on this circuit
MinUnutilizedCapacity	Real	Minimum amps remaining on this circuit
MaxUnutilizedCapacity	Real	Maximum amps remaining on this circuit
PowerFactor	Real	Power factor of the circuit
MinPowerFactor	Real	Minimum power factor
MaxPowerFactor	Real	Maximum power factor

Field	Type	Notes
ActivePower	Real	Active power drawn by the circuit
MinActivePower	Real	Minimum active power drawn by the circuit
MaxActivePower	Real	Maximum active power drawn by the circuit
ApparentPower	Real	Apparent power drawn by the circuit
MinApparentPower	Real	Minimum apparent power drawn by the circuit
MaxApparentPower	Real	Maximum apparent power drawn by the circuit
VoltAmpHour	Real	Cumulative volt-amp-hours consumed by the circuit
WattHour	Real	Cumulative watt-hours consumed by the circuit

PDUCircuitPoleReadings

Field	Type	Notes
PDUCircuitPoleReadingsID	Big Integer	Unique circuit pole number
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage drawn by the circuit pole
MinVoltage	Real	Minimum voltage reading
MaxVoltage	Real	Maximum voltage reading
Current	Real	Amps drawn by the circuit pole

Field	Type	Notes
MinCurrent	Real	Minimum amps drawn by the circuit pole
MaxCurrent	Real	Maximum amps drawn by the circuit pole
UnutilizedCapacity	Real	Available amps remaining on this circuit pole
MinUnutilizedCapacity	Real	Minimum amps remaining on this circuit pole
MaxUnutilizedCapacity	Real	Maximum amps remaining on this circuit pole

PDUCircuitBreakersReadings

The PDUCircuitBreakerReadings view shows the power data collected from circuit breakers on the PDU. This view does not contain any data for PDUs that do not have circuit breakers. A data record is added for each circuit breaker polled. This data is summarized hourly in a PDUCircuitBreakerReadingsRollup view, and the circuit breaker readings in this view are purged.

Field	Type	Notes
PDUCircuitBreakerReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Local timestamp
CurrentAmps	Real	Current value in Amps
UnutilizedCapacity	Real	Available amps remaining on this circuit breaker
MaxCurrentAmps	Real	Maximum amps drawn on the circuit breaker
MinCurrentAmps	Real	Minimum amps drawn on the circuit breaker

PDUSensorReadings

The PDUSensorReadings view shows the data collected from PDU sensors. A data record is added for each sensor polled. This data is summarized hourly in a PDUSensorReadingsRollup view and the sensor readings in this view are purged.

Field	Type	Notes
PDUSensorReadingsID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Local timestamp when the reading occurred
Value	Real	Sensor value
MinimumValue	Real	Minimum sensor value over the sample period. Applies to devices with data buffering enabled.
MaximumValue	Real	Maximum sensor value over the sample period. Applies to devices with data buffering enabled.

PDUOutletReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUOutletReadingsHourlyRollup, PDUOutletReadingsDailyRollup, and PDUOutletReadingsMonthlyRollup tables. If you experience any performance issues, move to the new tables.

The PDUOutletReadingsRollup view summarizes the outlet readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUOutletReadingsRollup view are purged.

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to

Field	Type	Notes
		PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval

Field	Type	Notes
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval
AverageActivePower	Real	Average power factor reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUOutletReadingHourlyRollups

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps)

Field	Type	Notes
		reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval

Field	Type	Notes
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUOutletReadingDailyRollups

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup

Field	Type	Notes
		interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUOutletReadingMonthlyRollups

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to

Field	Type	Notes
		PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval

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Field	Type	Notes
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUInletReadings tables.

The PDUReadingsRollup view summarizes the PDU readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUReadingsRollup are purged.

Field	Type	Notes
PDUReadingsRollup	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month

Field	Type	Notes
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDULineReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDULineReadingsHourlyRollup, PDULineReadingsDailyRollup, PDULineReadingsMonthlyRollup tables.

The PDULineReadingsRollup view summarizes the line readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDULineReadingsRollup is purged.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU

Field	Type	Notes
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingHourlyRollups

The PDULineReadingsHourlyRollup view summarizes the line readings power data over the hourly roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with	Timestamp when rollup

Field	Type	Notes
	Timezone	was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingDailyRollups

The PDULineReadingsDailyRollup view summarizes the line readings power data over the daily roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup

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Field	Type	Notes
		interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingMonthlyRollups

The PDULineReadingsMonthlyRollup view summarizes the line readings power data over the monthly roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacit	Real	Lowest unutilized

Field	Type	Notes
y		capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitReadingHourlyRollups

Field	Type	Notes
PDUCircuitReadingHourlyRollupsID	Big Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to the PDUCircuits table
Time	timestamp with time zone	Timestamp when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval

Field	Type	Notes
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval

Field	Type	Notes
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitReadingDailyRollups

Field	Type	Notes
PDUCircuitReadingDailyRollupsID	Big Integer	
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to the PDUCircuits table
Time	timestamp with time zone	Timestamp when rollup was created
Date	date	Date when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval

Field	Type	Notes
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval

Field	Type	Notes
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitReadingMonthlyRollups

Field	Type	Notes
PDUCircuitReadingMonthlyRollupsID	Big Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to the PDUCircuits table
Time	timestamp with time zone	Timestamp when rollup was created
Year	double precision	Year when rollup was created
Month	double precision	Month when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval

Field	Type	Notes
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

Field	Type	Notes
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitPoleReadingHourlyRollups

Field	Type	Notes
PDUCircuitPoleReadingHourlyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Timestamp when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval

Field	Type	Notes
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitPoleReadingDailyRollups

Field	Type	Notes
PDUCircuitPoleReadingDailyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Timestamp when rollup was created
Date	date	Date when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval

319

Field	Type	Notes
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitPoleReadingMonthlyRollups

Field	Type	Notes
PDUCircuitPoleReadingMonthlyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Timestamp when rollup was created
Year	double precision	Year when rollup was created
Month	double precision	Month when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval

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Field	Type	Notes
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitBreakerReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUCircuitBreakerReadingsHourlyRollup, PDUCircuitBreakerReadingDailyRollups, and PDUCircuitBreakerReadingMonthlyRollups tables. If you experience any performance issues, move to the new tables.

The PDUCircuitBreakerReadingsRollup view summarizes the circuit breaker readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month.   When data is rolled up, shorter interval roll-up entries in the PDUCircuitBreakerReadingsRollup view are purged.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table

Field	Type	Notes
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingHourlyRollups

The PDUCircuitBreakerReadingHourlyRollup view summarizes the circuit breaker readings power data over the hourly roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Timestamp when rollup was created

Field	Type	Notes
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingDailyRollups

The PDUCircuitBreakerReadingsDailyRollup view summarizes the circuit breaker readings power data over the daily roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup

Field	Type	Notes
		interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingMonthlyRollups

The PDUCircuitBreakerReadingsMonthlyRollup view summarizes the circuit breaker readings power data over the monthly roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval

Field	Type	Notes
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUSensorReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUSensorReadingsHourlyRollups, PDUSensorReadingsDailyRollups, and PDUSensorReadingsMonthlyRollups tables. If you experience any performance issues, move to the new tables.

The PDUSensorReadingsRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Non-unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval

Field	Type	Notes
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingHourlyRollup

The PDUSensorReadingsHourlyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingDailyRollup

The PDUSensorReadingsDailyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in

Field	Type	Notes
		PDUSensors
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingMonthlyRollup

The PDUSensorReadingsMonthlyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensors

The PDUSensors view contains information about sensors attached to PDUs that Power IQ manages.

Field	Type	Notes
SensorID	Integer	Auto-generated ID
PDUID	Integer	Foreign key reference to PDUs table
PDUSensorID	Integer	ID of the sensor on the PDU, as gathered from the pdu
SensorNumber	Integer	Sensor number on the PDU
AttributeName	VarChar(64)	Type of sensor
Label	VarChar(255)	Sensor's label as gathered from the PDU
Removed	VarChar(64)	When the sensor was removed from the system, or null for current sensors
Position	VarChar(10)	Sensor position on the PDU: inlet, outlet or outside air

DataCenters

The DataCenters view contains information about data center objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
DataCenterID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this data center object
CompanyName	VarChar(255)	Name of the company that owns this data center
ContactName	VarChar(255)	Name of the person to contact regarding data center

Field	Type	Notes
ContactPhone	VarChar(255)	Phone number for contact
ContactEmail	VarChar(255)	Email for contact
City	VarChar(255)	City location of data center
State	VarChar(255)	State location of data center
Country	VarChar(255)	Country location of data center
PeakKWHRate	Double	Energy cost per Kilowatt Hour during peak hours
OffPeakKWHRate	Double	Energy cost per Kilowatt Hour during off-peak hours
PeakBegin	Double	Time of day peak hours begin For example 19.5 = 19:30 hours
PeakEnd	Double	Time of day peak hours end
CO2Factor	Double	CO2 computational factor
CoolingFactor	Double	Cooling factor for data center
CustomField1	VarChar(255)	A user-defined field
CustomField2	VarChar(255)	A user-defined field
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this data center

Floors

The Floors view contains information about Floor objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
FloorID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Floor object.

Field	Type	Notes
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Floor.

Rooms

The Rooms view contains information about Room objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RoomID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Room object.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Room.

Aisles

The Aisles view contains information about Aisle objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
AisleID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Aisle object.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Aisle.

Rows

The Rows view contains information about Row objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RowID	Integer	Auto-generated ID
Name	VarChar(64)	Human-assigned name for this Row object.

Field	Type	Notes
ExternalKey	VarChar(256)	The unique code used by the Enterprise Model to identify this Row.

Racks

The Racks view contains information about Rack objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RackID	Integer	Auto-generated ID
Name	VarChar (255)	Human-assigned name for this Rack object.
SpaceIdentifier	VarChar(255)	Optional human-assigned value to identify this rack.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Rack.

The ITDevices view contains information about IT Device objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
ITDeviceID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this IT Device object
Customer	VarChar(255)	Name of the customer that owns this object
DeviceType	VarChar(255)	Type of device
PowerRating	Integer	Power in watts that this device is rated for
Decommissioned	Boolean	Whether this device should be considered decommissioned
CustomField1	VarChar(255)	A user-defined field
CustomField2	VarChar(255)	A user-defined field
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to

Field	Type	Notes
		identify this IT Device

IT Device Readings Rollups

The IT device readings rollups views contain rollups of raw readings.

The following limitations apply:

- IT devices associated with Raritan PX1 and PX2 outlets only.
- Data buffering must be enabled on the PDU.
- Outlets from other PDUs are excluded from the rollups.

ITDeviceReadingHourlyRollups

See *IT Device Readings Rollups* (on page 332) for details on this view.

Field	Type	Notes
ITDeviceReadingHourlyRollupsID	Bigint	Unique ID for each reading
ITDeviceID	Integer	ID of the IT Device
Time	Timestamp with time zone	Timestamp when rollup was created
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

Field	Type	Notes
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

ITDeviceReadingDailyRollups

See *IT Device Readings Rollups* (on page 332) for details on this view.

Field	Type	Notes
ITDeviceReadingDailyRollupsID	bigint	Unique ID for each reading
ITDeviceID	integer	ID of the IT Device
Date	date	Date when rollup was created
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

Field	Type	Notes
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

ITDeviceReadingMonthlyRollups

See *IT Device Readings Rollups* (on page 332) for details on this view.

Field	Type	Notes
ITDeviceReadingMonthlyRollupsID	bigint	Unique ID for each reading
ITDeviceID	integer	ID of the IT Device
Year	double precision	Year when rollup was created
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

Field	Type	Notes
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

EDMNodes

The EDMNodes view contains the relationship between EDM entities arranged as nested sets. EDM entities are part of a data hierarchy. Hierarchical data can be efficiently searched when arranged as a Nested set tree structure.

Field	Type	Notes
ID	Integer	Auto-generated EDMNodes ID
Lft	Integer	Auto-generated EDMNode Left ID
Rgt	Integer	Auto-generated EDMNode Right ID
edm_entity_type	VarChar(40)	Entity Type. For example, DataCenter, Floor, Rack, Device, ComputerSystem, Sensors. Entity Type ComputerSystem represents a PDU system.
edm_entity_id	Integer	Entity ID of the entity.
create_at	Timestamp	Create time stamp.
Updated_at	Timestamp	Update time stamp.
ParentID	Integer	Entity ID of the parent entity

AssetStrips

The AssetStrips view contains information about asset management strips attached to PDUs that Power IQ manages.

Field	Type	Notes
AssetStripID	Integer	Database id of the asset strip
PDUID	Integer	Database id of the attached PDU
Name	VarChar (255)	Name of the asset strip
State	VarChar (64)	ok, upgrading, unavailable, unsupported
AssetStripCreationTime	Timestamp with time zone	Time asset strip was created in the database
AssetStripLastUpdateTime	Timestamp with time zone	Time the asset strip last changed in the database
AssetStripOrdinal	Integer	The id of the asset strip on the PDU: 1 to n

RackUnits

The RackUnits view contains information about the rack units on asset strips connected to PDUs that Power IQ manages.

Field	Type	Notes
RackUnitID	Integer	Database id of rack unit
AssetStripID	Integer	Database id of asset strip. See *AssetStrips* (on page 336).
AssetTagIDString	VarChar (255)	Asset tag id string of any attached asset tag that plugs into the asset strip. Unique from the factory.
RackUnitOrdinal	Smallint	1-n the number of the rack unit within the asset strip
RackUnitLEDState	VarChar (64)	LED state: on, off, blinking

Field	Type	Notes
RackUnitLEDMode	VarChar (64)	LED mode: automatic or manual
RackUnitLEDColor	VarChar (6)	LED color: hexadecimal code for the color
RackUnitCreationTime	Timestamp with time zone	When the rack unit was created in the database
RackUnitLastUpdateTime	Timestamp with time zone	When the rack unit was last changed in the database

PUECalculations

Field	Type	Notes
PUECalculationsID	bigint	Unique ID for each reading
DataCenterID	integer	Foreign key reference to DataCenters table
TotalEnergy	integer	PUE facility energy
TotalAdjustment	integer	Facility Energy manual adjustment value
ITEnergy	integer	PUE IT energy
ITAdjustment	integer	IT Energy manual adjustment value
MeasuredOn	date	The date when rollup was created
Granularity	text	whether daily or monthly rollup

Sample ODBC Queries

This section contains sample ODBC queries that can be used to generate custom reports.

Obtain Active Power and Apparent Power Data for a PDU With IP Address 66.214.208.92

Select "PDUs"."IPAddress", "PDUs"."PDUName", "PDUReadings"."ActivePower", "PDUReadings"."ApparentPower" , "PDUReadings"."Time" from "PDUs", "PDUReadings" where "PDUs"."IPAddress"='66.214.208.91' AND "PDUs"."ID"="PDUReadings"."PDUID";

The table shows a sample custom report.

IP Address	PDU Name	Active Power	Apparent Power	Time
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 12:46:21.753-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 12:58:23.871-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 16:29:26.032-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 16:32:36.868-05

Obtain Active Power and Apparent Power for an IT Device With Name "DBServer"

raritan

Select "ITDevices"."Name", "PDUOutletReadings"."Time", "PDUOutletReadings"."ActivePower", "PDUOutletReadings"."ApparentPower", "PDUOutletReadings"."CurrentAmps" from "ITDevices", "PDUOutlets", "PDUOutletReadings" where "ITDevices"."Name"='DBServer' AND "PDUOutletReadings"."OutletID" = "PDUOutlets"."PDUOutletsID" AND "PDUOutlets"."ITDeviceID" = "ITDevices"."ITDeviceID";

The table shows a sample custom report.

Name	Time	Active Power	Apparent Power	Current Amps
DBServer	2009-12-08 14:16:31.759-05	0	0	0
DBServer	2009-12-08 16:11:27.017-05	0	0	0

Report Maximum Power Reading for Each IT Device Since Added to Power IQ

To obtain the maximum power reading for an IT device since it was added to Power IQ, three queries are needed. These sample queries group data by device name. This assumes that device names are unique. If your device names are not unique, use IT Device ID for grouping.

1. Query for all devices with all readings for all outlets.

2. Group, per device, per hour, all outlets of a device and sum up the outlet usage

3. Find the maximum power per device of the total power consumption.

▶ **List all outlet readings for all devices:**
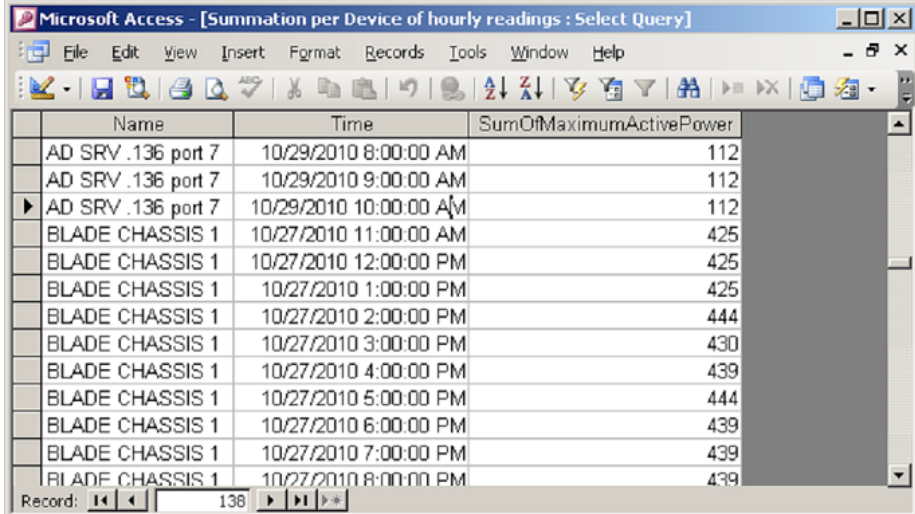
```
SELECT odbc_ITDevices.Name,
odbc_PDUOutletReadingsRollup.Time,
odbc_PDUOutlets.PDUOutletsID,
odbc_PDUOutletReadingsRollup.MaximumActivePower
FROM odbc_ITDevices, odbc_PDUOutlets,
odbc_PDUOutletReadingsRollup
WHERE
(((odbc_PDUOutletReadingsRollup.RollupInterval)=1) AND
((odbc_PDUOutletReadingsRollup.OutletID)=[odbc_PDUOut
lets].[PDUOutletsID]) AND
((odbc_PDUOutlets.ITDeviceID)=[odbc_ITDevices].[ITDev
iceID]))
ORDER BY odbc_ITDevices.Name,
odbc_PDUOutletReadingsRollup.Time,
odbc_PDUOutlets.PDUOutletsID;
```

▶ **Group hourly outlet readings per IT device:**

SELECT [List of all Devices with all readings for all
outlets].Name, [List of all Devices with all readings for
all outlets].Time, Sum([List of all Devices with all
readings for all outlets].MaximumActivePower) AS
SumOfMaximumActivePower
FROM [List of all Devices with all readings for all outlets]
GROUP BY [List of all Devices with all readings for all
outlets].Name, [List of all Devices with all readings for
all outlets].Time
ORDER BY [List of all Devices with all readings for all
outlets].Name;

▶ **Find the maximum power reading per IT device:**

```
SELECT [Summation per Device of hourly readings].Name,
Max([Summation per Device of hourly
readings].SumOfMaximumActivePower) AS
MaxOfSumOfMaximumActivePower
FROM [Summation per Device of hourly readings]
GROUP BY [Summation per Device of hourly readings].Name;
```

Name	MaxOfSumOfMaximumActivePower
AD SRV .136 port 7	117
Adobe Flex KX2.139 PORT 11	117
Adobe Photoshop KX2.139 PORT 9	139
BLADE CHASSIS 1	444
BLADE CHASSIS 2	945
Cisco .151	21
Cisco 2500 .151	20
Cisco 2500 Router .136	22
CISCO SX.117 PORT 1	20
CISCO SX.117 PORT 2	23
CISCO SX.129 PORT 1	22
CISCO SX.129 PORT 2	107
CISCO SX.129 PORT 3	57

Record: 7 of 35

Finding All Entities in a Rack

The following query shows all the entities, such as IT Devices and PDUs, contained in a specific rack. The example uses "Rack 4."

1. Retrieve the EDMNodes id for a rack with RackId=4.

    ▪ oculan=> select id from "EDMNodes" where
      edm_entity_type='Rack' and edm_entity_id=4;

    id

    14

    (1 row)

2. Use the EDMNodes id =14 to retrieve entities contained under this rack.

    ▪ oculan=> select "EDMNodes".* FROM "EDMNodes",
      "EDMNodes" AS parent where (("EDMNodes".id != parent.id)
      AND ("EDMNodes".lft >parent.lft AND "EDMNodes".rgt
      <=parent.rgt AND parent.id=14)) ORDER BY "EDMNodes".lft;

The table shows a sample custom report.

ID	Lft	Rgt	EDM_Entity_Type	EDM_Entity_ID	Created_at	Updated_at
1	4	5	Device	3	2009-06-19 11:16:48.257348-0	2009-06-19 11:16:48.257348-04
2	6	7	Device	4	2009-06-19 11:16:48.274988-0	2009-06-19 11:16:48.274988-04
3	8	9	Device	5	2009-06-19 11:16:48.276324-0	2009-06-19 11:16:48.276324-04

ODBC Configuration and Sample Query for Apple Users

This section contains instructions for configuring ODBC and creating custom reports for Apple users.

These instructions apply to the following Apple products:

1. Mac OS 10.7.x or higher. These instructions were tested in Lion.

2. Microsoft Excel 2011

The sample report provides the Max/Min/Avg power consumption of every rack in the data center.

Download and Install ODBC Client Driver for Mac

1. Go to
   http://www.actualtech.com/product_opensourcedatabases.php
   (see http://www.actualtech.com/product_opensourcedatabases.php -
   http://www.actualtech.com/product_opensourcedatabases.php) ,
   to download the ODBC Pack for Mac OSX.

   Note: The driver is free to try. You can confirm that it works for you first, by following the steps in this guide.

2. Follow the usual Mac steps to install the "Actual ODBC Pack.pkg"

Download and Install Microsoft Query for Mac (included in Office 2011 v14.1.2)

1. Make sure you have the latest updates for your version of Microsoft Excel.

2. If you are using Mac OS X Lion or higher, you must use Microsoft Office 2011 v14.1.2 or higher.

Allow Your Mac to Access Power IQ via ODBC

1. Login to Power IQ.

2. In the Settings tab, click ODBC Access in the Data Management section. The Configure ODBC Database Access page opens.

3. Click Add. Double-click the 0.0.0.0/0 Network Address, then enter the IP Address information of your Mac. Or, leave the default 0.0.0.0/0 to allow access from all IP addresses.

4. Click Save.
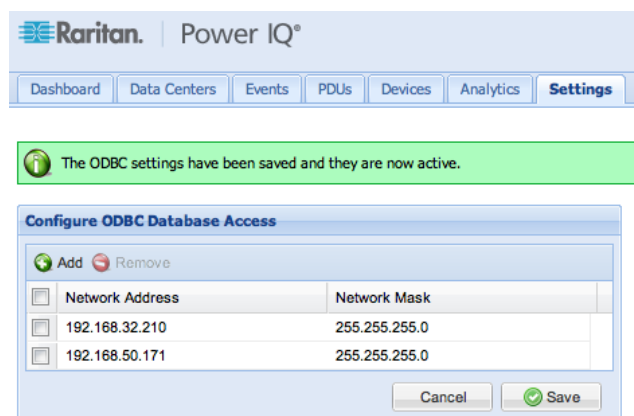
Add Power IQ as an ODBC Information Source to your Mac

1. On your Mac, launch /Applications/Utilities/ODBC Manager.app

2. Select the tab "User DSN", and click Add.

3. Select Actual Open Source Databases and click OK. The Actual Open Source Databases DSN Configuration wizard opens.

4. Click Continue.

5. Name the Power IQ that you are connecting to, and select PostgreSQL as the database type. Click Continue.

6. Enter the IP address of your Power IQ server, and copy the rest of the settings exactly as pictured here. Click Continue.

- Server: IP address of Power IQ

- Port: 5432

▪ Do NOT select "Connect to server to obtain default settings for the additional configuration options"

7. Enter "raritan" as the database name. Make sure to select the checkbox labeled "Always include views in table lists". Click Continue.

8. Click Test.
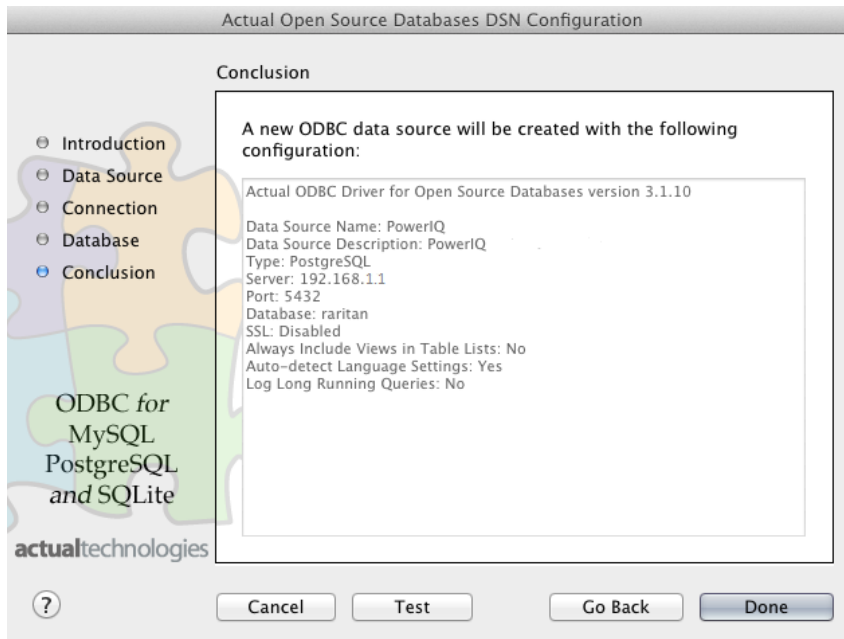
9. At the next prompt, enter the username and password and click OK.

    ▪ Username: obdcuser

    ▪ Password: raritan
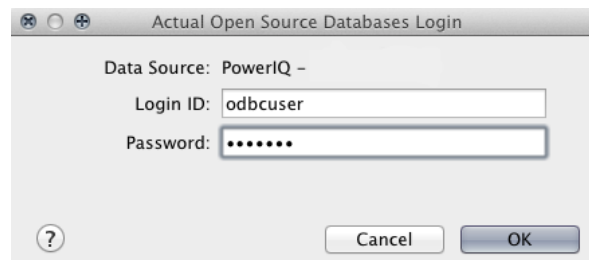
10. The test results should be successful. Click OK.

Test Results:

Attempting to connect to database raritan on server 192.168.1.1 ...

Database version: PostgreSQL 8.4.1667392623

Test completed successfully.

OK
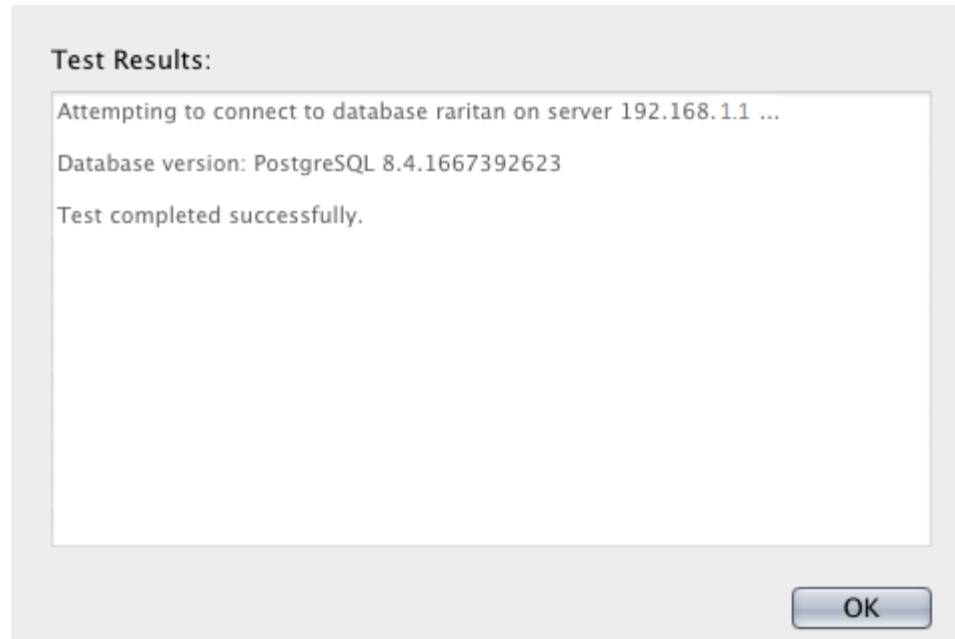
11. Click Done.

Note: If the test was successful, the ODBC driver works, and you can purchase it.

12. Launch /Applications/Utilities/ODBC Manager.app again. Select User DSN and highlight the Power IQ entry you just created.

13. Click Configure.

14. Click Licenses and follow instructions to buy and enter a license key.
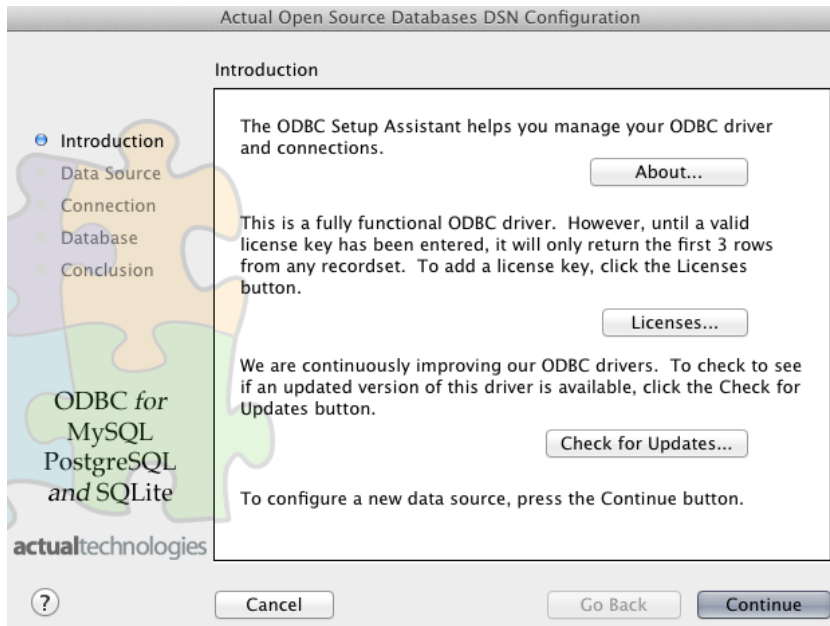
Remember, the license you want to buy is the "Actual ODBC Driver for Open Source Databases."

Your Mac now can access all the data on the Power IQ server, and you can create reports using Microsoft Excel, FileMaker Pro, or any ODBC-compliant reporting tool.

See **Create Database Connection in Excel** (on page 348) for instructions on using Microsoft Excel.

Create Database Connection in Excel

1. On your Mac, launch Excel.

2. Choose Excel > About Excel. If you are running Mac Lion or higher, make sure you have Excel version 14.1.2 or higher.

3. Create a new Workbook and save it. For example, "Power Consumption by Rack.xlsx"

4. In the Excel toolbar, choose Data > Get External Data > New Database Query.
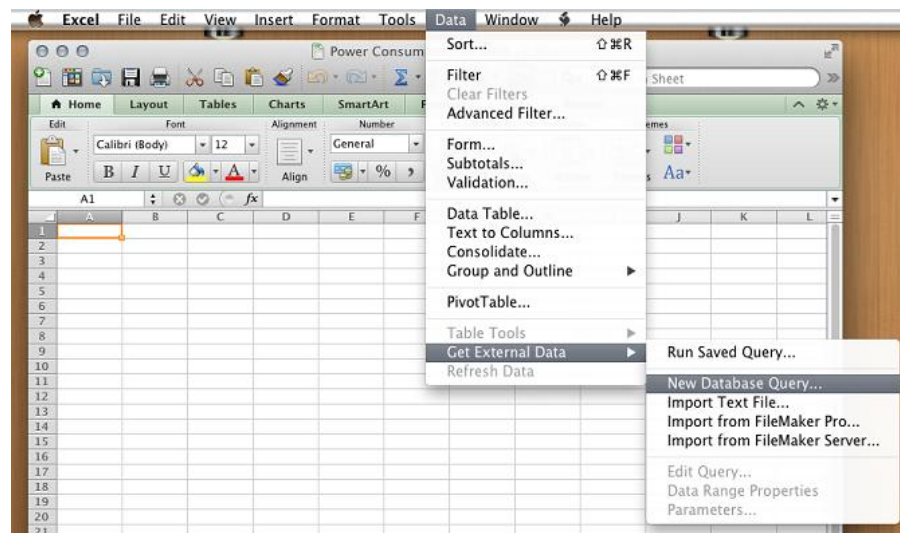
5. The "iODBC Data Source Chooser" dialog appears. In the User DSN tab, select the Power IQ data source that you created previously. Click OK.
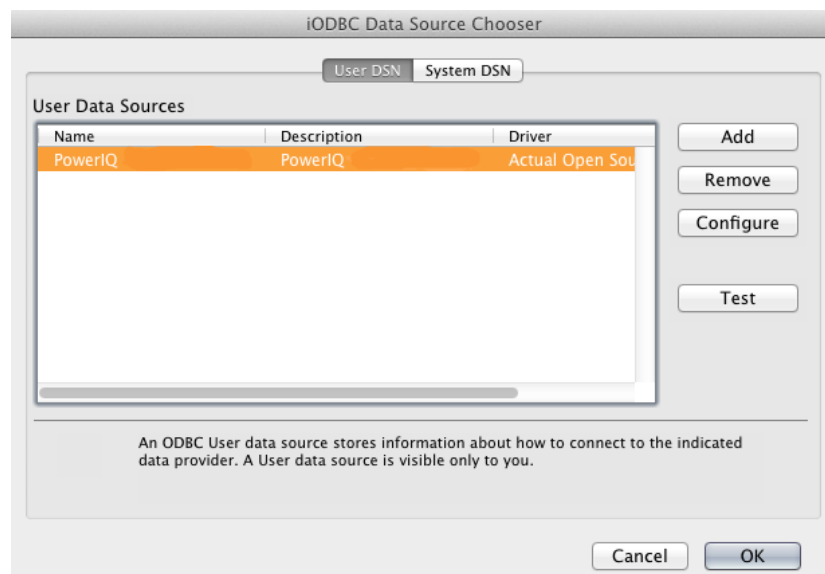
6. If this is the first time you are using the data source in Excel, enter the username and password for the Power IQ ODBC database, and click Store password in Keychain then click OK.

   ▪ Username: obdcuser

   ▪ Password: raritan

Formulate a Database Query

After creating the database connection, Microsoft Excel ("Microsoft Query") shows a list of all data tables that Power IQ makes available. See **Power IQ ODBC Schema** (on page 282)
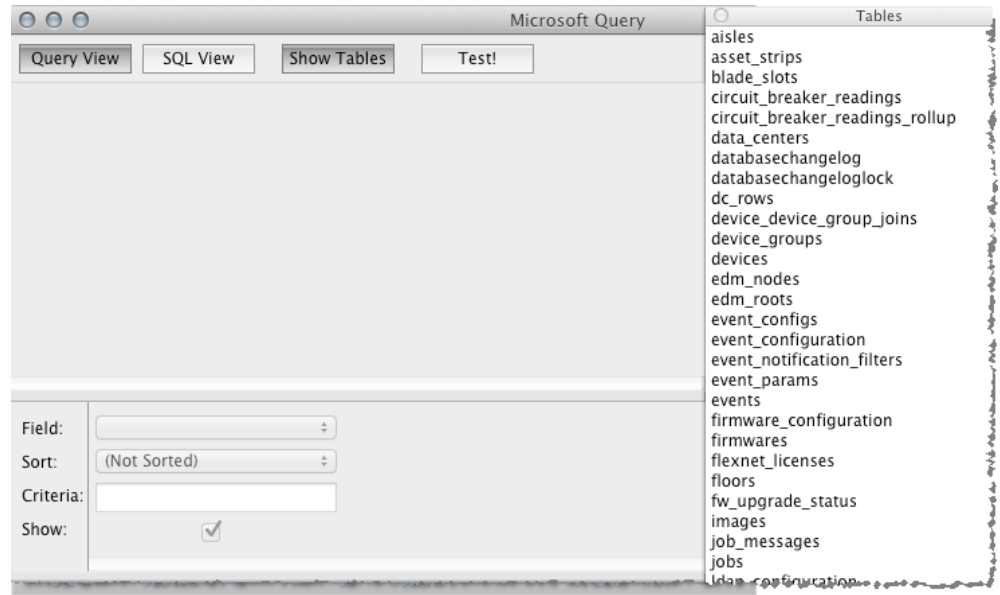
▶ **To formulate a database query:**

These instructions will create a report providing the max/min/average power utilization of every PDU in Power IQ.

1. Click SQL View.

2. Copy and paste this EXACT string, including every quotation mark, every capitalization, and so on. The string must be used Exactly as shown.

```
SELECT "PDUReadingsRollup"."PDUID", "PDUs"."ID",
"PDUs"."PDUName",
"PDUReadingsRollup"."AverageActivePower",
"PDUReadingsRollup"."AverageApparentPower",
"PDUReadingsRollup"."MaximumActivePower",
"PDUReadingsRollup"."MaximumApparentPower",
"PDUReadingsRollup"."MinimumActivePower",
"PDUReadingsRollup"."MinimumApparentPower",
"PDUReadingsRollup"."Time"

FROM "PDUReadingsRollup", "PDUs"

WHERE "PDUReadingsRollup"."PDUID" = "PDUs"."ID"
```

```
AND "PDUReadingsRollup"."Time" = '2012-09-10
00:00:00'
```
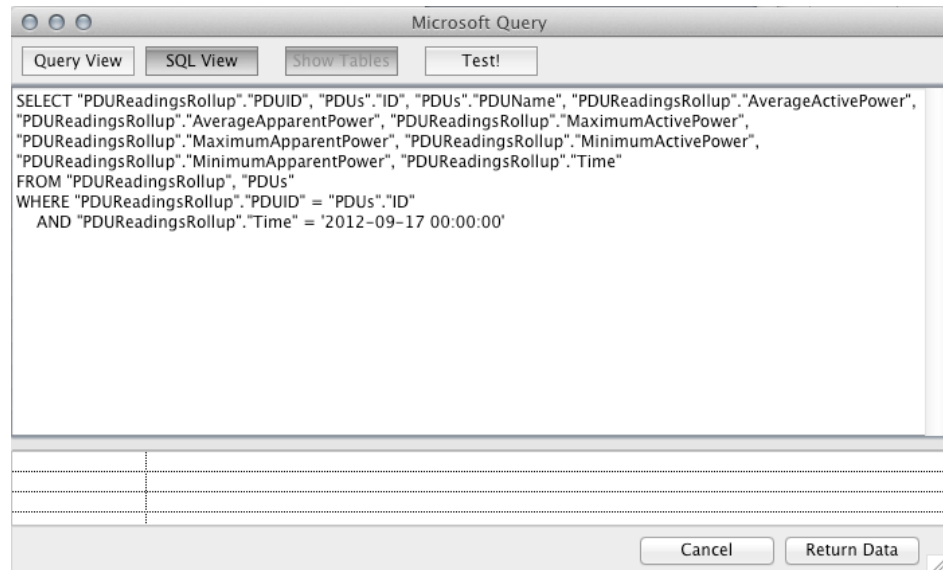

3. Click Return Data. A new window opens. Select "New Sheet", then click Properties.
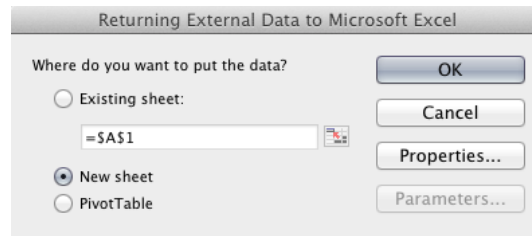
4. Deselect the checkboxes for "Enable background refresh" and Use Table.
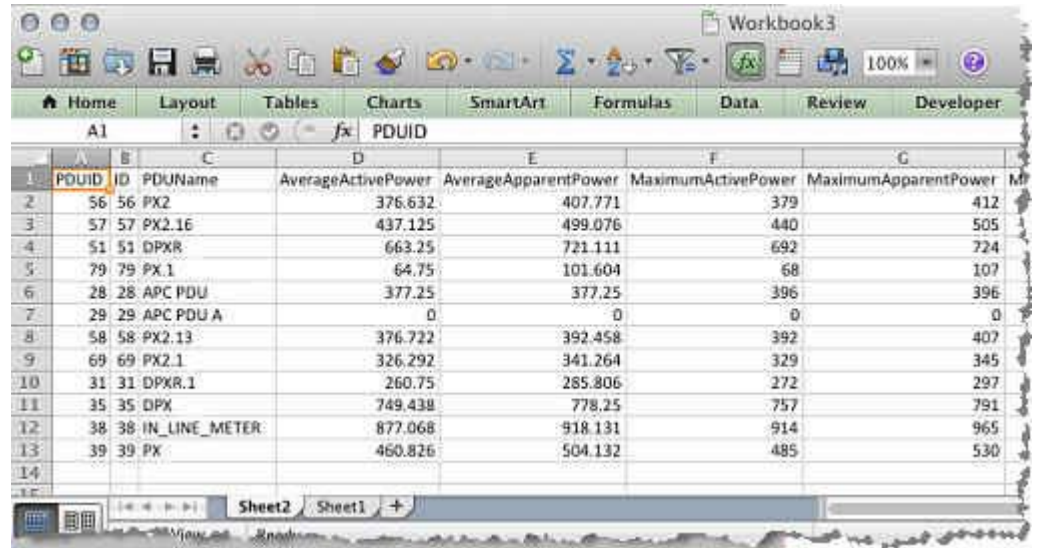
5. Click OK, then click OK again on the previous "New Sheet" dialog.

6. The report is generated. The query shows rollups from September 10, 2012. Change the query date in the string you copied and pasted for data from other days.

Appendix B Frequently Asked Questions

In This Chapter

Security Questions

Question	Answer
Are failed login attempts recorded?	The audit log records all login attempts. You can also configure Power IQ to send syslog notifications for entries in the audit log.
Does Power IQ support LDAP lock-out settings?	Power IQ respects the lock-out settings of an LDAP server. If a user attempts multiple invalid logins, and the LDAP server set the account to be blocked, Power IQ no longer allows access.
Do session timeouts work in an LDAP setting?	Session timeouts are applicable to LDAP users and local users.

PDU Questions

Question	Answer
The status of my PDU says "Degraded."	- Check to see if the SNMP agent is enabled on the PDU. - If enabled, check to see if the matching SNMP read strings are configured for the PDU and Power IQ. - Check to see if you are running the latest PX firmware. **For Dominion PX PDUs.** - If you have enabled Buffered Data Collection, make sure the PX has been configured with an SNMP write string. **For Dominion PX PDUs**. - Reduce the poll rate or increase the number of CPUs (VMware).
How do I configure my MRV PDU so that it will work with Power IQ's power control feature?	Make sure that the SNMP community string you use to configure the MRV PDU in Power IQ supports both SNMP v1 and v2c Gets and Sets. The community string must be configured for v1 and v2c access in both the Get Clients section and the Set Clients section on the MRV PDU.

Unable to Collect IPv4 Routing Table

The error "Unable to collect IPv4 routing table" may display when you attempt to launch aPower IQ virtual machine with multiple NIC cards, using ESXi 5.1.

Renaming two files may be a workaround to this VMware Tools issue.

```
mv
/usr/lib/vmware-tools/plugins32/vmsvc/libtimeSync.so
/usr/lib/vmware-tools/plugins32/vmsvc/libtimeSync.so.
renamed
```

```
mv
/usr/lib/vmware-tools/plugins64/vmsvc/libtimeSync.so
/usr/lib/vmware-tools/plugins64/vmsvc/libtimeSync.so.
renamed
```

Index

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