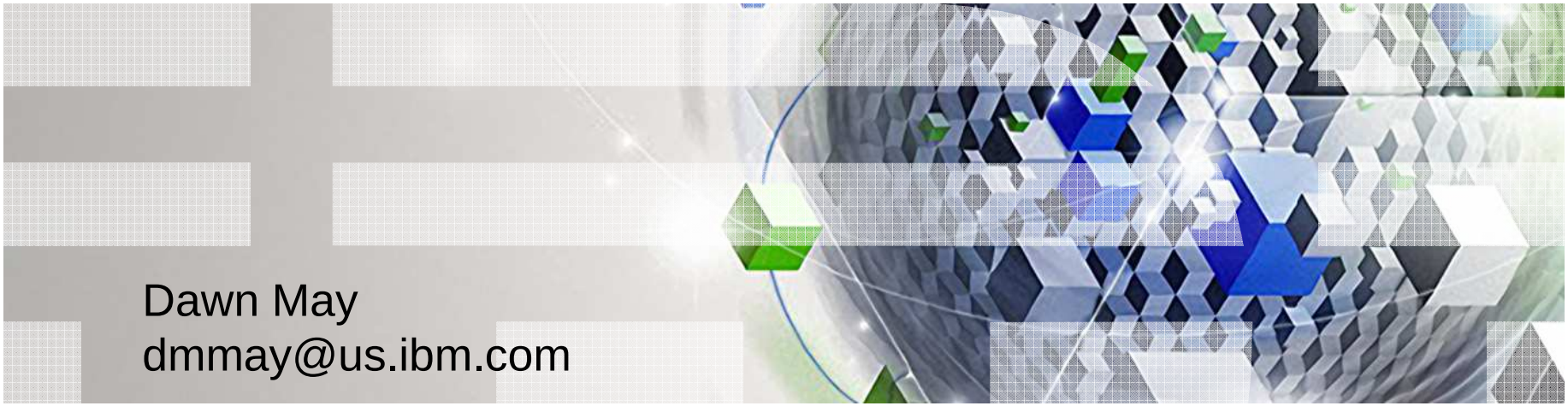
IBM® Systems Director Active Energy Manager™ 4.3



Dawn May
dmmay@us.ibm.com

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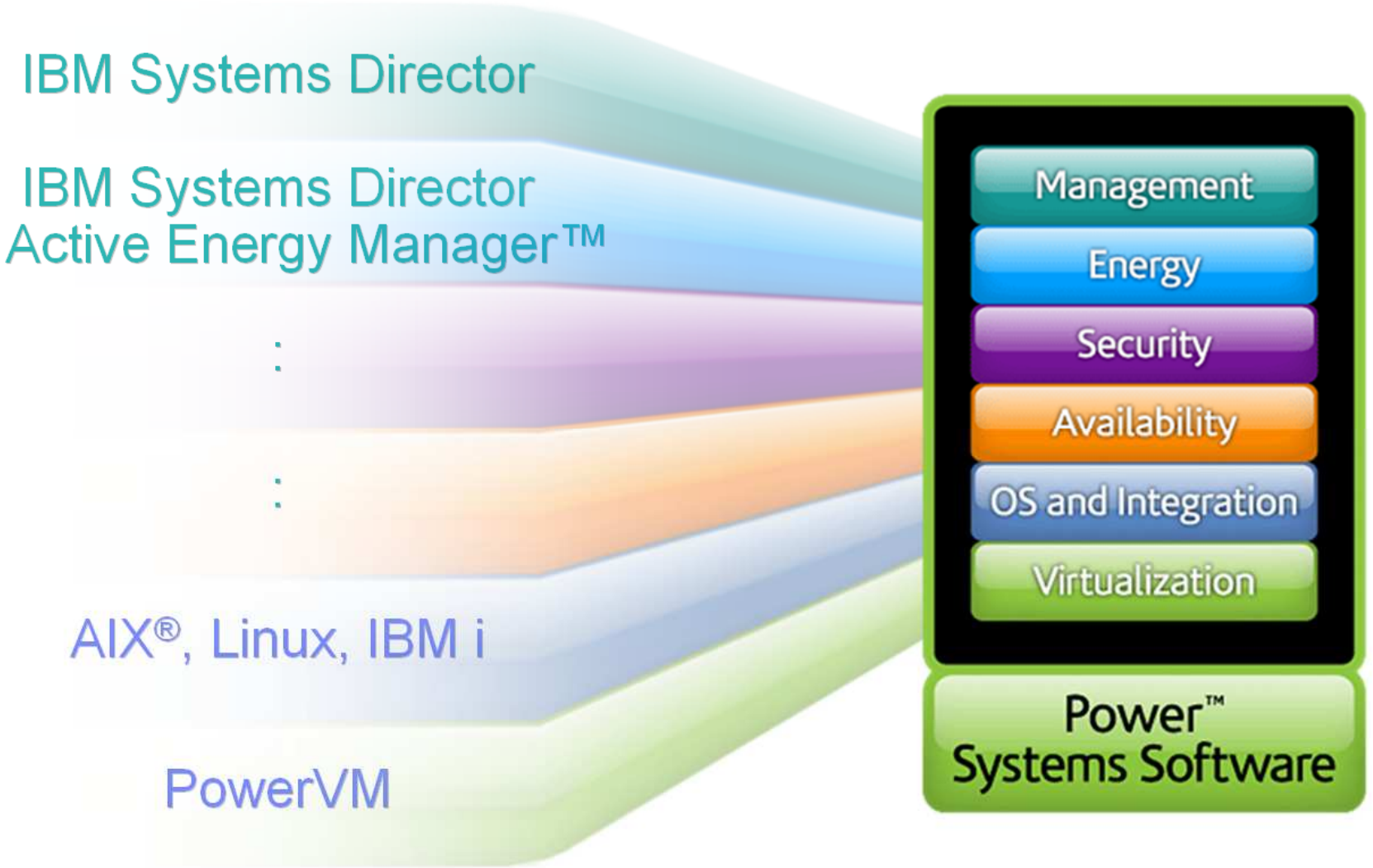
IBM Power Systems Software



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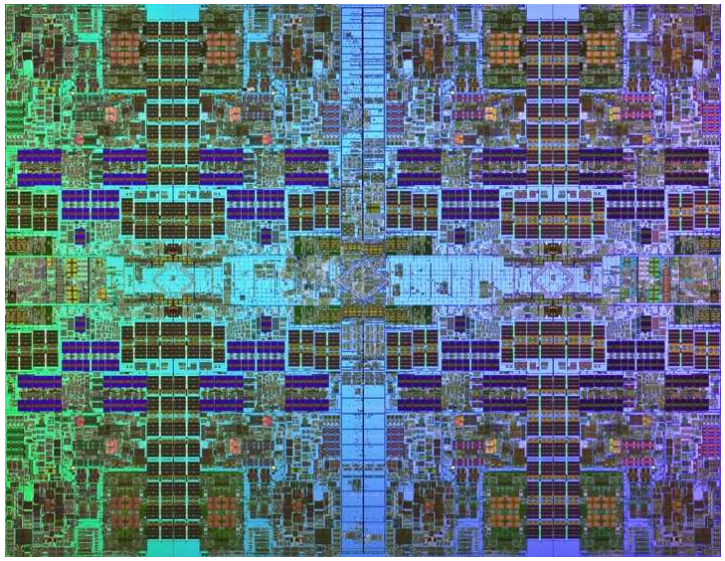
Active Energy Manager - Agenda

- Presentation
  - Benefits
  - Monitoring functions
  - Management Functions
  - Configuring cooling devices
  - Configuring metering devices
  - Energy relationships and topology perspectives
  - Event propagation to related resources

Power Technology leadership



- ✓ 4, 6 or 8 cores per socket
- ✓ 3.0 to 4.14 GHz
- ✓ Up to 4 threads per core
- ✓ Integrated eDRAM L3 Cache
- ✓ Dynamic Energy Optimization

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IBM EnergyScale Technology with POWER6 and POWER7

- Power / Thermal Trending
  - Collect and report power consumption, inlet and exhaust temp
- Power Capping
  - Processors are throttled to use less power
- Power Savings
  - Static Power Save (SPS)
  - Dynamic Power Save (DPS)
    - Favor Power
    - Favor Performance (DPS-FP)

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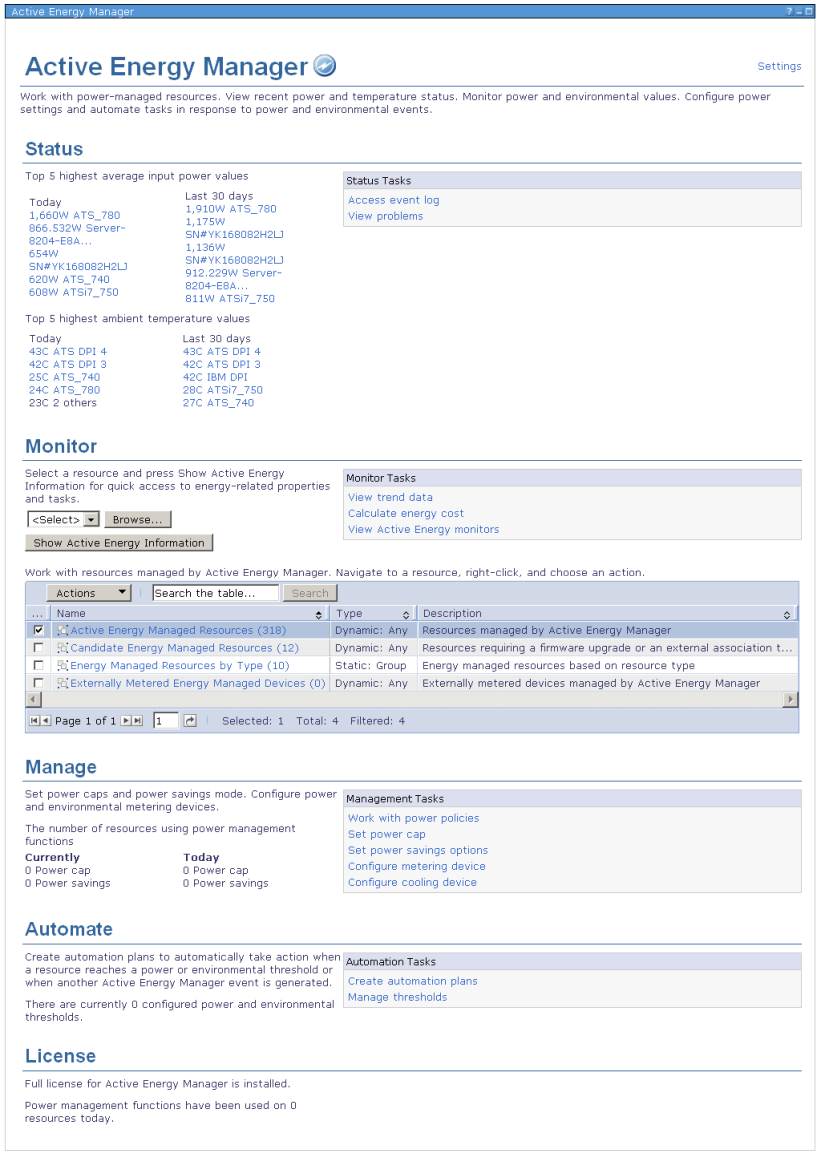
Benefits

- Manage data center power and cooling more effectively
  - Data collection from a multitude of sources
  - Real-time and historical analysis
  - Understand relationships between resources
  - Integrate with IBM Systems Director automation plans
- Communicates with facility management applications
  - Enabling IT administrators to better monitor power issues in real time
- Adjust power usage on select systems for better utilization of existing resources
  - Power savings
  - Power capping
  - PDU+ outlet control
- Plan for the future by viewing trends of power and environment data over time to address potential capital investments due to energy

Active Energy Manger Task Page

- Settings
- Status
  - Highest power and temperatures
- Monitor
  - Active Energy Managed Resources
  - Candidate Energy Managed Resources
  - Energy Managed Resources by Type
  - Externally Metered Energy Managed Devices
- Manage
  - Caps and savings
  - Plans
  - Configuration
- Automate
- License



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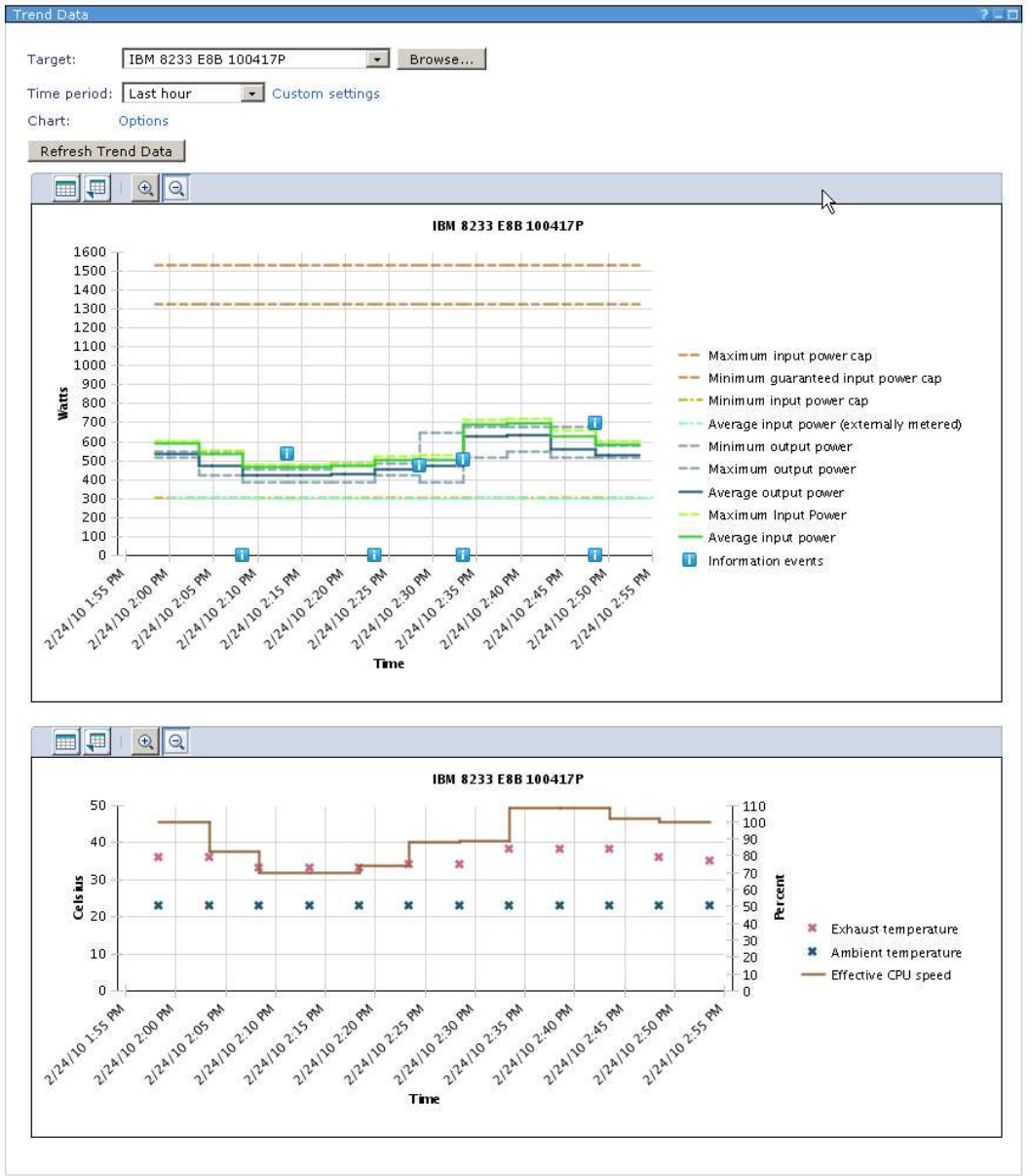
Monitoring Functions

- Trend Data
  - Displays new and historical power and environmental data and events
  - Provides two views - chart and table
  - Can trend single resource or a group of resources
- Cost Calculator
  - Establish by a resource or group of resources over a period of time
  - Define cost assumptions
  - Displays amount of energy used and the cost of that energy
- Monitors & Thresholds
  - IBM Systems Director provides a function to create monitors
  - Active Energy Manager provides a number of monitors for the energy resources
  - Thresholds can be set on a monitor to cause an event to be created
  - Systems Director automation plans can be triggered from an energy event
  - Active Energy Manager monitors and thresholds are integrated into IBM Systems Director function System Status and Health

Trend Data

- Energy trends in upper chart
  - Input & output power
  - Maximums, averages & minimums
  - Power caps
  - Data are averages over intervals
- Temperature data in lower chart
  - Discrete values
  - Plotted against left axis
- Effective CPU speed in lower chart
  - Data are averages over intervals
  - Plotted against right axis
  - May exceed 100%



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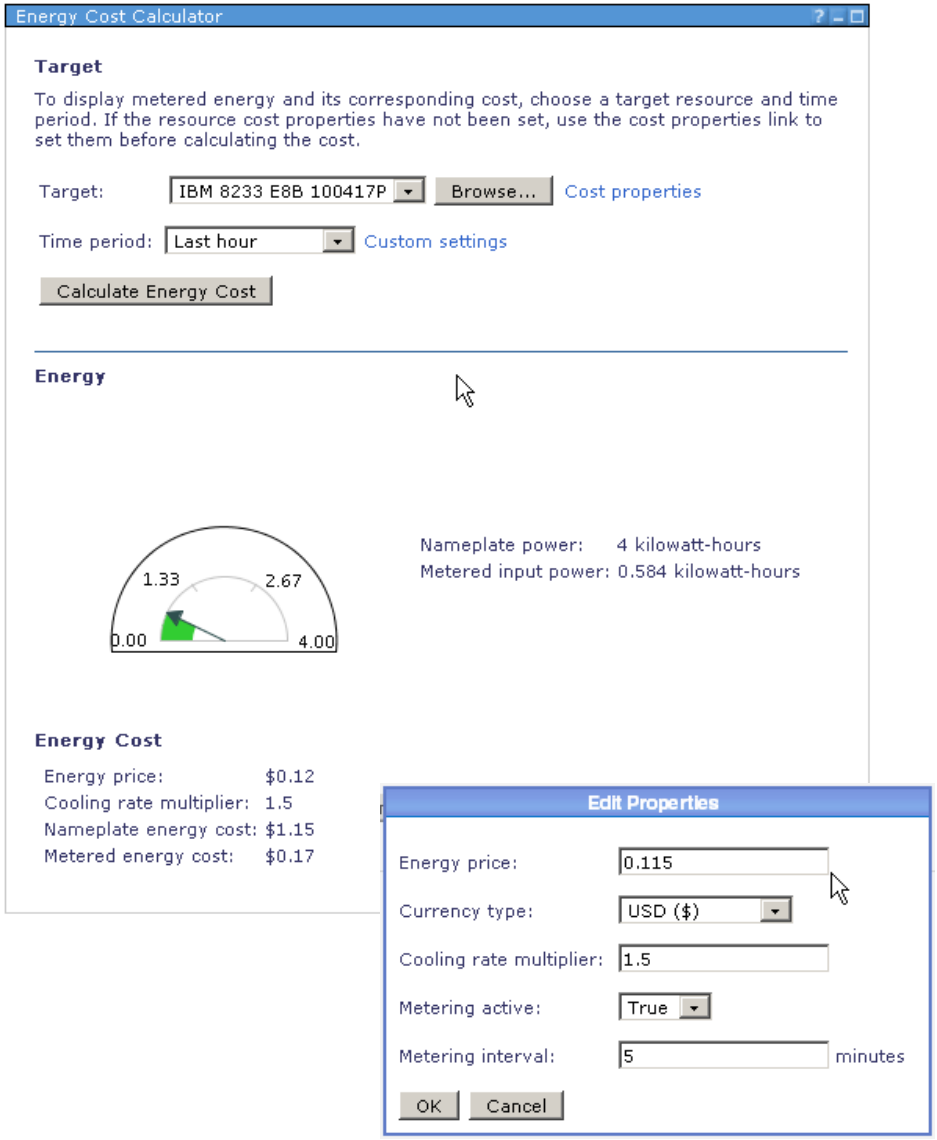
Energy Cost Calculator

- Estimates the cost of energy used for a resource or group of resources over a specified period of time
- User inputs the known values or best assumptions for energy price and cooling rate multiplier
- Displays a visual indication of the number of watt-hours consumed
- Compares actual use to what would have been consumed had nameplate power been drawn over that entire period
- May provide input for hardware upgrade investment



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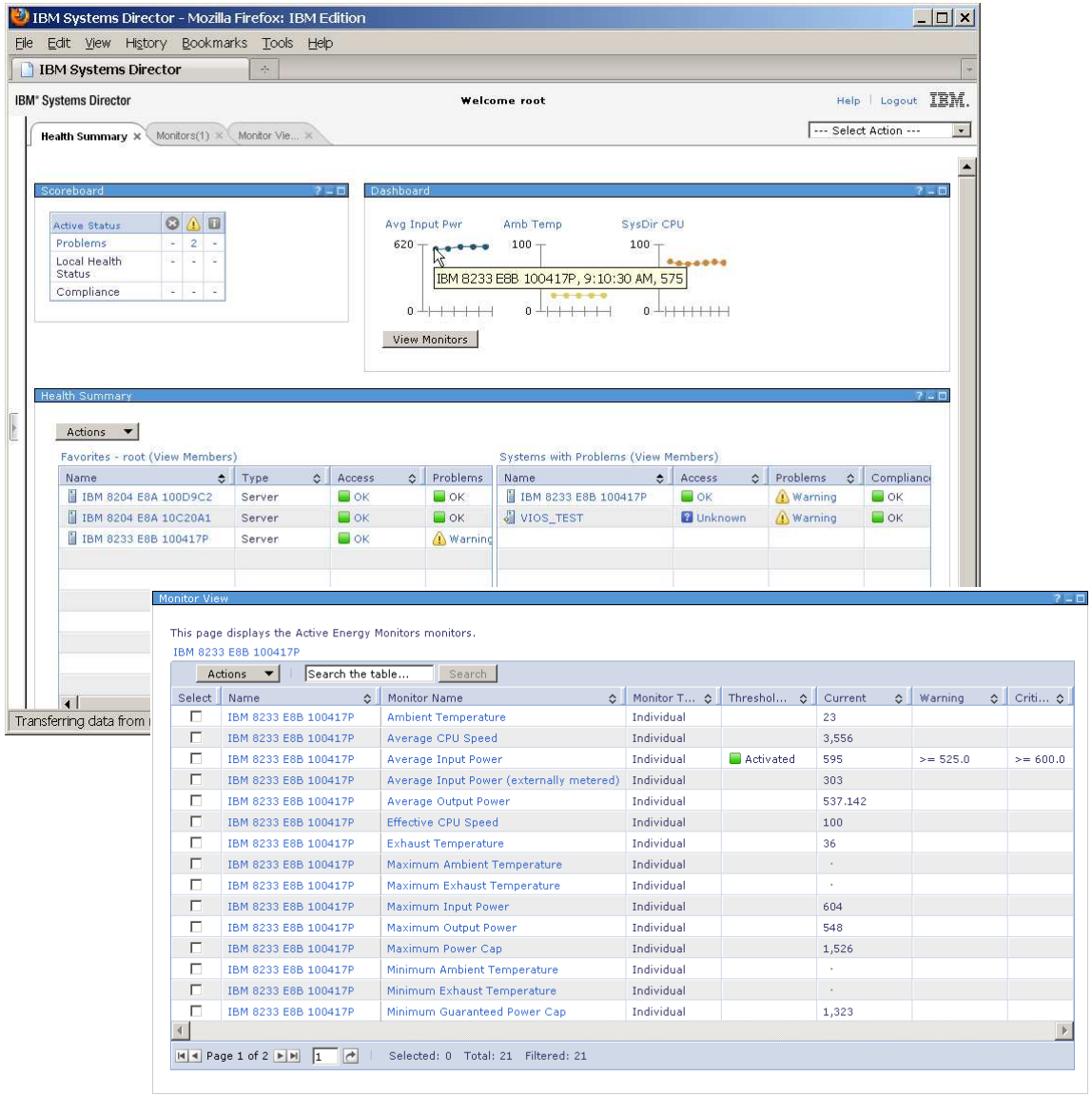
Energy Event Monitors

- Over twenty types of energy monitors
- Monitor resources or groups of resources
- Displayable on Health Summary
- Thresholds can be defined and activated
- Events can be used in Systems Director Automation Plans
- Other energy events
  - Start / end power capping or power savings



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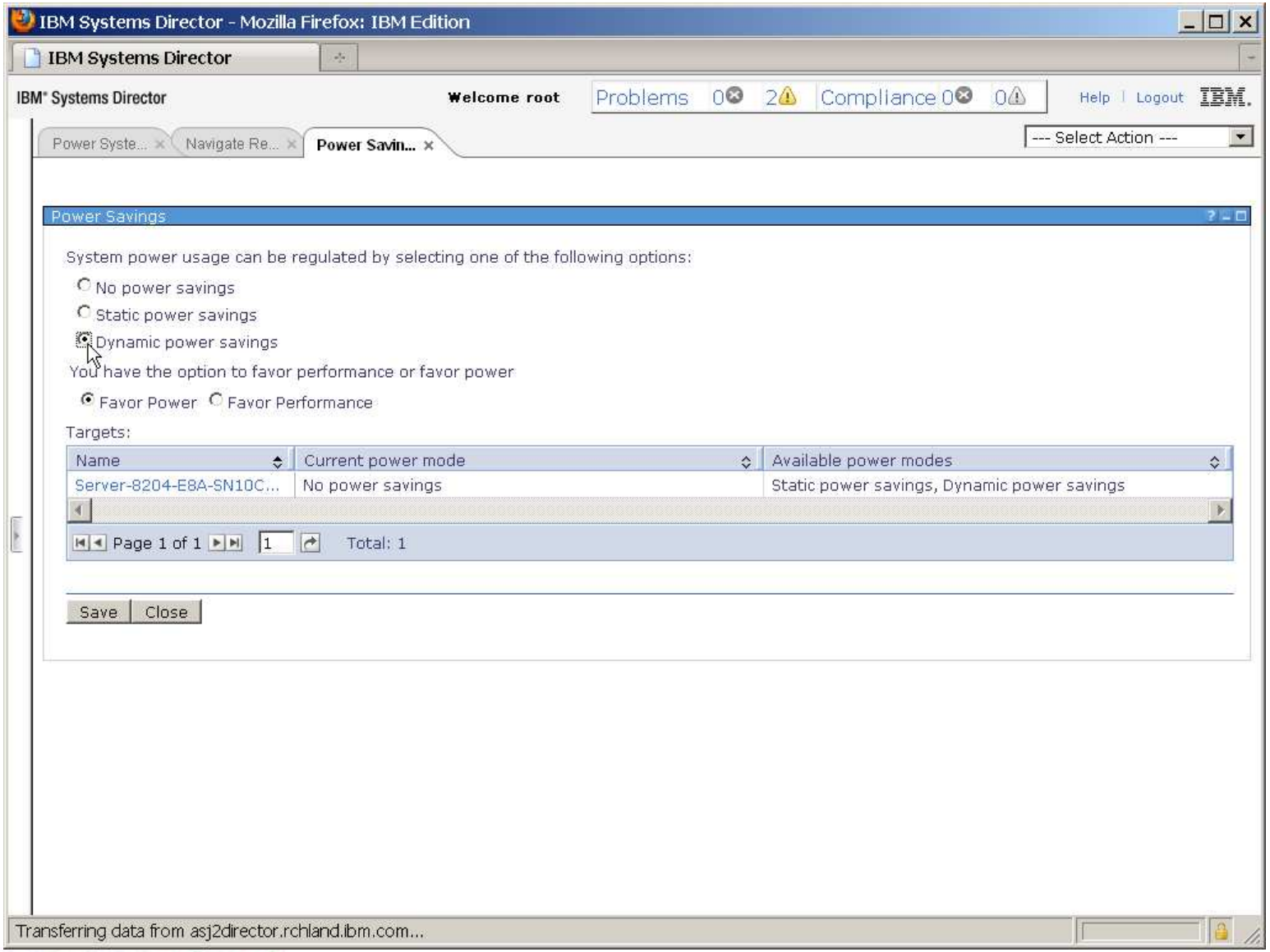
Management Functions

- Power savings
  - Static power saver
    - Use for predictable demand dip, such as nights and weekend
    - Use for critical peak reductions
    - May not affect throughput
  - Dynamic power saver
    - Energy / utilization trade-off
    - Favor performance or power savings
- Power capping
  - Not for saving power, but for allocating limited power across systems
  - Has minimum guaranteed settings
- PDU+ outlet control
  - Works with specific hardware
  - Allows on / off / reboot
  - Control through IBM Systems Director schedule or action plan
  - Understand all implications before using

Power Savings Settings



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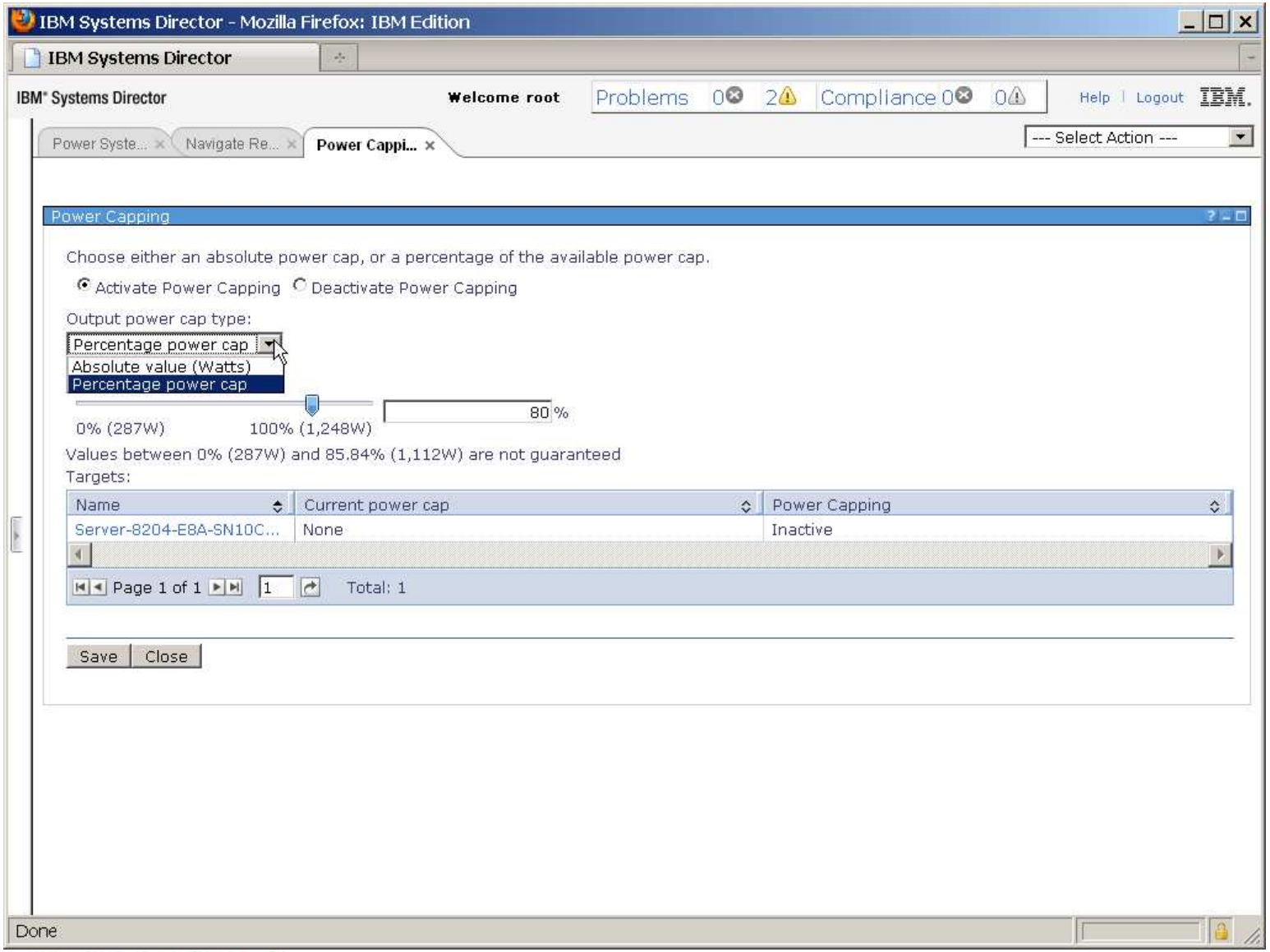
Power Capping Settings



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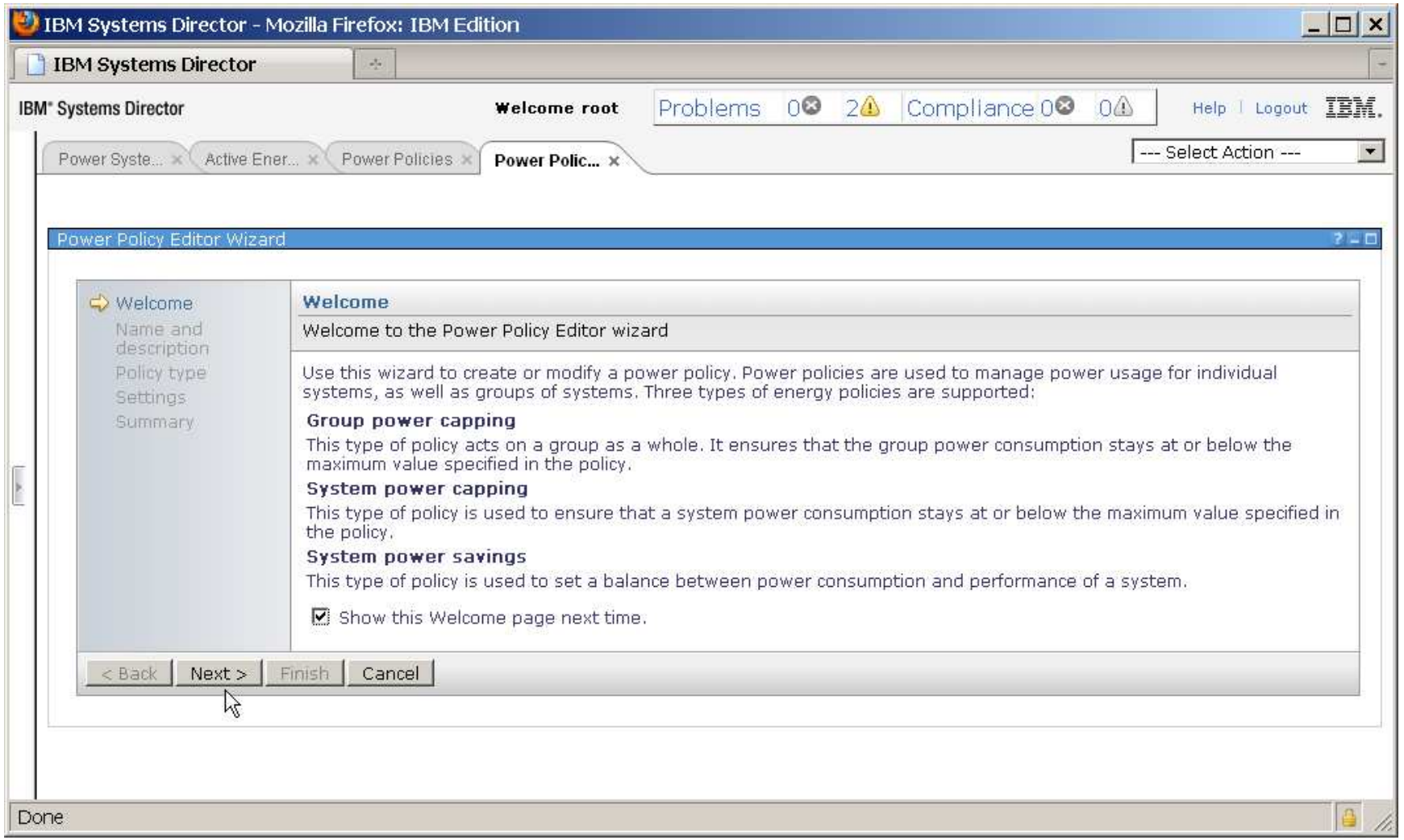
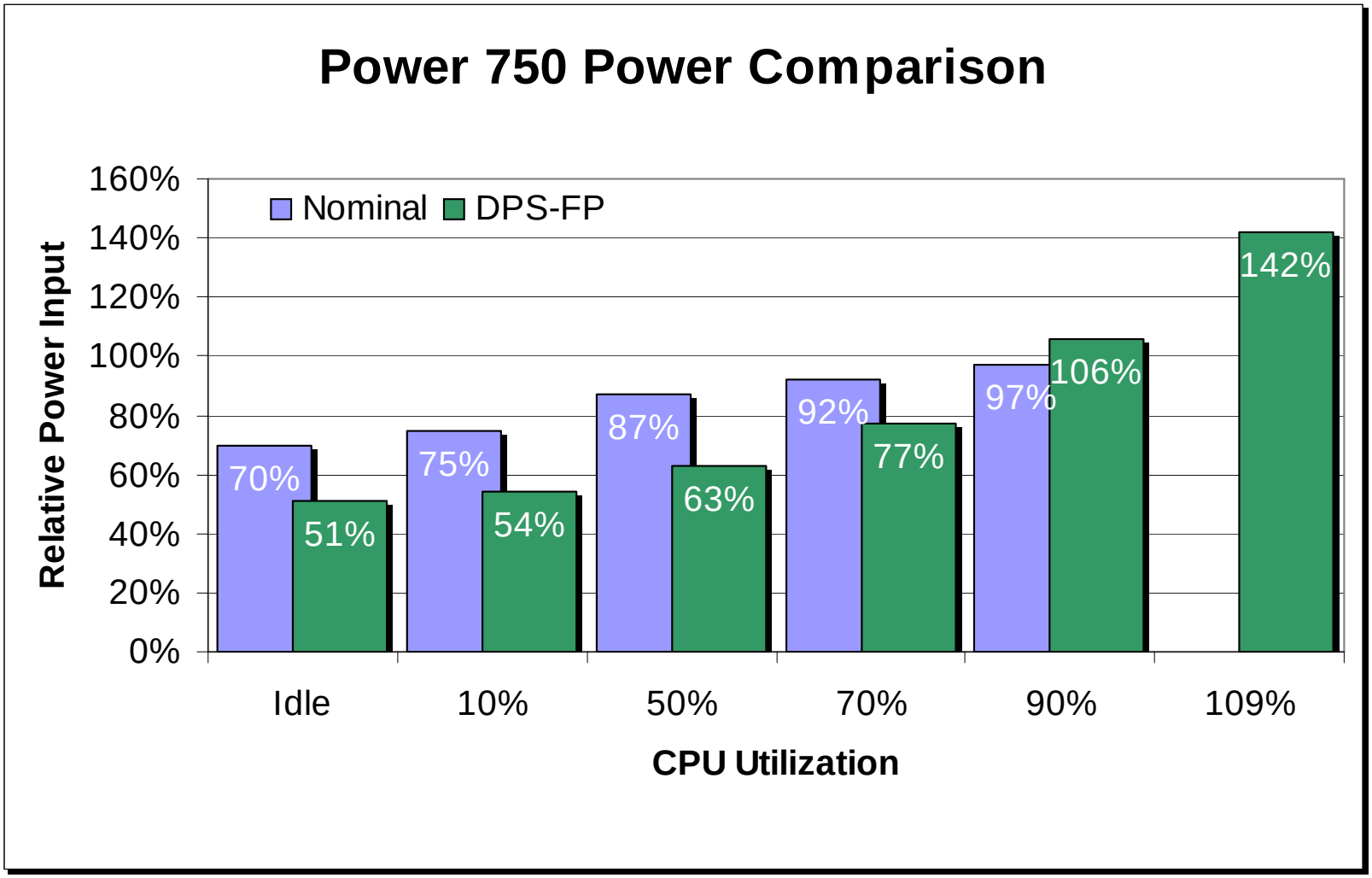
Power Policy Editor Wizard



POWER7 Over-Clocking



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Power management commands

- getpcap
  - Get the current power cap values for the specified Active Energy Manager resources
- setpcap
  - Get the current power cap values for the specified Active Energy Manager resources
- getpsaver
  - Get the current power savings values for the specified Active Energy Manager resources
- setpsaver
  - Set the power savings to static, dynamic or off with favor power savings over performance or favor performance over power savings to the selected Active Energy Manager resources
- lspolicy
  - List policy attributes
- chpolicy
  - Create, modify and delete policies
- setpolicy
  - Set the policy to the specified resource
- getoutletstate
  - Display the state of the specified power outlet resource
- setoutletstate
  - Set the state of the specified power outlet resource

Sensors, Facilities and Hardware Support

- Sensors and PDUs
  - Avocent PDUs
  - Arch Rock PhyNet 3.5.4 or 4.0, IPpower nodes and IPthermal nodes sensors
  - APC PDUs (4.1.1.1)
  - Geist
  - Rittal PDUs
  - Server Technology
  - SynapSense Version 5
- Facilities Vendors
  - APC InfraStruXure Central V6.0
  - Eaton Power Xpert Reporting (PXR) V2.0
  - Emerson-Liebert SiteScan sensor support
- Server Hardware
  - Power Systems servers
  - System X

Newer IBM Systems Support

	Firmware Level [1]		Power Monitoring	Power Capping	Power Savings
	BIOS	BMC			
System x3200 M3 (7327, 7328)	latest firmware	latest firmware	Yes	Yes	Yes[2]
System x3250 M3 (4251, 4252)	latest firmware	latest firmware	Yes	Yes	Yes[2]
System x3850 M3 (7145, 7146)	latest firmware	latest firmware	Yes	Yes	Yes[2]
BladeCenter HS22V (1949, 7871)	latest firmware	latest firmware	Yes	Yes	Yes[2]
	HMC	FSP			
IBM Power 750 (8233-E8B)	R710.0	EM710	Yes	Yes[5]	Yes[6]
IBM Power 755 (8233-H8B)	R710.0	EM710	Yes	Yes[5]	Yes[6]
IBM Power 770 (9119-MMB)	R711.0	EM711	Yes	Yes[5]	Yes[6]
IBM Power 780 (9179-MHB)	R711.0	EM711	Yes	Yes[5]	Yes[6]

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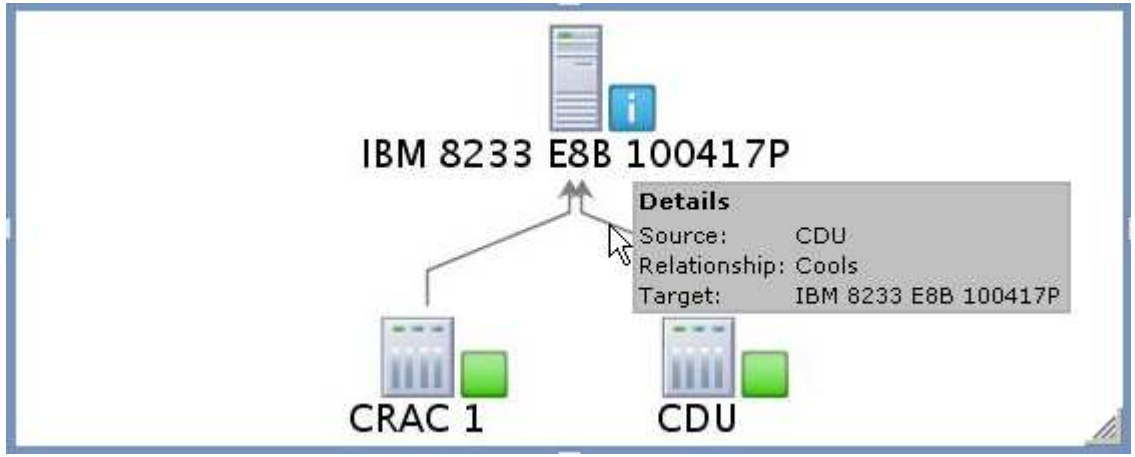
Hardware Support Notes

1. The supported firmware levels listed for each server/machine type are those that have been tested with Active Energy Manager. The listed firmware levels and later levels are supported.
2. Power savings is enabled by the BIOS and controlled thereafter by the operating system. Active Energy Manager cannot control power savings in this case.
3. Nameplate power will not be available for this server until a later firmware release.
4. Supports power capping in single-node configurations only. Capping is not supported in multi-node configurations.
5. Supports soft power capping.
6. Supports dynamic power savings.
7. Supports static power savings only.

Configuring Cooling Devices

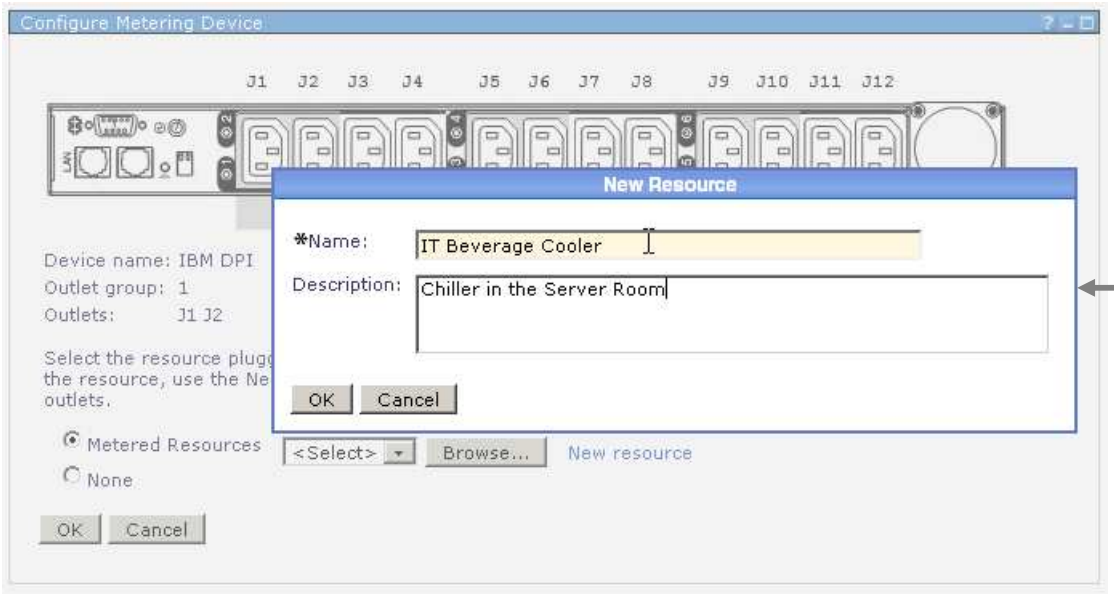
- Manually configure a cooling device to specify which resources it cools
- View all resources cooled by a cooling device
- Viewing all cooling devices which cool a resource
- Events can be generated for a resource when an associated cooling device experiences a severe event



Configuring Metering Devices

- Create associations directly with Power Distribution Units and Uninterruptible Power Supplies
- Outlets or power sensors do not need to be detected for these devices
- Enables the associated resources to be part of the Active Energy Power perspective support and the power event propagation support

When outlets are detected



When outlets are not detected

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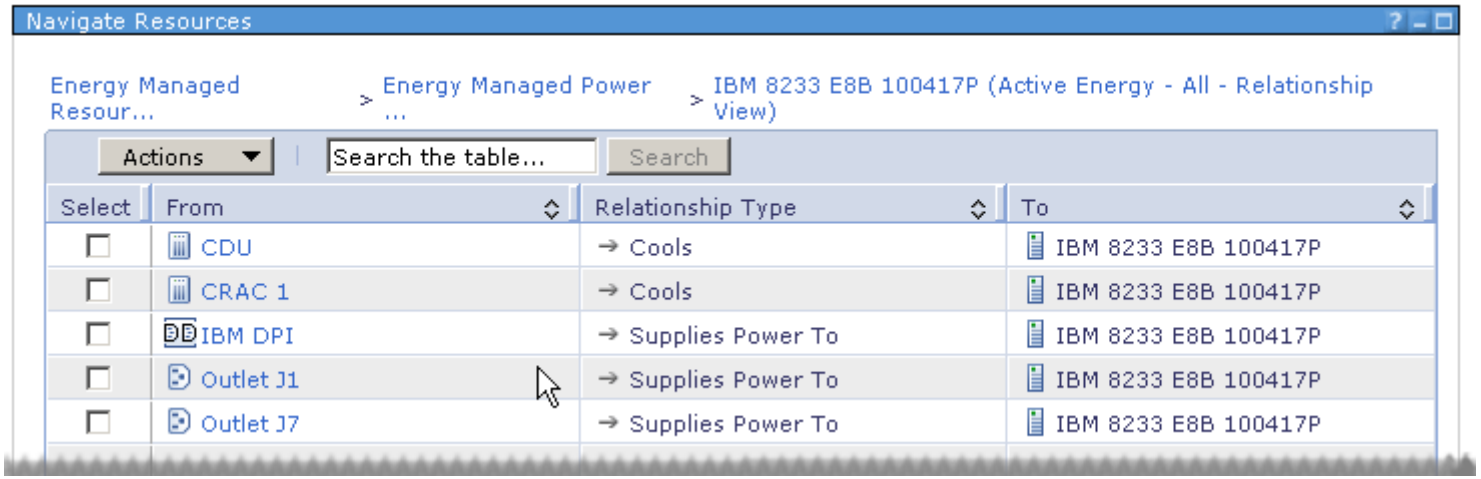
Power and Cooling Relationships

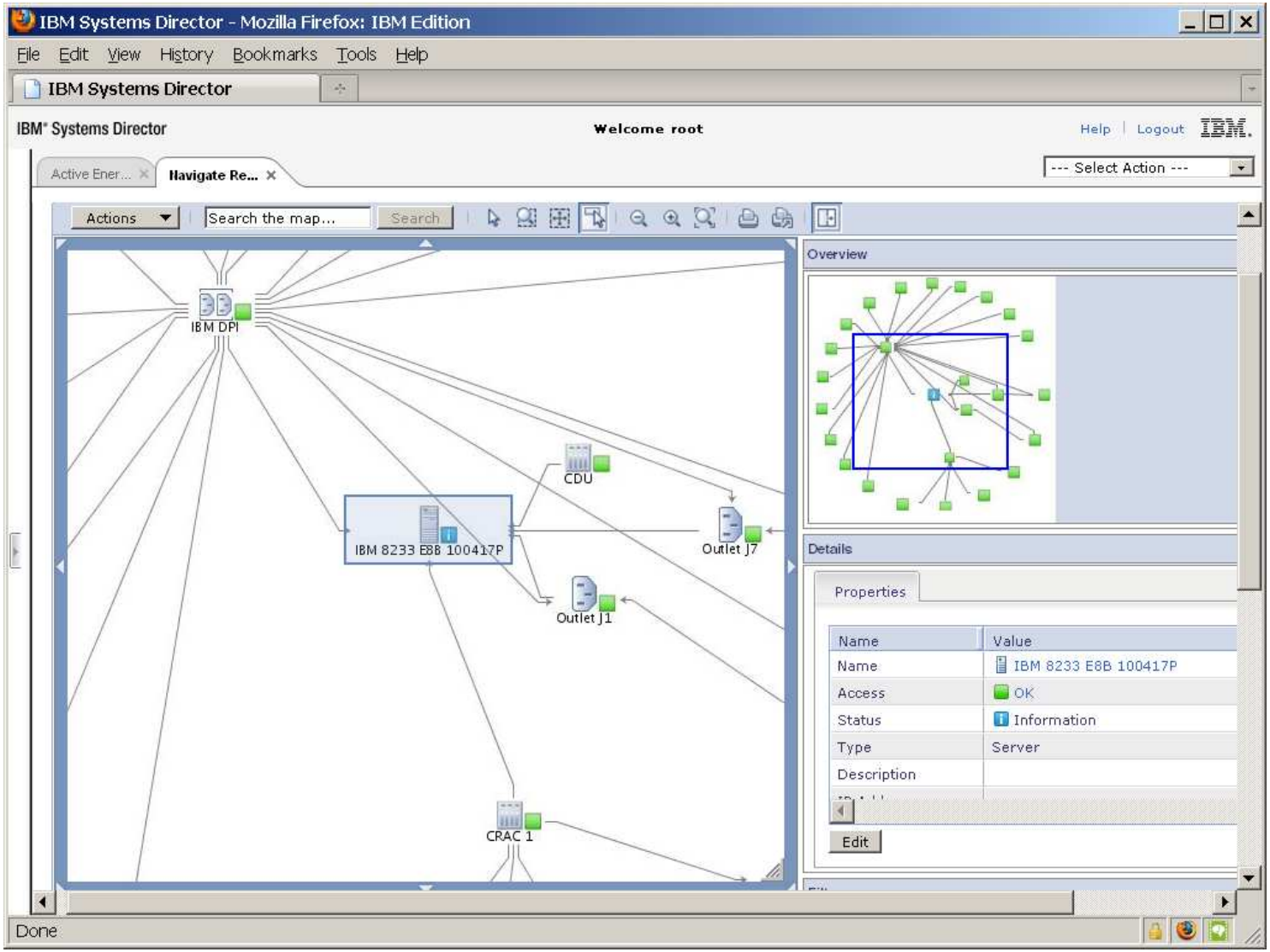
- Active Energy Power perspective
  - High-level view of how power flows between resources
  - Defines relationships between resources which supply power and resources which consume that power
- Active Energy Cooling perspective
  - High-level view of how cooling is provided for resources
  - Defines relationships between cooling units and the resources which rely on them



Event Propagation to Related Resources

- Based on configured power and cooling relationships
- For a severe event for a Power Unit
  - Severe event is generated for each associated resource
    - Event type notes that power may have been lost
    - Automation plans can be based on the associated resource
- For a severe event for a Cooling Unit
  - Warning event is generated for each associated resource
    - Event type notes that the resource may no longer be sufficiently cooled
    - Automation plans can be based on the associated resource

Energy Relationships and Topology Perspectives



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Active Energy Properties Tab

- Additional Highlights and Tasks sections
  - Highlights key energy information
  - Fast path to related energy tasks
- Two additional options for accessing Active Energy properties
  - Right click an energy managed resource, and choose Energy→ Active Energy Properties
  - On the Active Energy Manager task page, select a resource then click the “Show Active Energy Information” button in the Monitor section

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Performance considerations

- Internal product performance enhancements
- “Default metering active” added to Active Energy Manager settings
- Installation option to defer start of metering
- Systems Director Workload Estimator Plugin?

Director Resources Discovered	*AEM Resources in Metering Mode*	*AEM Resources Metered*
2 Blade Centers **1 System p Server** **1 System x Server** **1 System z HMC** **2 SynapSense Networks** **2 PDUs**	**2 Blade Centers** **1 System p Server** **1 System x Server** **each z Server (ex 2)** **each Sensor Node (ex 12)** **2 PDUs**	**2*52 (Blades, Slots, Modules, …)** **1** **1** **2** **each Sensor (ex 12*5)** **each Outlet, Outlet Group, Sensor (ex 40)**
9 Total	**20 Total**	**208 Total**

- See the Performance Tuning and Scaling Guide for IBM Systems Director 6.2
  - http://www-01.ibm.com/support/docview.wss?uid=nas7cd6a96f49d05f608862577420075ca9a

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IBM Systems Director Editions for Power , V6.2

- IBM Systems Director Express Edition
  - IBM Systems Director V6.2
  - IBM Systems Director VMControl Express Edition for Power, V2.3
  - IBM Systems Director Service and Support Manager V6.2
  - IBM Systems Director Transition Manager V6.2 for HP Systems Insight Manager
- IBM Systems Director Standard Edition
  - All of Express Edition plus..
  - IBM Systems Director Standard Edition Launchpad V6.2
  - IBM Systems Director Active Energy Manager™ V4.3
  - IBM Systems Director VMControl Standard Edition for Power, V2.3
  - IBM Systems Director Network Control V1.2
- IBM Systems Director Enterprise Edition
  - All of Standard Edition plus…
  - IBM Systems Director VMControl Enterprise Edition for Power, V2.3
  - IBM Tivoli Monitoring (ITM) V6.2.2 FP2
  - IBM Tivoli Monitoring (ITM) - OS Agents
  - IBM Tivoli Monitoring (ITM) - System p Agents
  - IBM Tivoli Monitoring for Energy Management 6.2.1
  - IBM Tivoli Application Dependency Discovery Manager (TADDM) 7.2
  - IBM Tivoli Performance Analyzer 6.2.2
  - IBM Tivoli Common Reporting for Asset and Performance Management 1.3
  - DB2 Enterprise Server Edition 9.7 FP1
- * IBM United States Software Announcement 210-100, July 20, 2010

Useful information Sources

- Systems Director Information Center
  - Overview of Active Energy Manager
  - Planning for Active Energy Manager
  - Installing Active Energy Manager
  - Accessing Active Energy Manager
  - Navigating Active Energy Manager resources
  - Configuring default Active Energy Manager settings
  - Monitoring power usage
  - Managing power usage
  - Troubleshooting and support
  - Reference
  - Publications and related information
  - Glossary

http://publib.boulder.ibm.com/infocenter/director/v6r2x/topic/com.ibm.director.aem.helps.doc/frb0_main.html

Useful information Sources

- Energy Scale White Papers
  - IBM EnergyScale for POWER6 Processor-Based Systems

http://www-03.ibm.com/systems/power/hardware/whitepapers/energyscale.html

  - IBM EnergyScale for POWER7 Processor-Based Systems

http://www-03.ibm.com/systems/power/hardware/whitepapers/energyscale7.html

  - EnergyScale Features
  - User Interfaces
  - Performance analysis

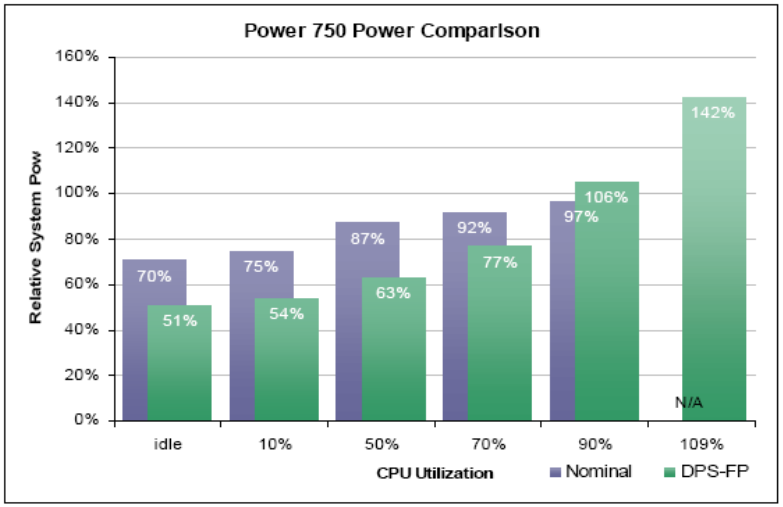

Illustration 30: Dynamic Power Optimizer, when enabled on an example Power 750 server, yields significant power savings at low utilization. At extremely high workloads, CPU utilization may exceed that of nominal at the expense of total power consumed.

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IBM Systems Energy Estimator

- Web-based tool for estimating power requirements for IBM Power Systems

http://www-947.ibm.com/systems/support/tools/estimator/energy/index.html

System configuration

Processor Model: 750-8233-E8B 8336 3550 32

Desired CPU utilization: 100%

Number of cores: 32 Active cores

Memory DIMMs

512MB DIMMs	1GB DIMMs	2GB DIMMs	4GB DIMMs	8GB DIMMs	16GB DIMMs	32GB DIMMs	Total Memory
N/A	N/A	N/A	0	0	24	N/A	384 GB

Internal Media: Backplane for 2.5 inch media, external SAS support

DVD	Tape	10K rpm Disk	15K rpm Disk	Solid State Disk
Yes	No	0	0	0

PCI

PCI Cards	GX Cards	Additional PCI or GX cards
3	1	N/A

Integrated Host Ethernet Adapter: Integrated 4-port 1Gb Ethernet Card

Expansion: Add

Expansion Type

Disks	PCI	Configuration Rule	Disk Type
0	0	using 5886 and 5796	15K

Duplicate

Continue

IBM Systems Energy Estimator v2010.1 25-Feb-2010 www-912

Model:	750-8233-E8B
rPerf:	331.06
Processor CPW:	181,000
Cores:	32 cores
Processor:	IBM® POWER7
Clock speed:	3550 MHz
Configured Memory:	384 GB
Estimated energy:	1658 Watts 5659 BTU/hr

Included components:	Qty	Feature	Description
	4	8336	POWER7 8-core 3.55 GHz Processor Card
	32		Active Cores
	1		System Planar
	12	4528	Memory - 32GB (2 x 16GB)
	1	8340	Backplane for 2.5 inch media, external SAS support
	1	5756	DVD
	1	5624	Integrated 4-port 1Gb Ethernet Card
	1		Generic GX Adapter
	3		Generic PCI card
	1	N/A	Standard Fans/Blowers

Note: This is an estimate only. Actual results may vary.

Note: Data used for this energy estimate was collected in an ambient temperature environment using redundant power supplies with system resources operating near maximum levels, unless specified otherwise in the table above.

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Customer Reference for Power Management

- United States Bowling Congress uses intelligent sensors and power management for energy savings
  - http://www-03.ibm.com/press/us/en/pressrelease/27220.wss

Winner of COMMON US 2009 Innovation award for energy efficiency.

http://www.talktenpin.net/index.php?option=com_content&task=view&id=3530&Itemid=78

United States Bowling Congress

Consolidated onto Power servers and blades with PowerVM
Active Energy Manager

USBC uses intelligent sensor technology to manage power utilization to reduce cooling and electricity costs in its data center. …resulting in a nearly 50 percent reduction in cooling cost and eliminates more than five tons of carbon emissions annually.

Jim Oberholtzer
Vice President Technology

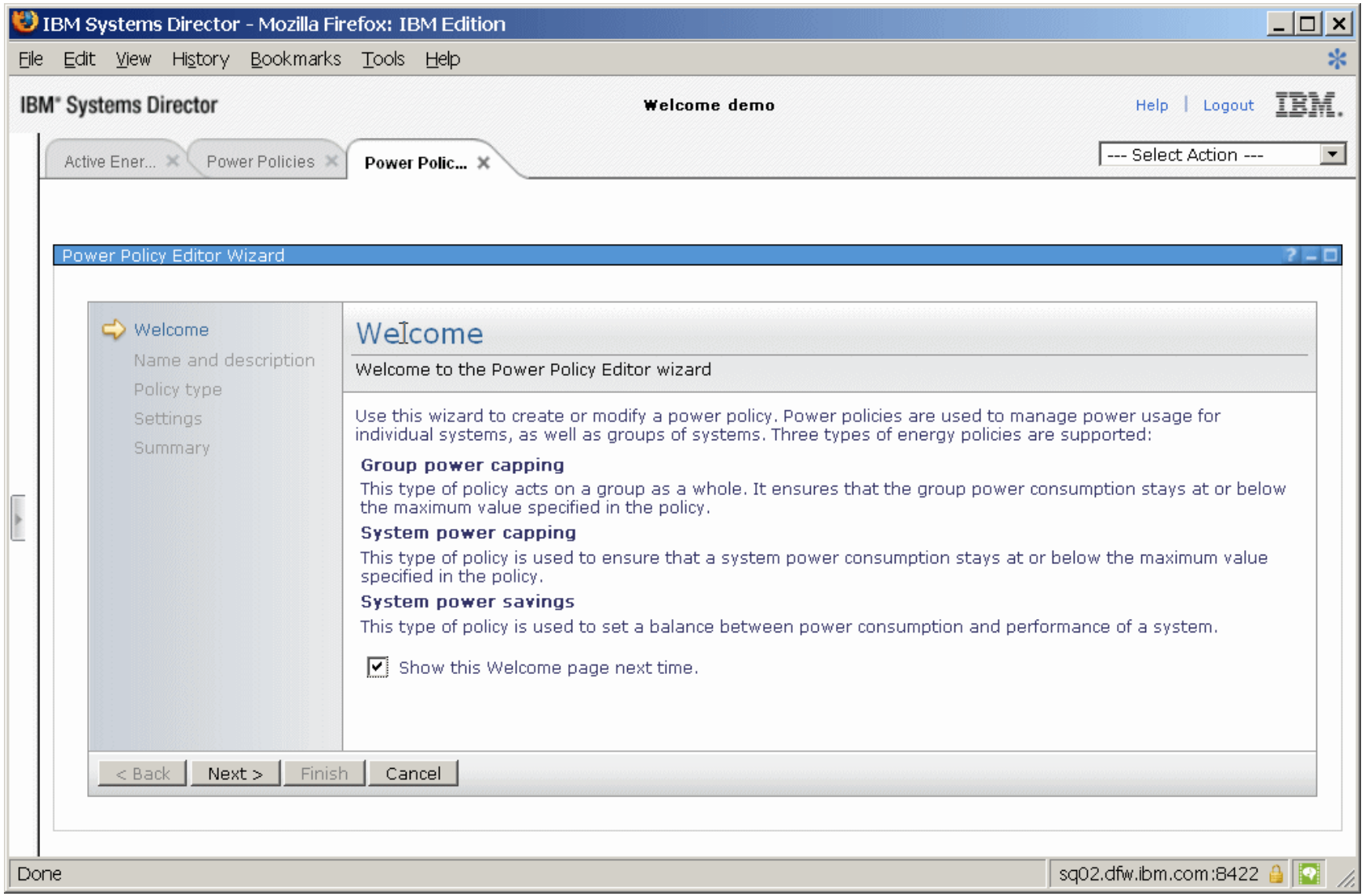
AEM Red Books

- Going "Green" with IBM Active Energy Manager
  - http://w3.itso.ibm.com/redpieces/abstracts/redp4361.html
- Implementing IBM Systems Director Active Energy Manager
  - http://w3.itso.ibm.com/abstracts/sg247780.html

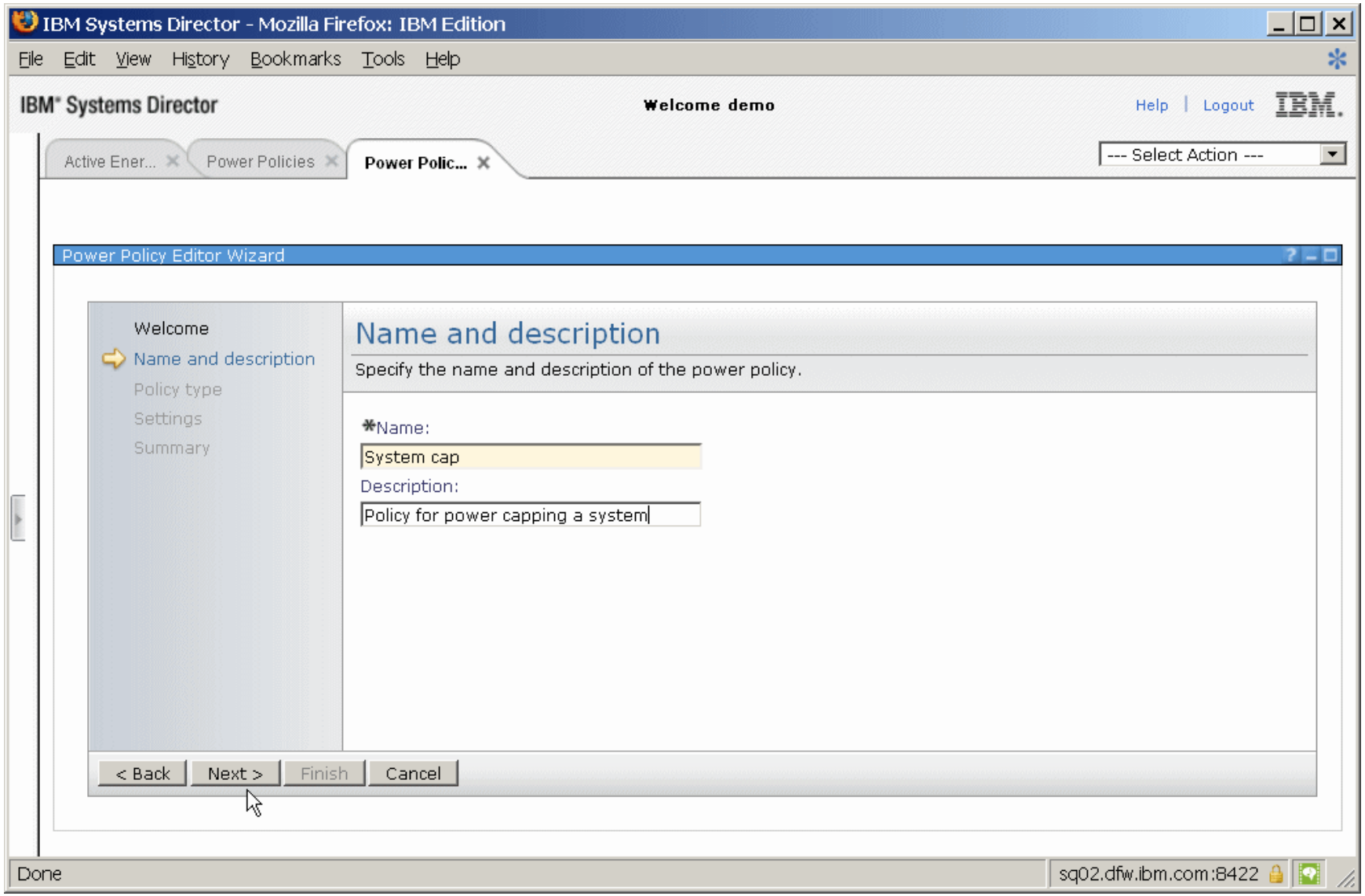
Additional material

- Creating a power policy
- Applying a power policy
- Viewing trend data as policies are applied and removed

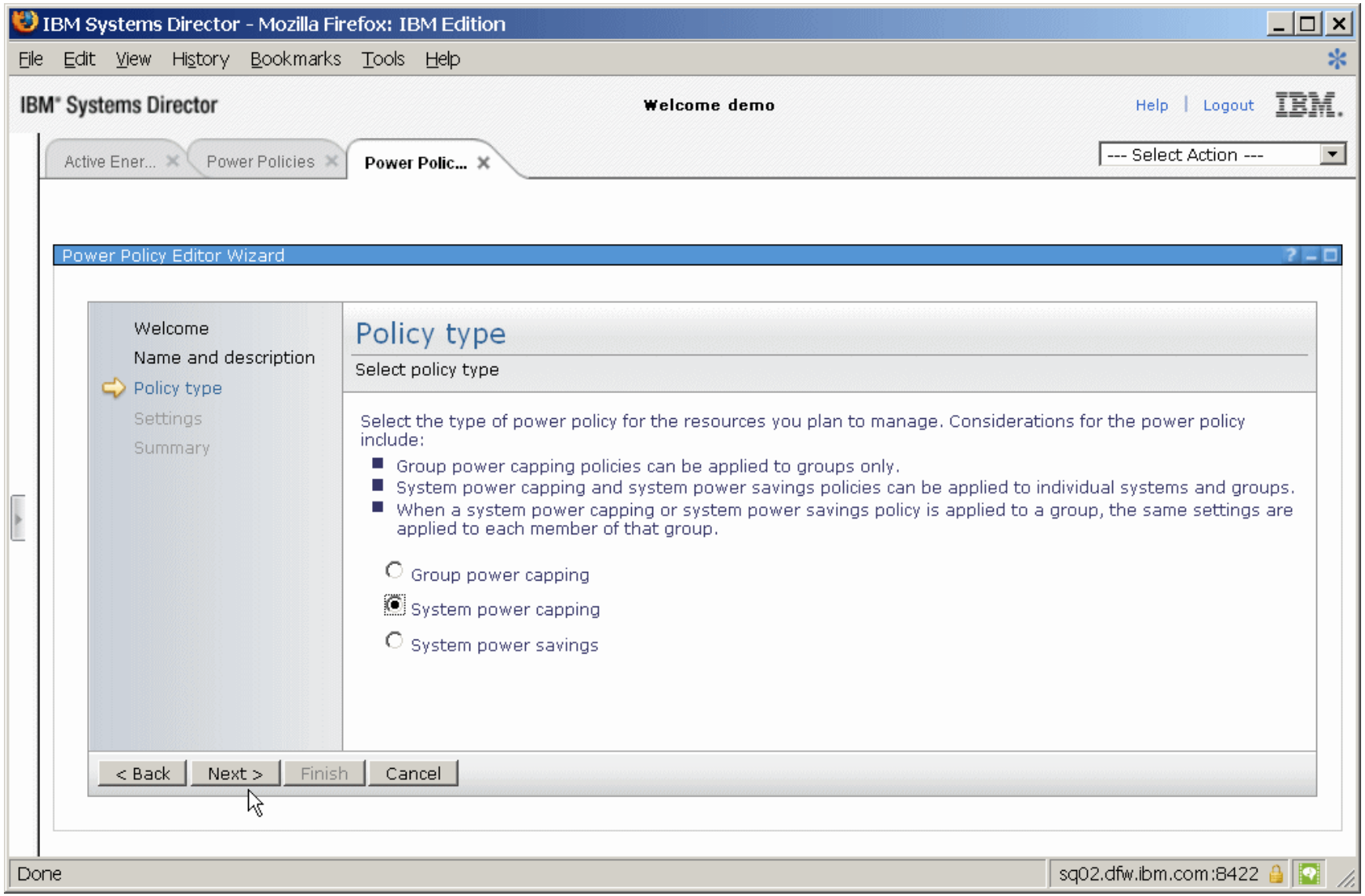
Creating a Power Policy (1 of 6)



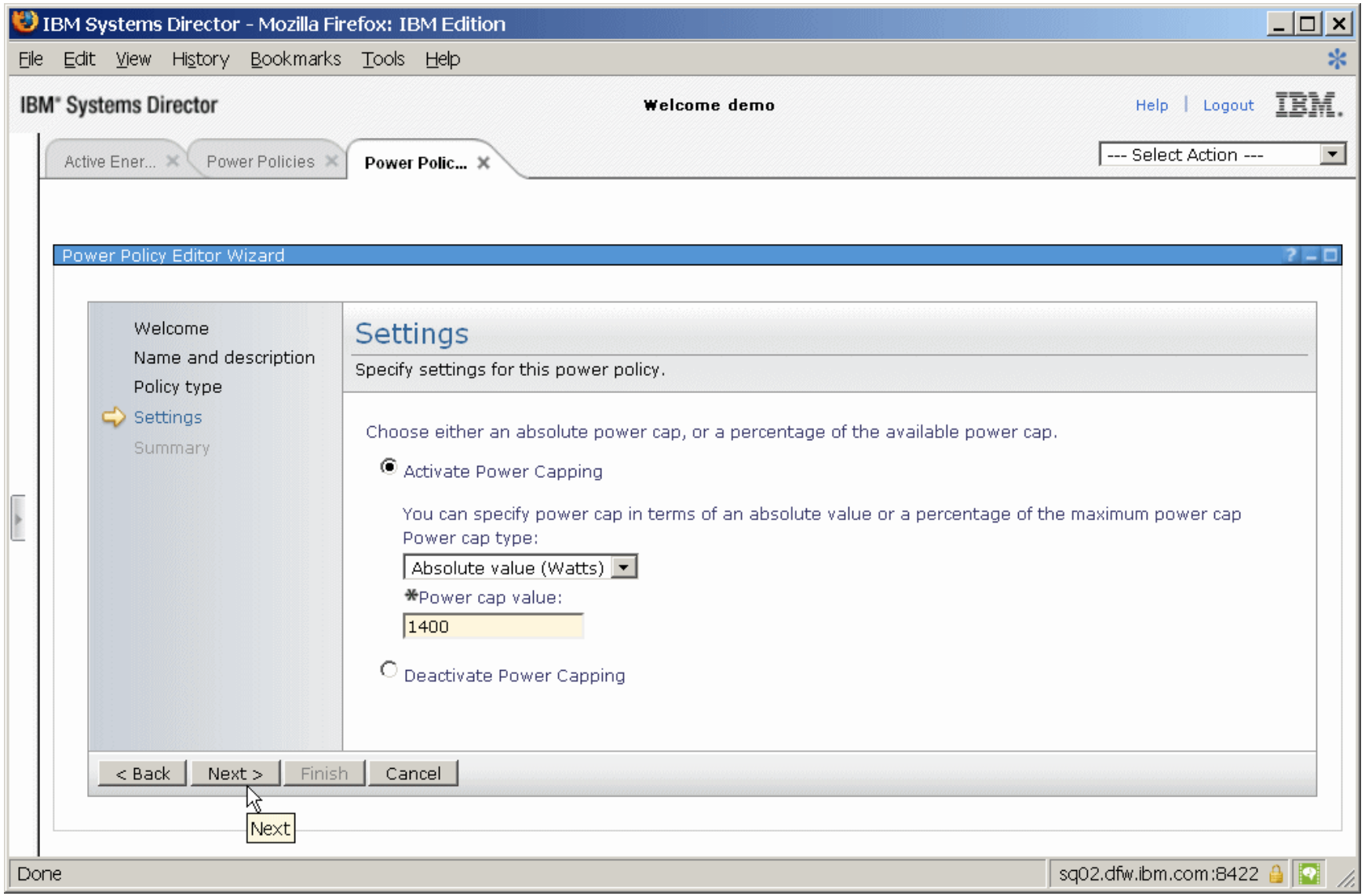
Creating a Power Policy (2 of 6)



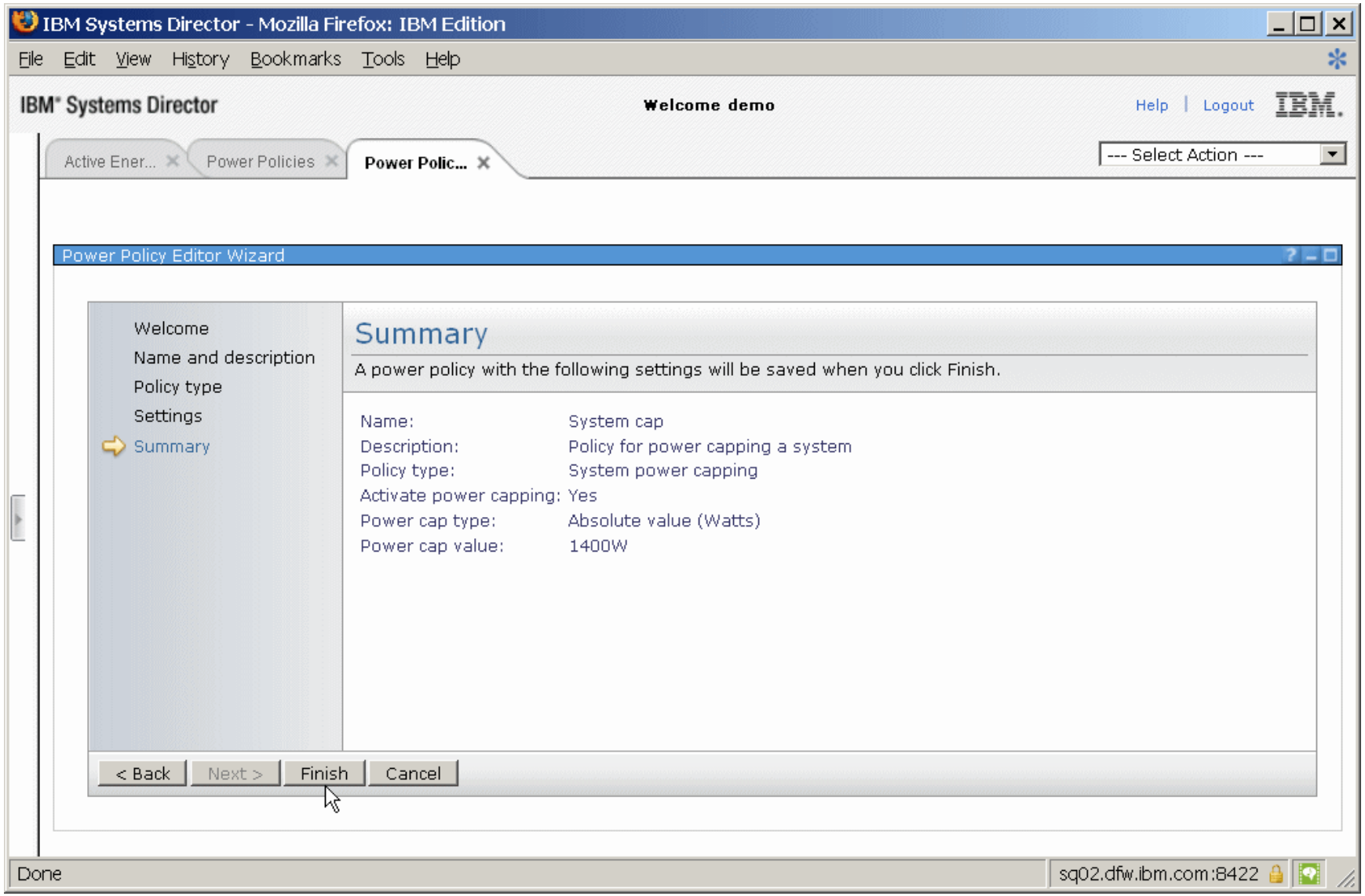
Creating a Power Policy (3 of 6)



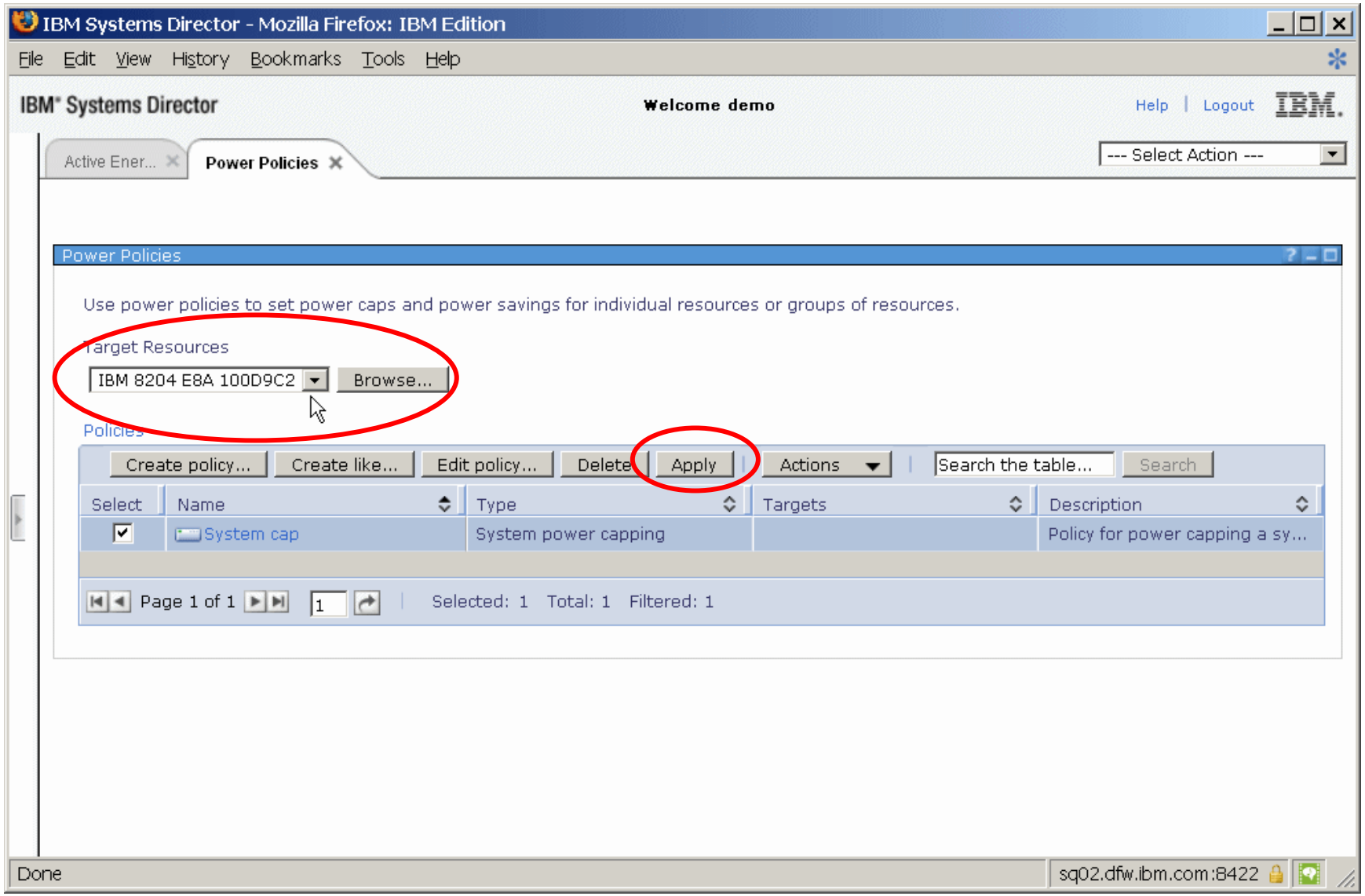
Creating a Power Policy (4 of 6)



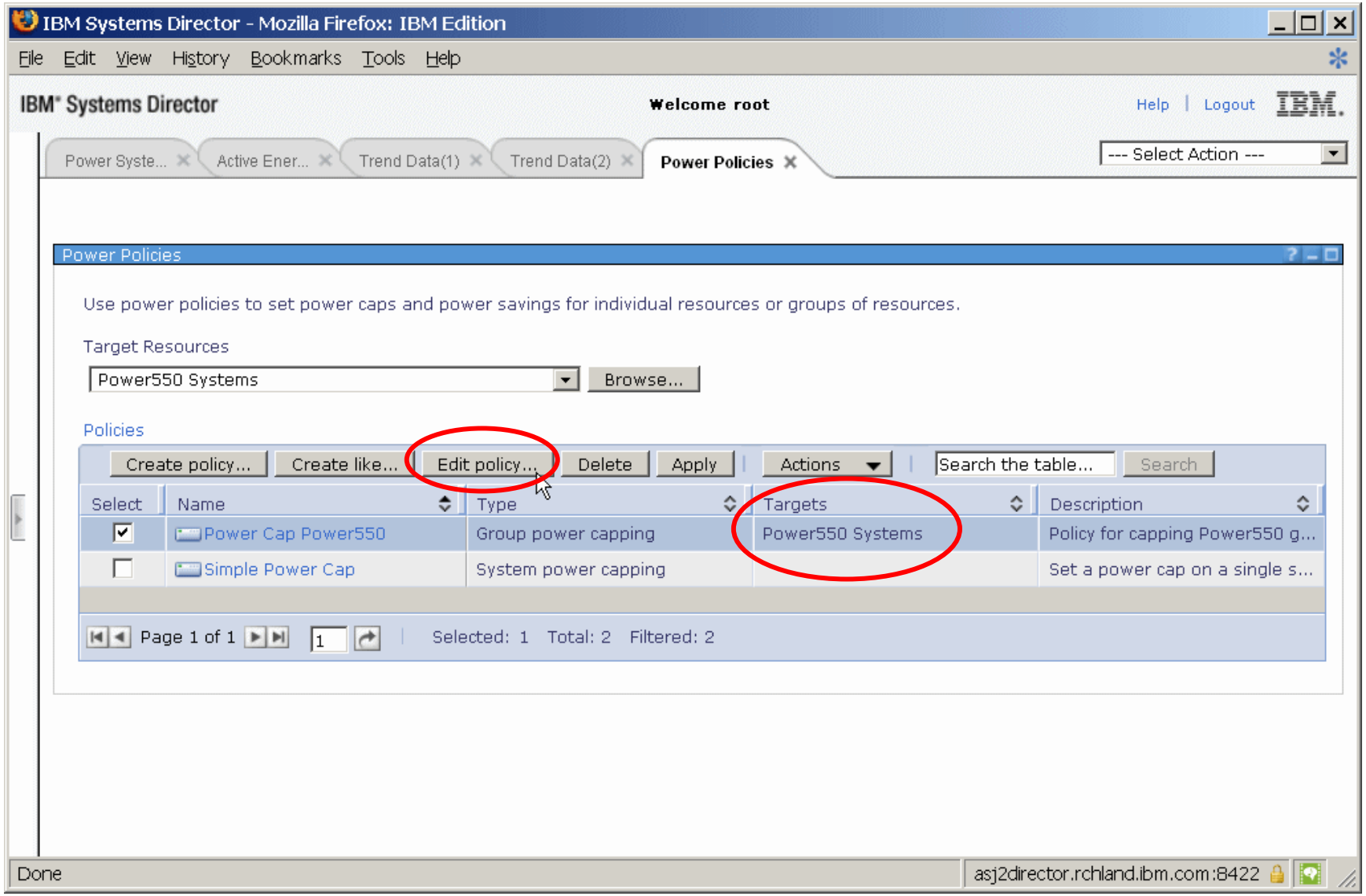
Creating a Power Policy (5 of 6)



Creating a Power Policy (6 of 6)



Change Power Policy (1)



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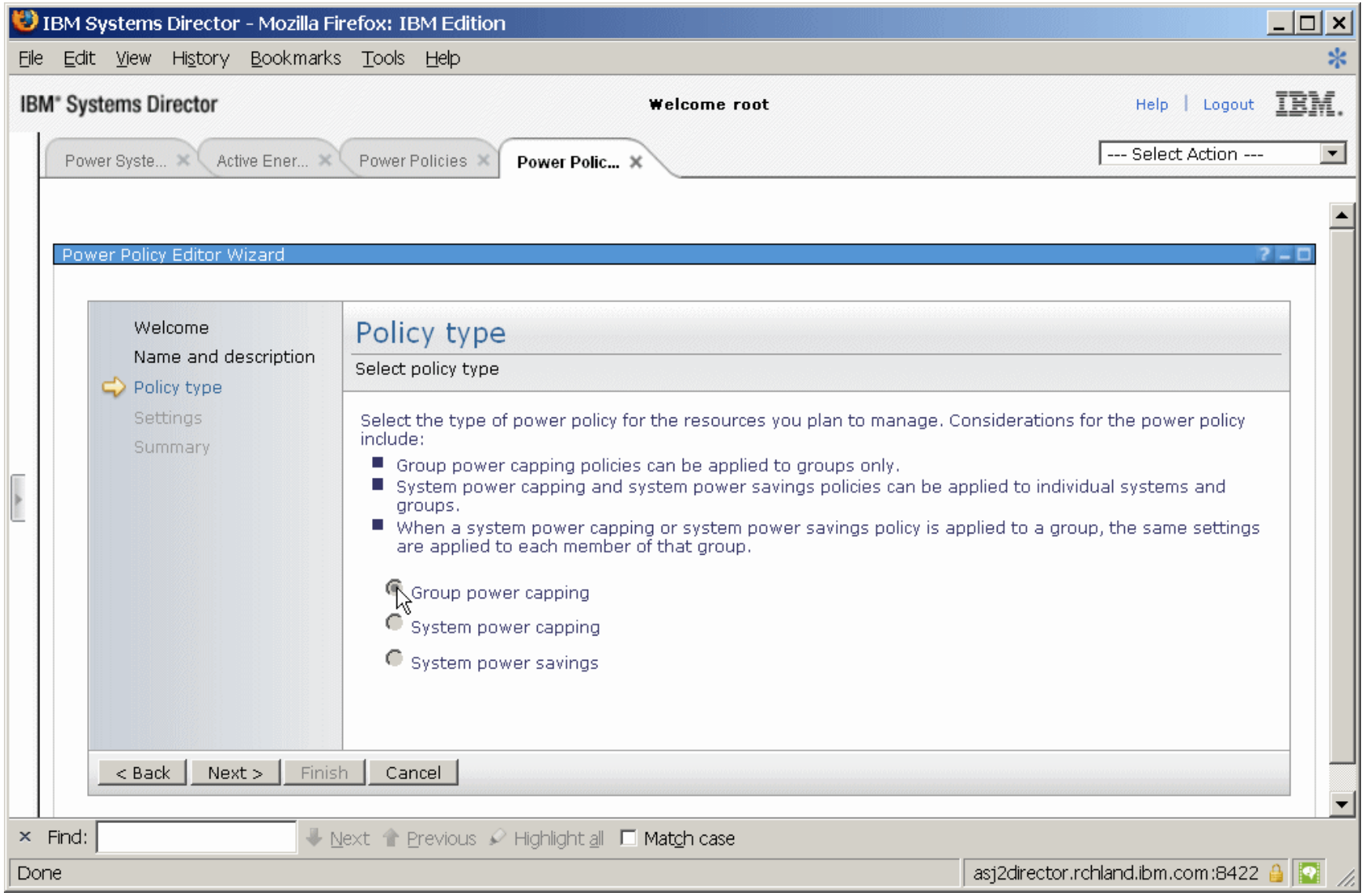
Group Policy (1)



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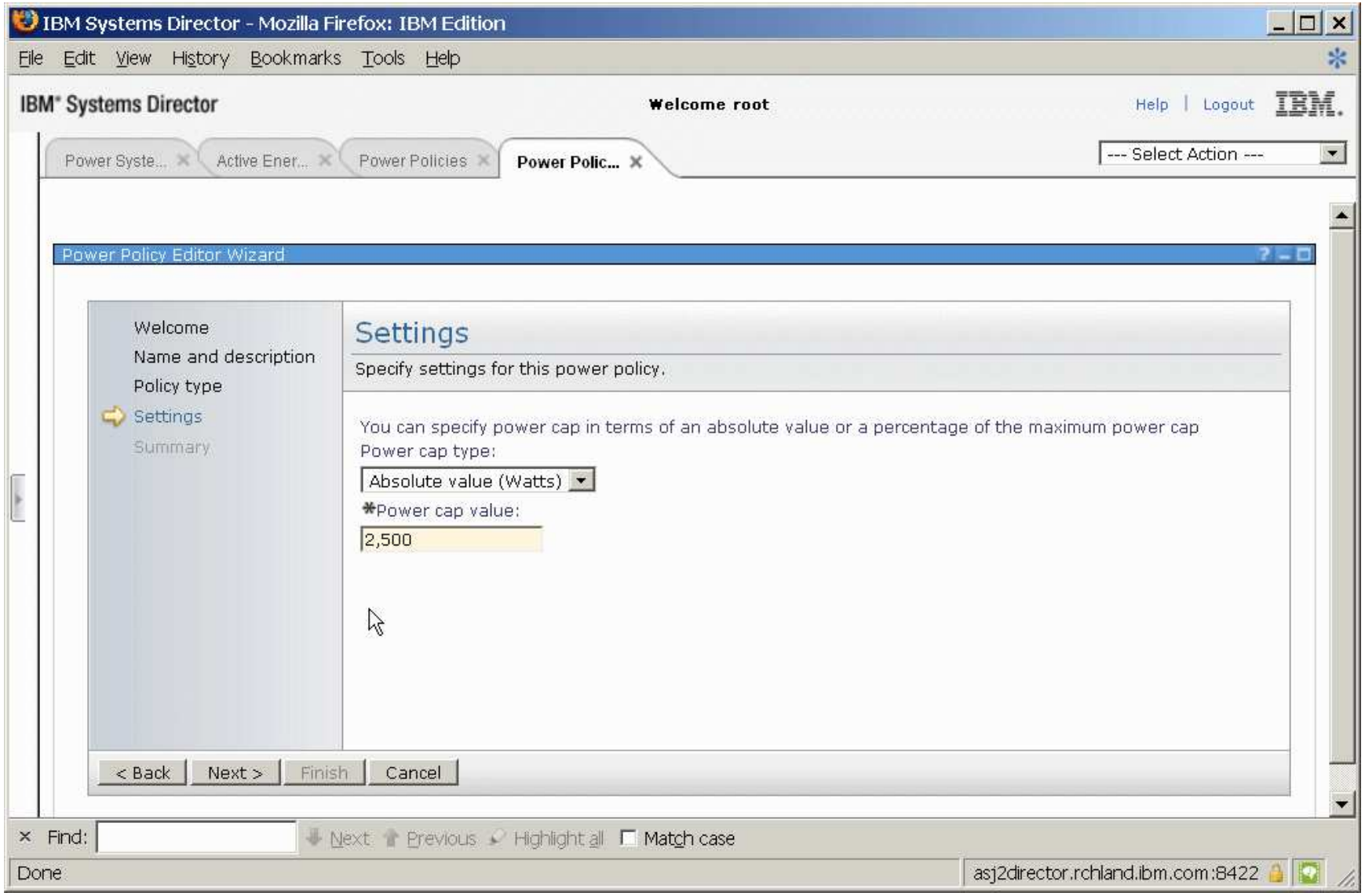
Group Policy (2)



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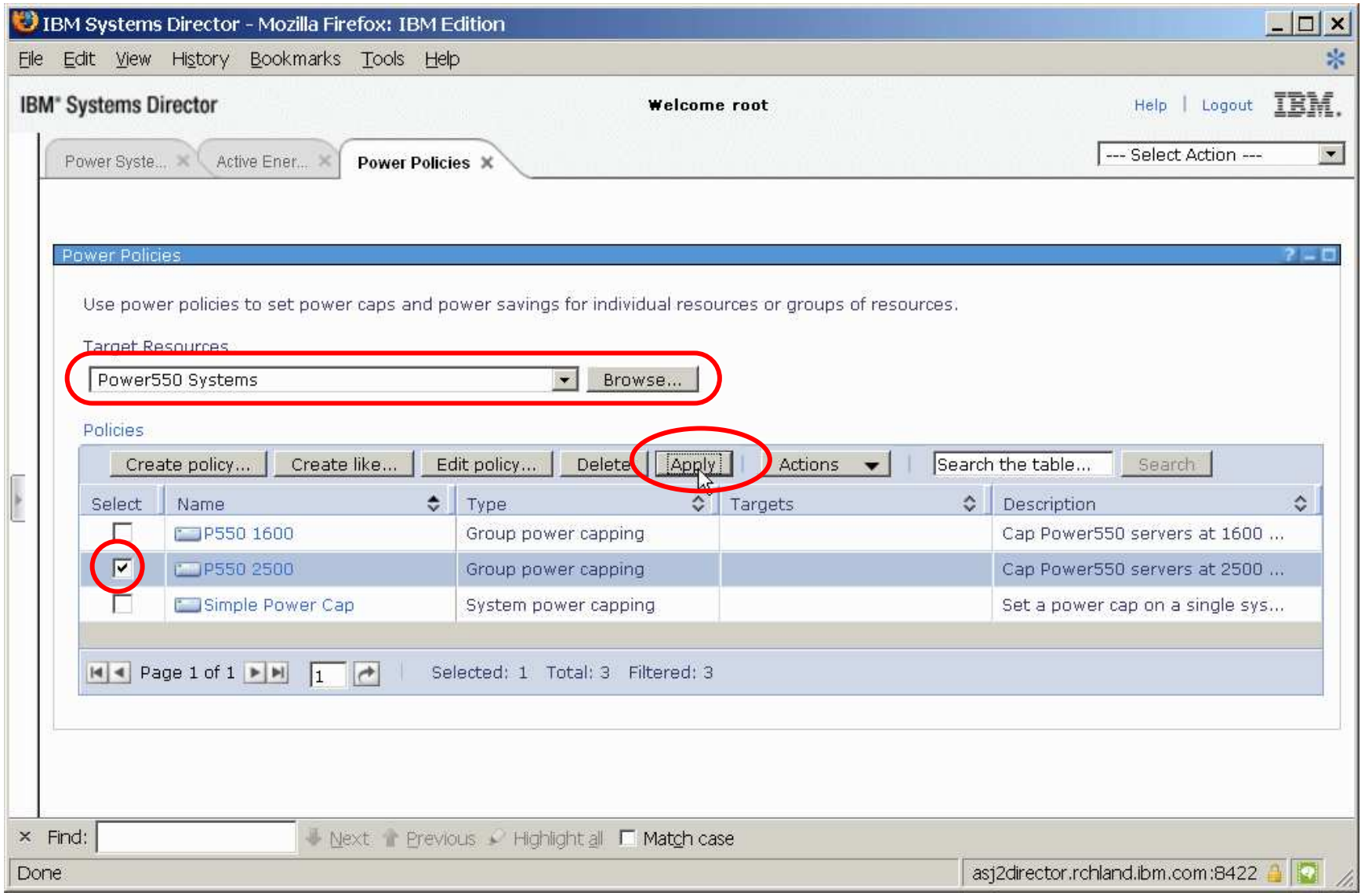
Applying a Power Policy (1)



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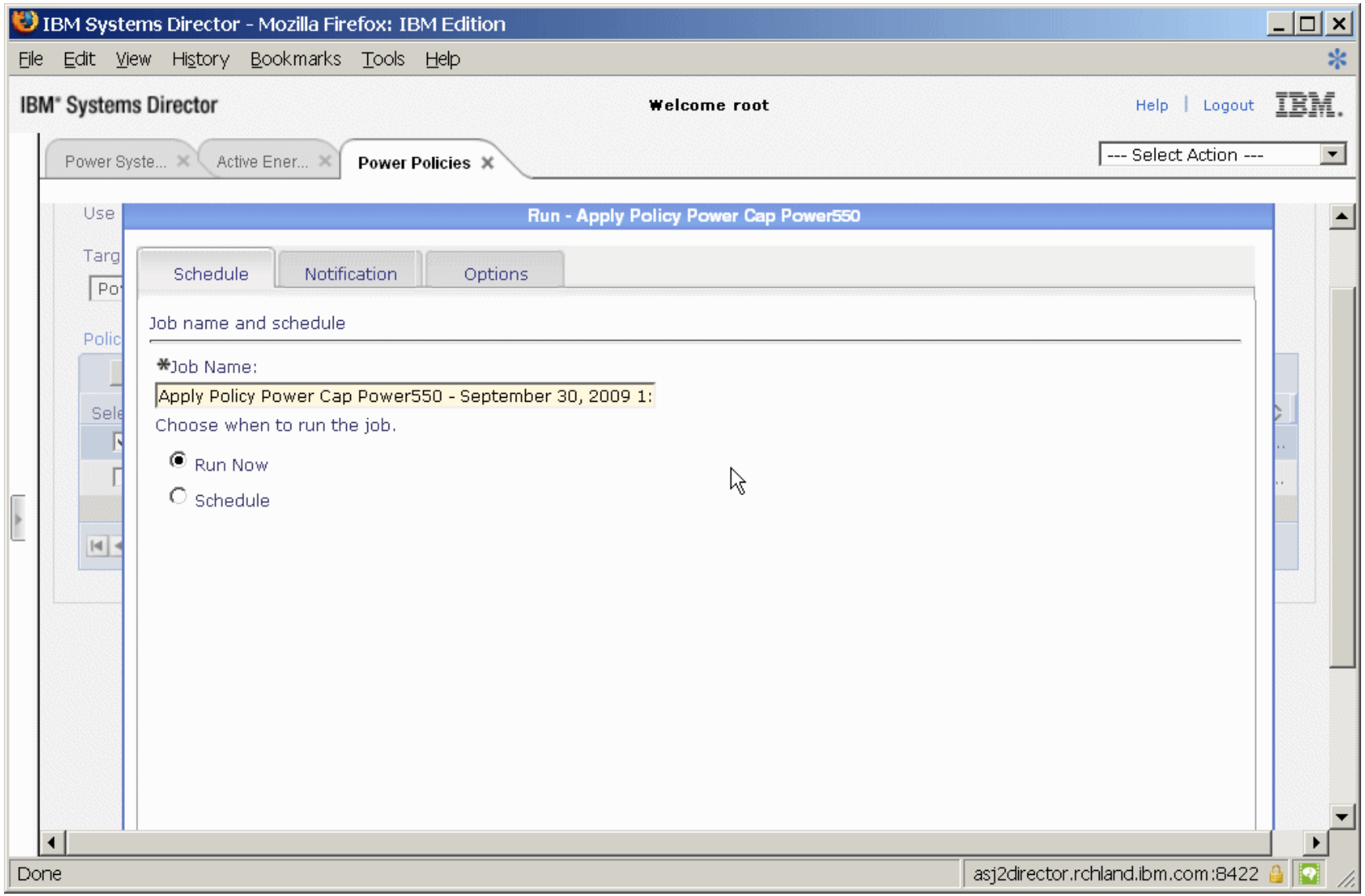
Applying a Power Policy (2)



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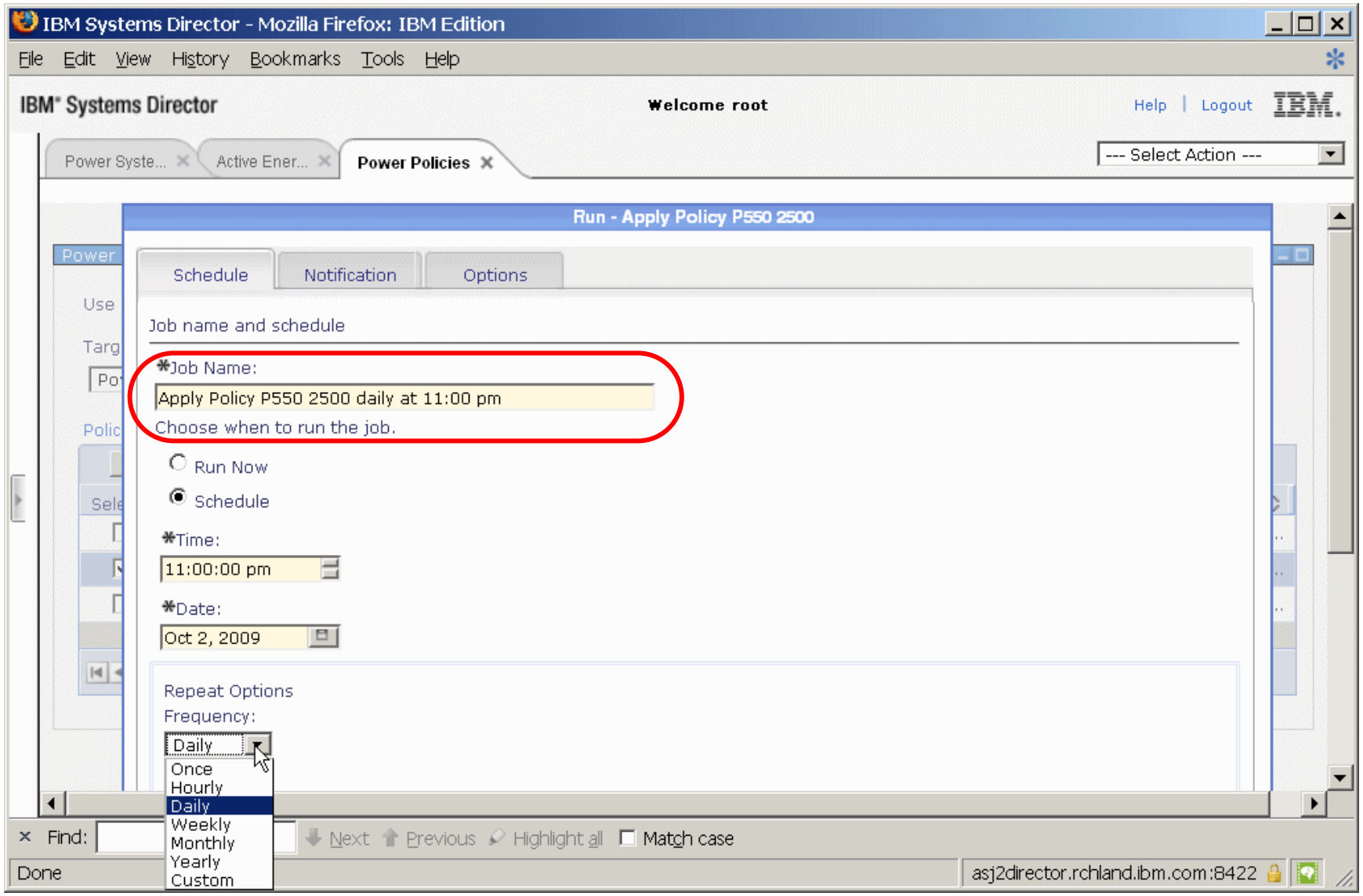
Applying a Power Policy (3)



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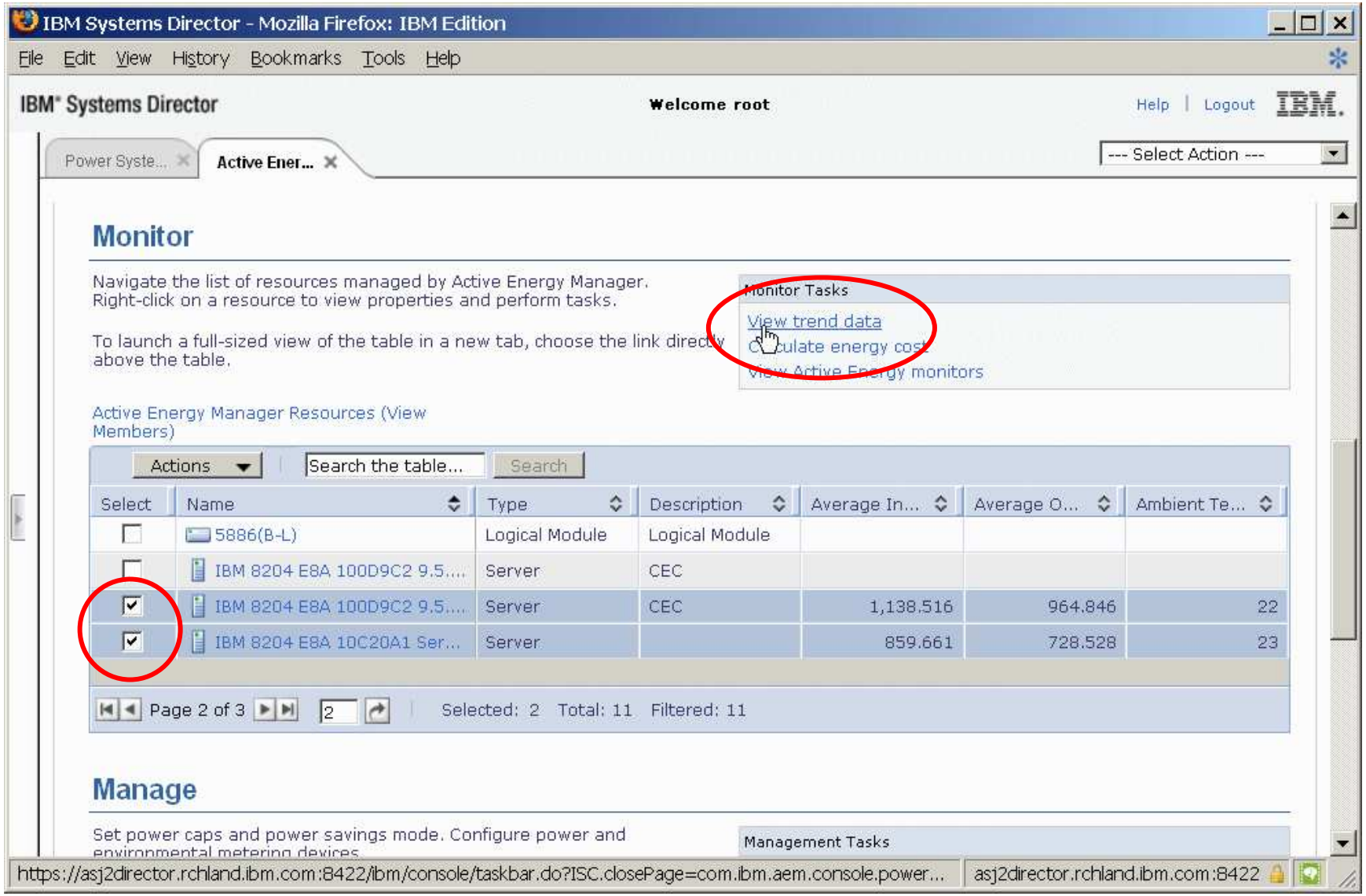
View Trend Data



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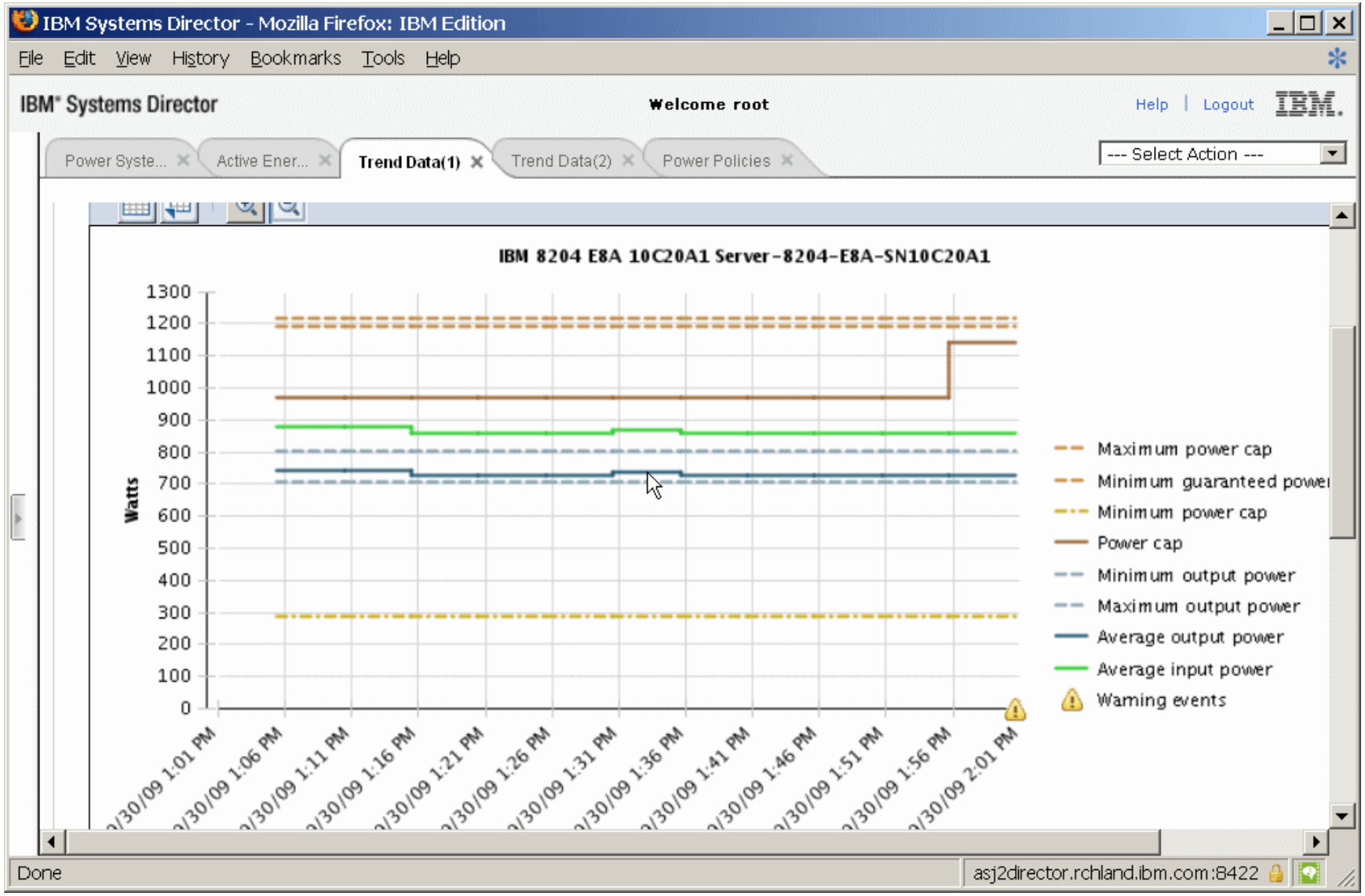
View Trend After First Policy – System C20A1



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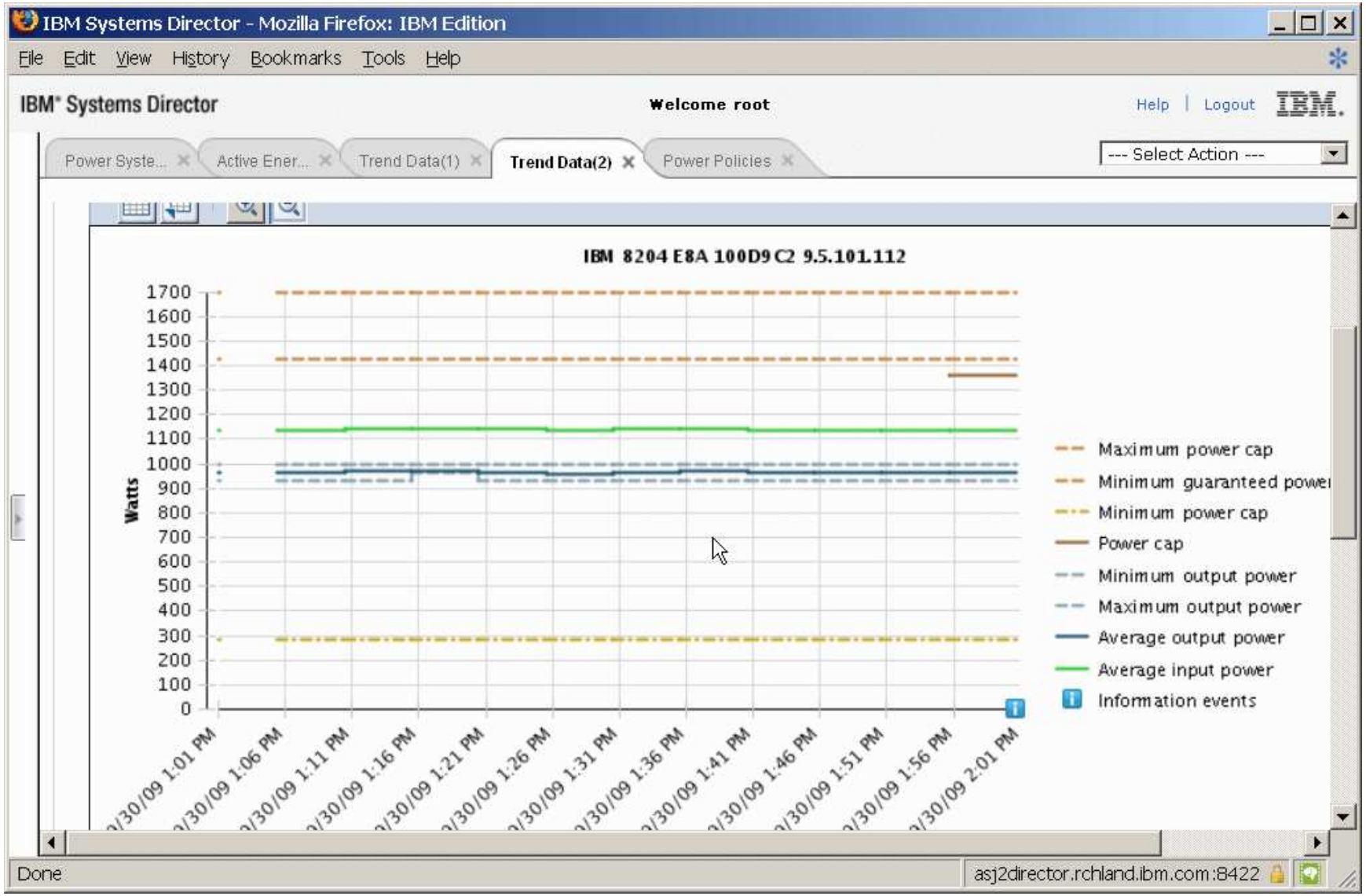
View Trend After First Policy – System 09DC2



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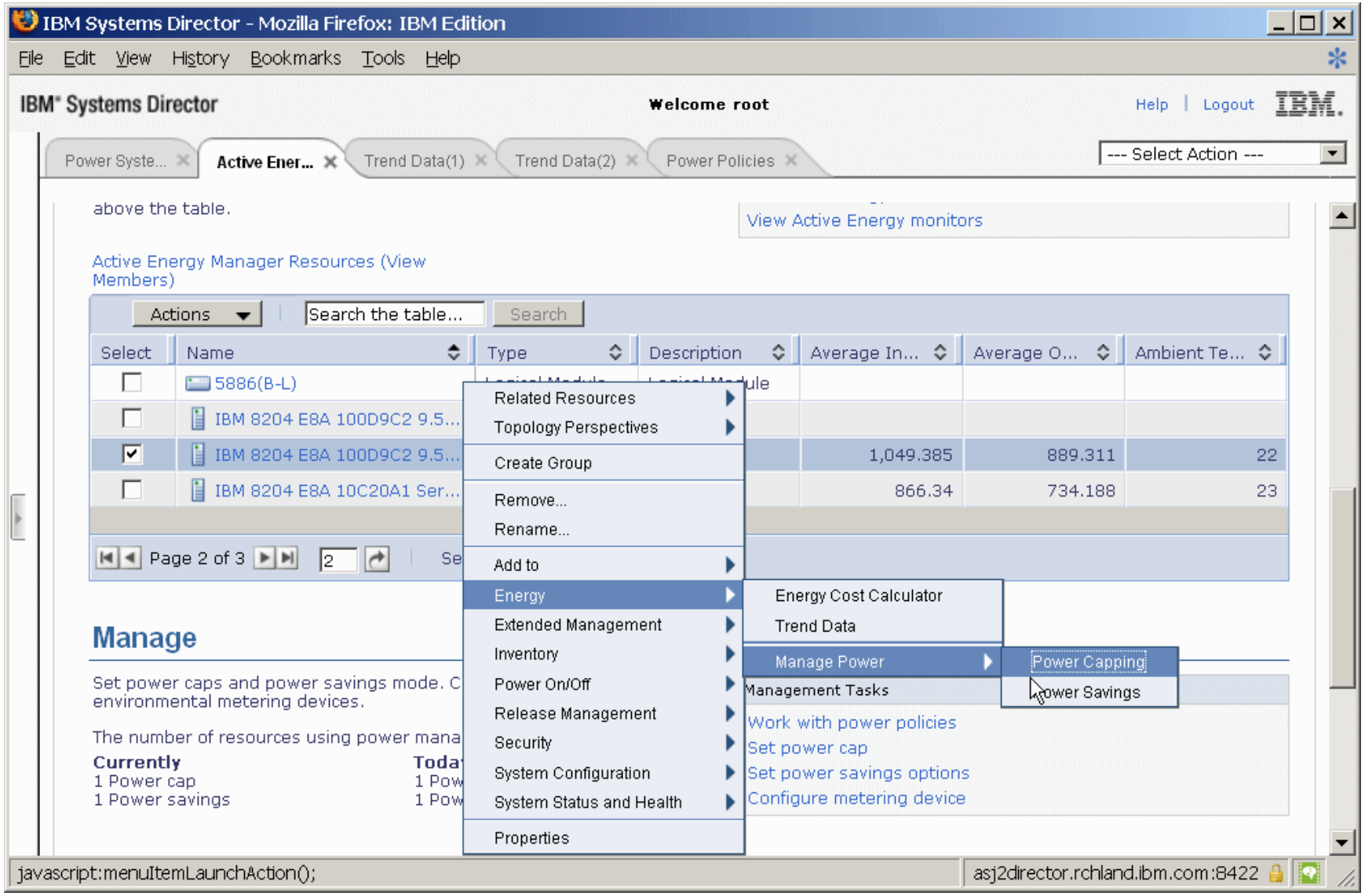
Manage Power Capping (1)



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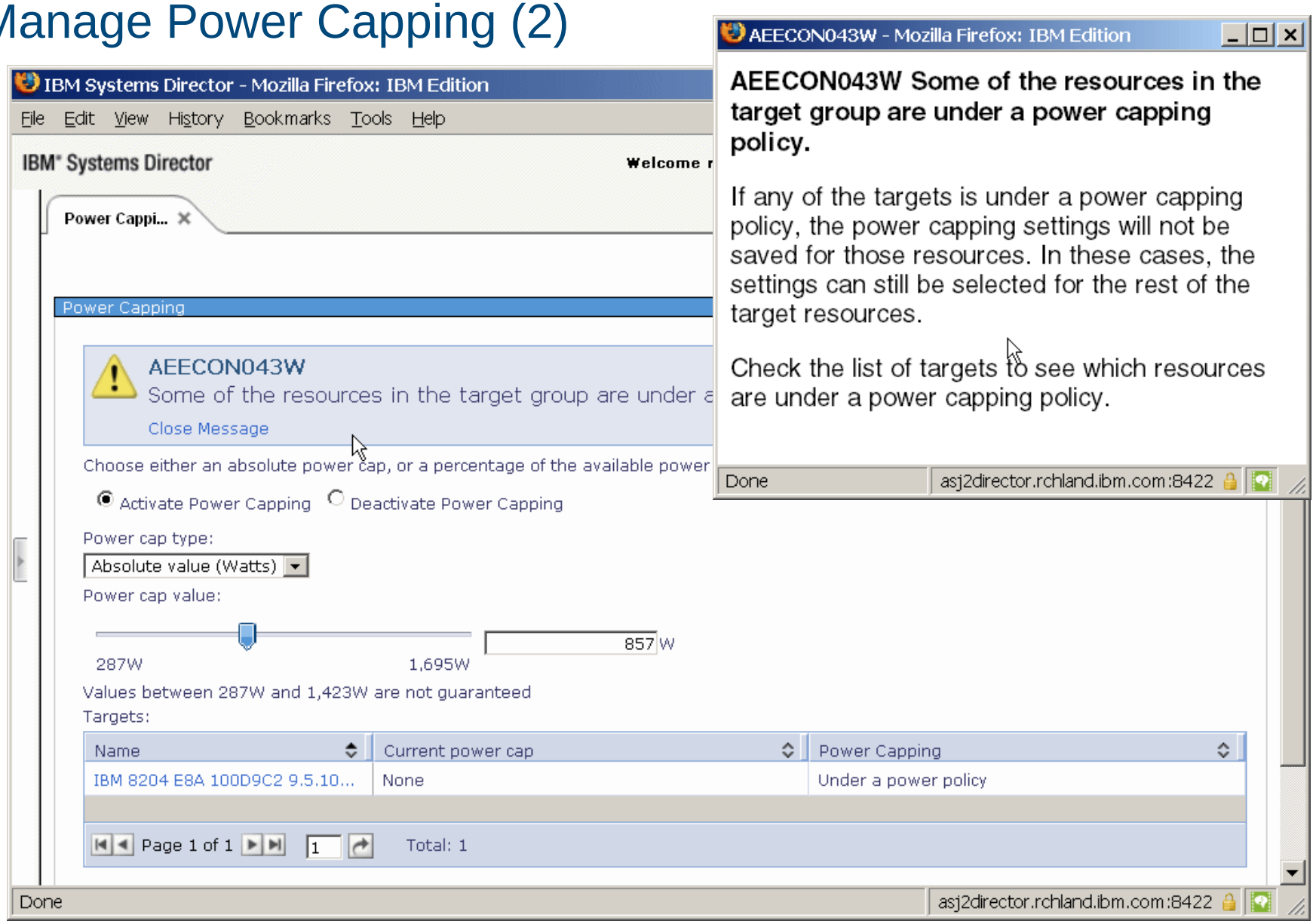
Manage Power Capping (2)



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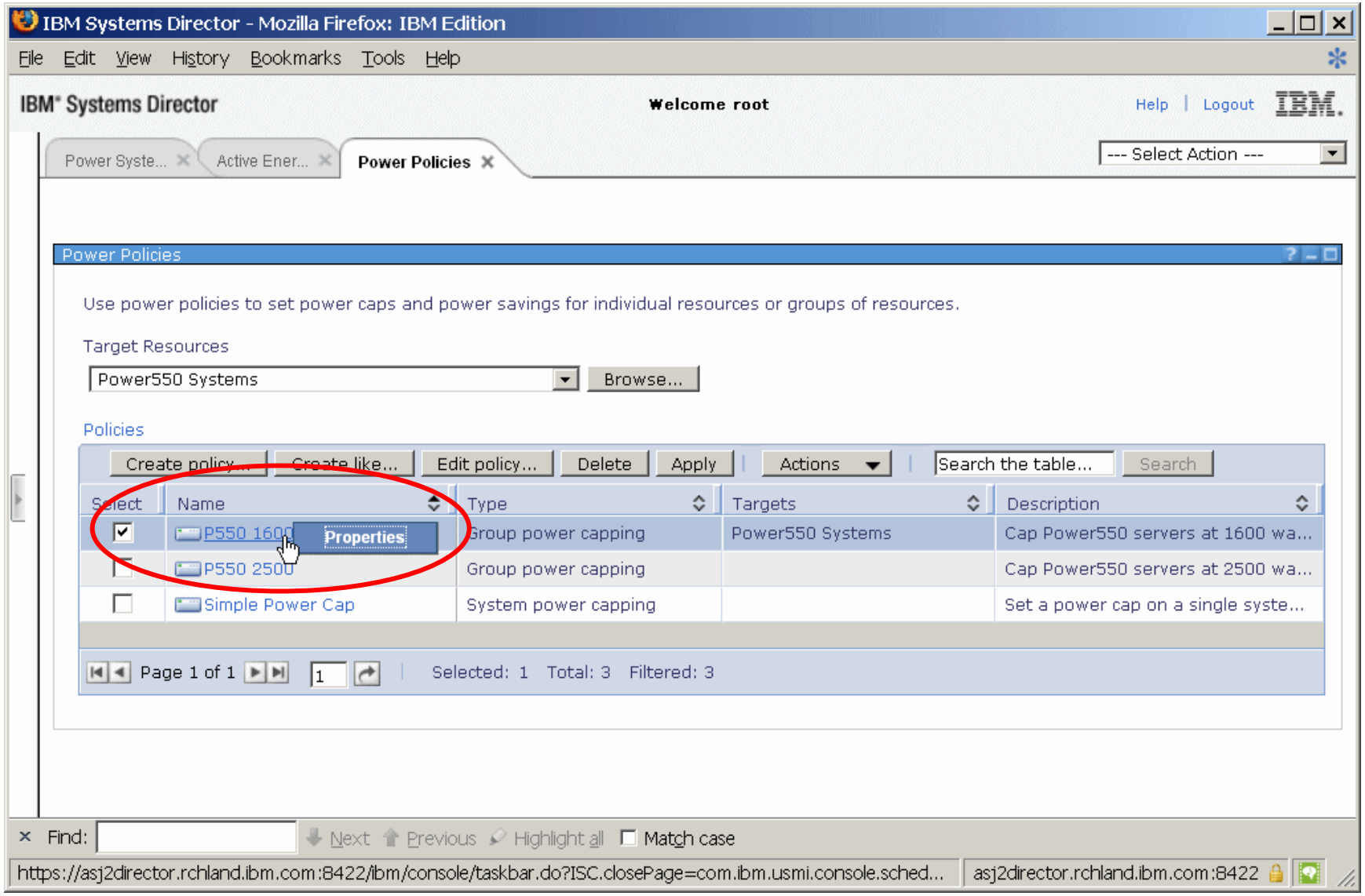
Removing a Power Policy (1)



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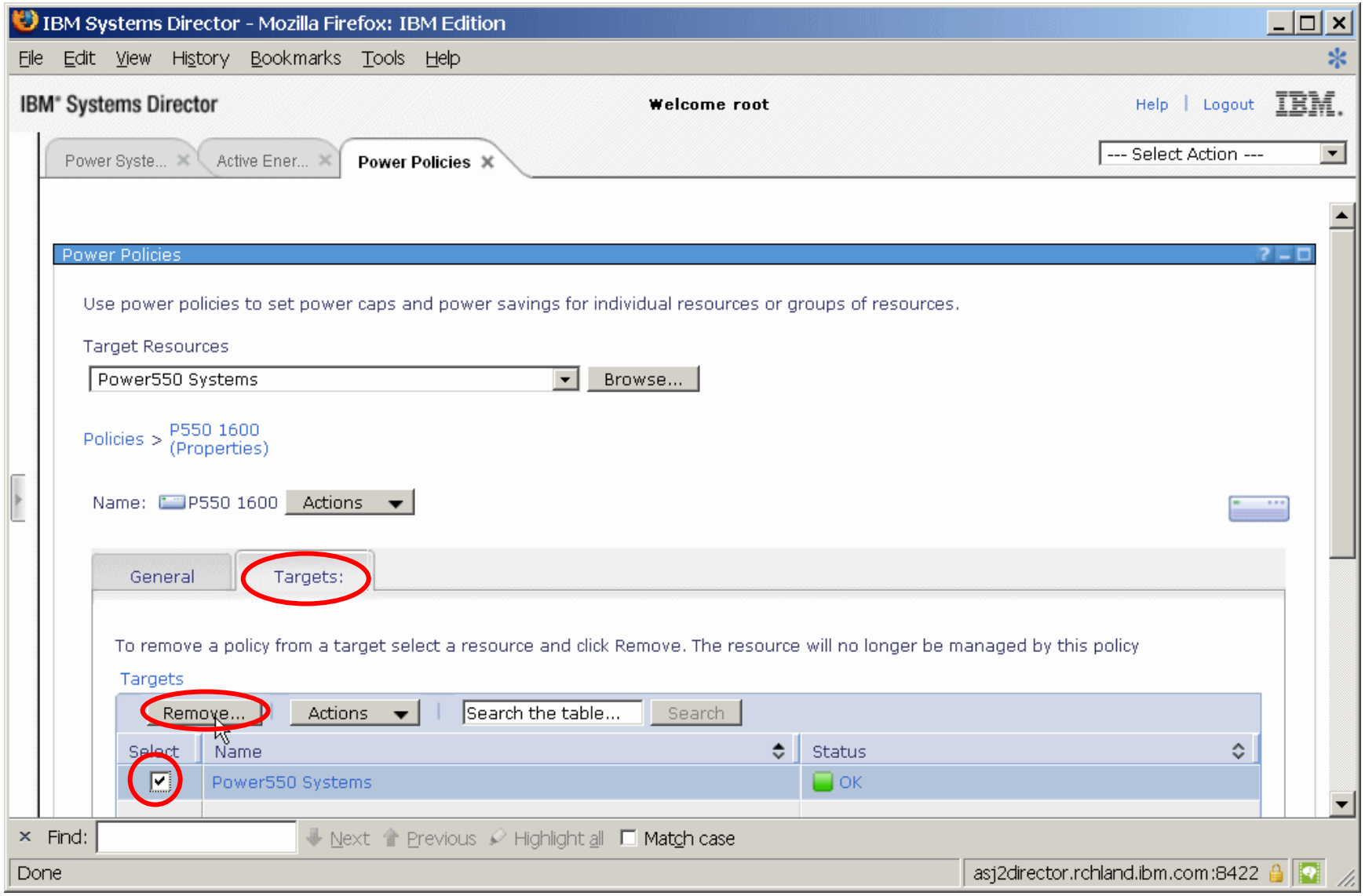
Removing a Power Policy (2)



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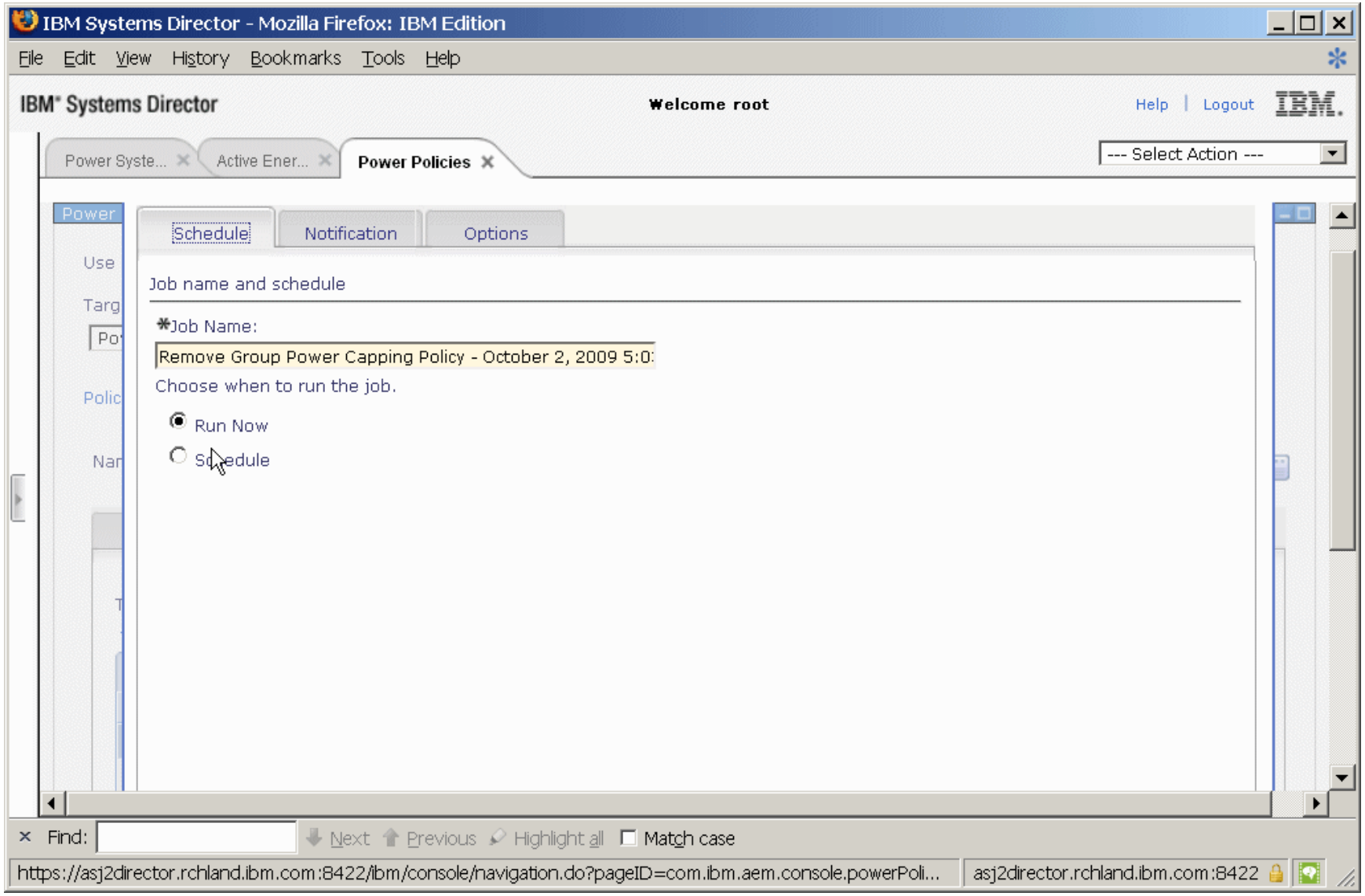
Removing a Power Policy (3)



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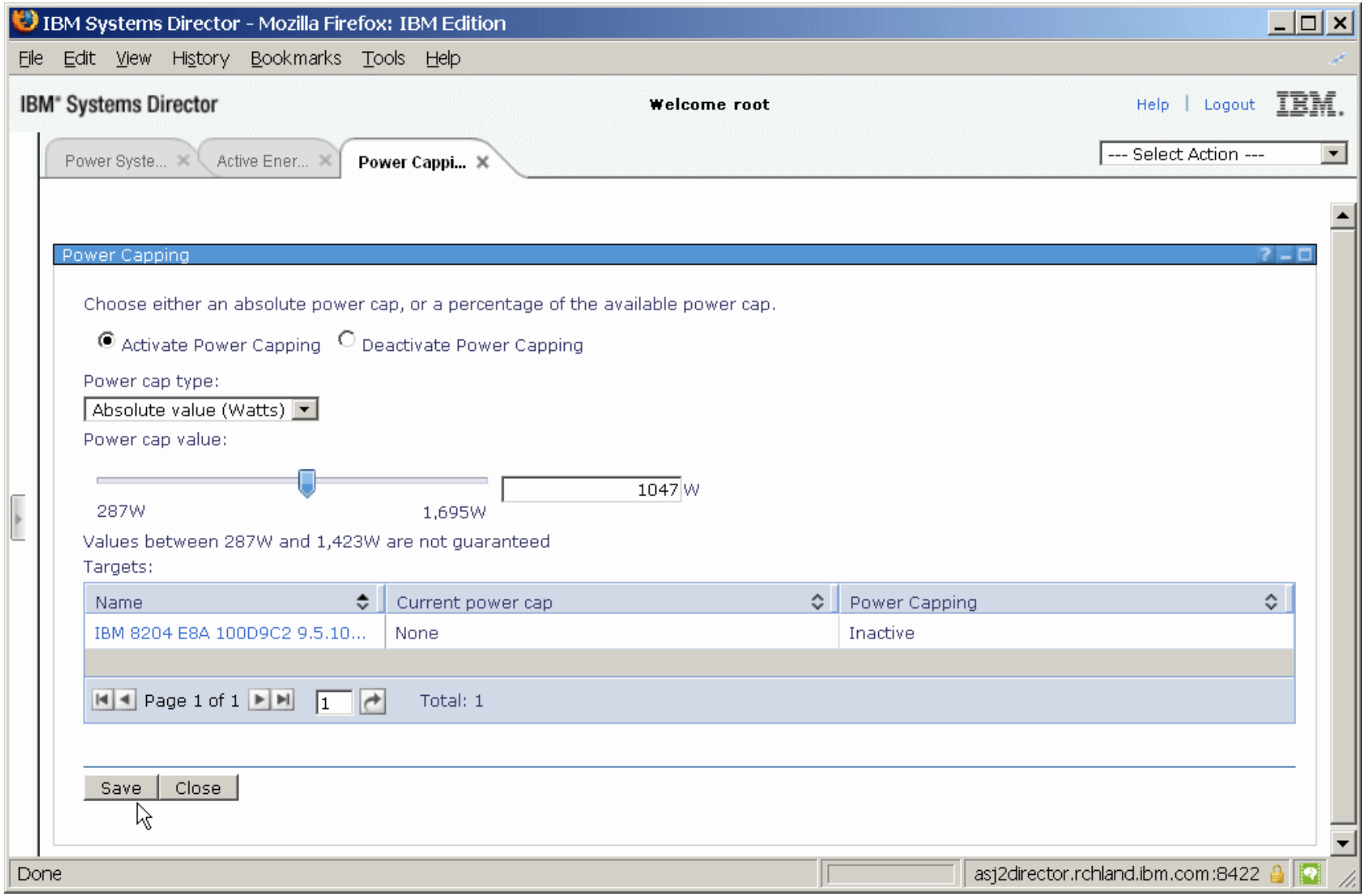
Changing a Power Cap



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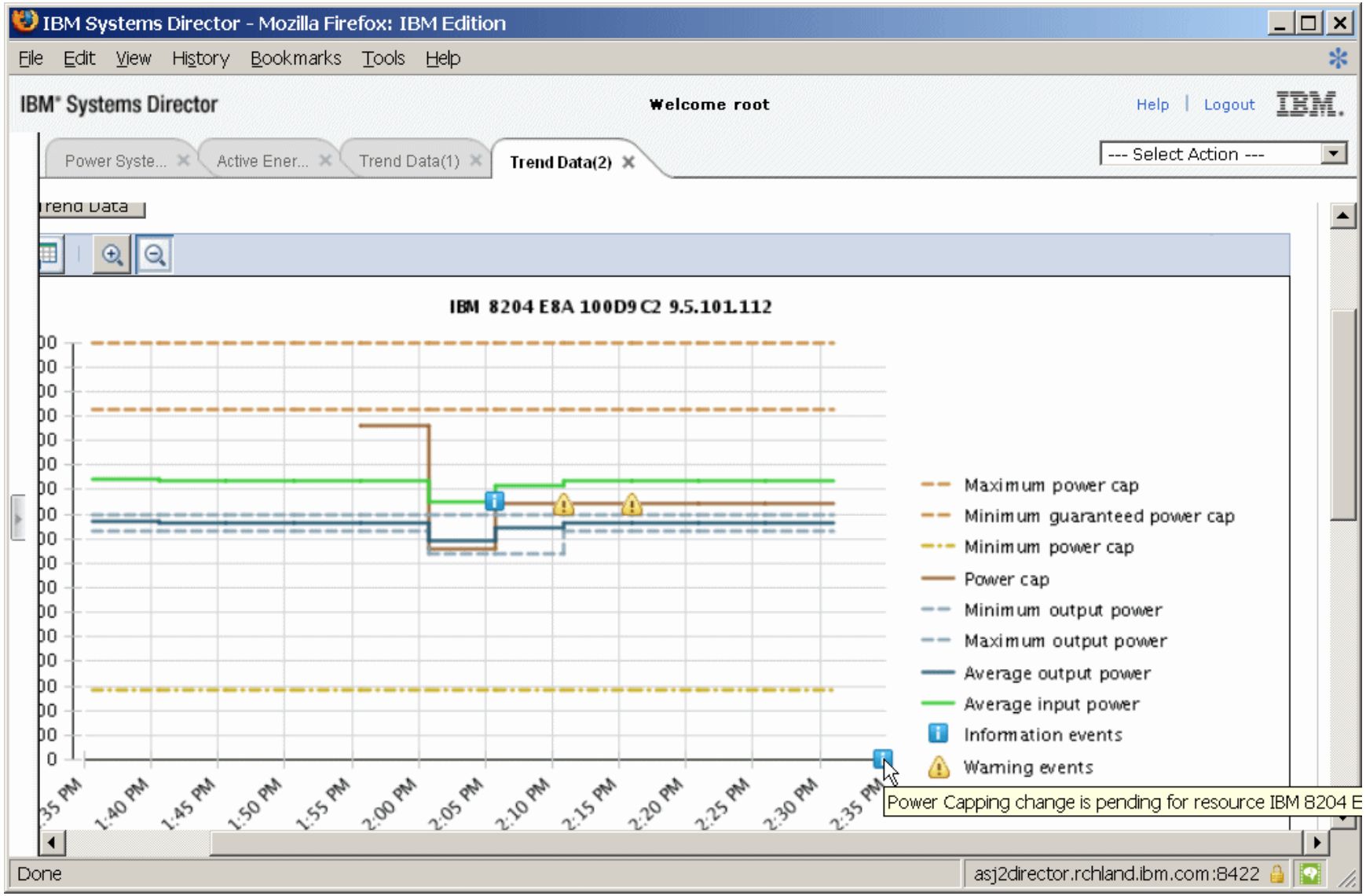
Trend After Most Changes – System 0D9C2



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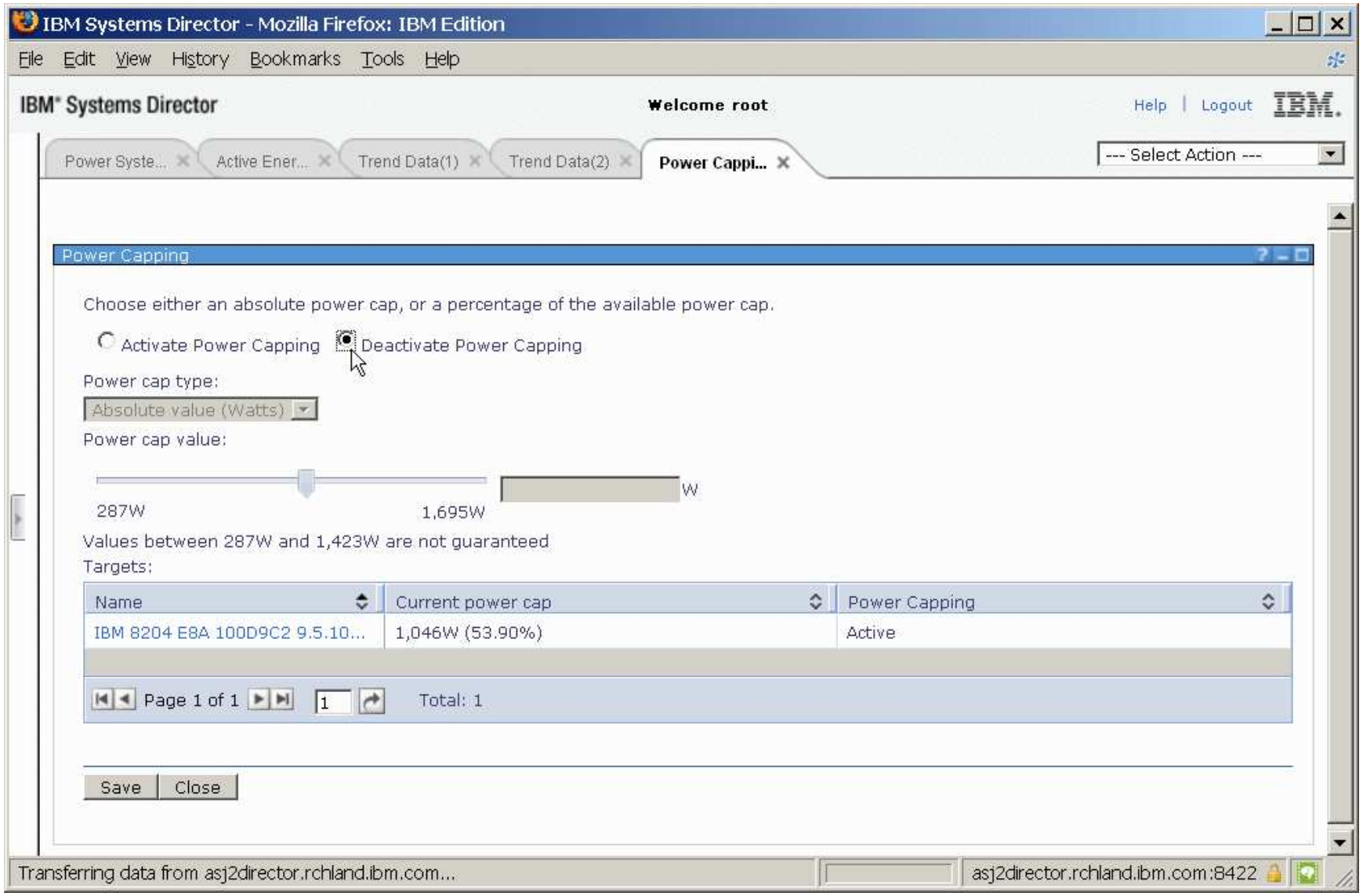
Deactivating Power Capping



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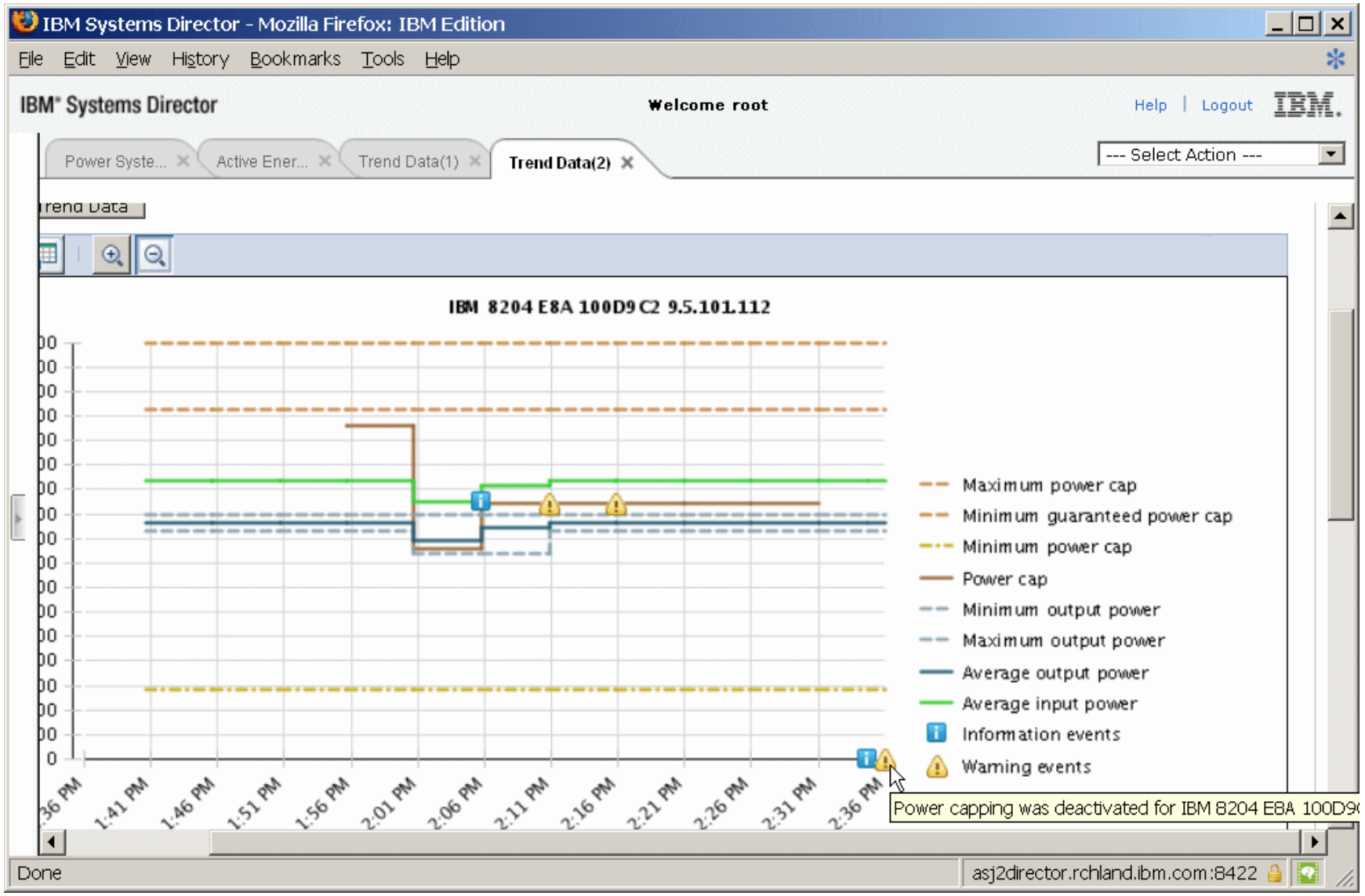
Trend After ALL Changes – System 0D9C2



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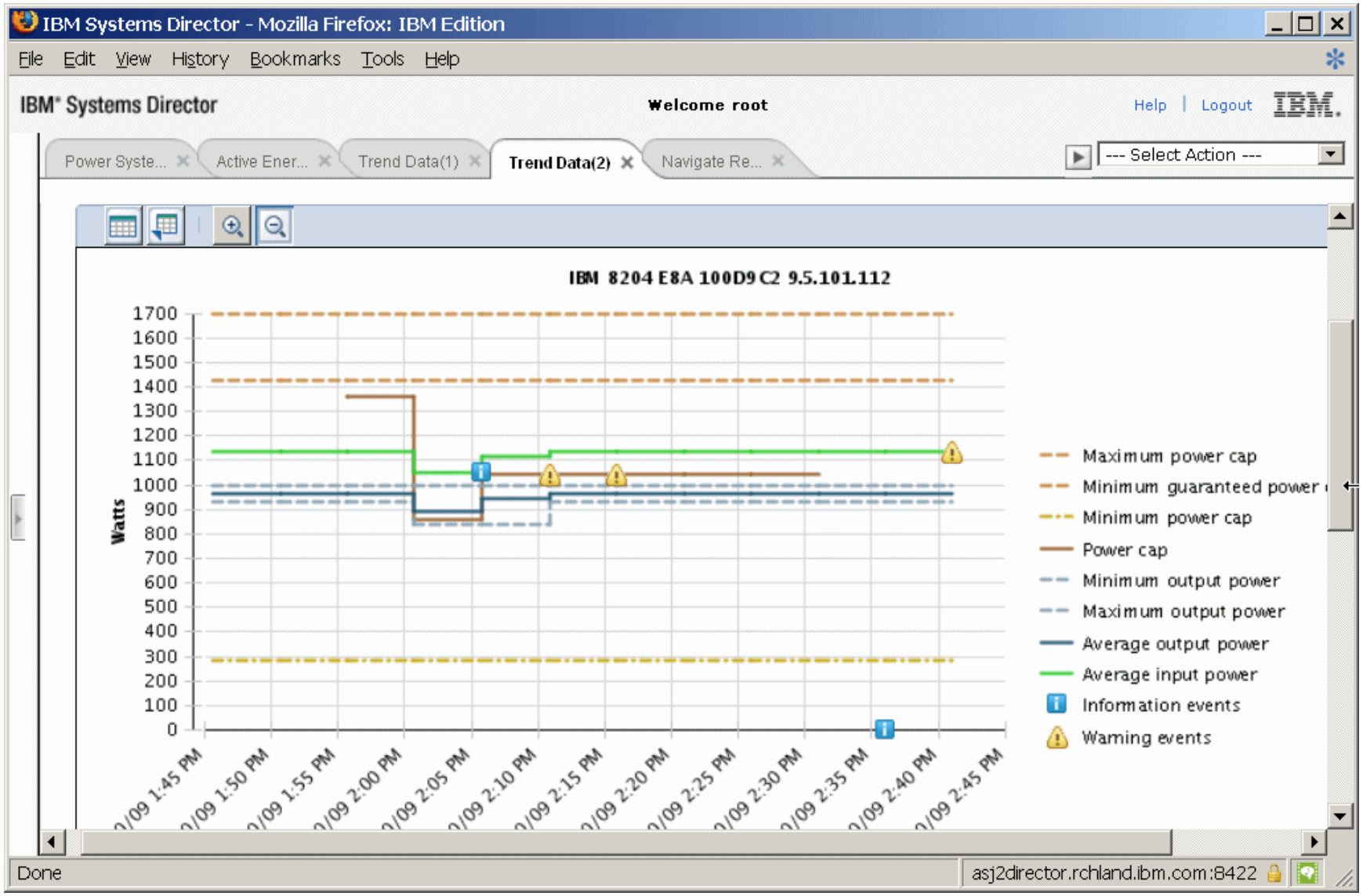
Trend Data – Custom Time Interval (1)



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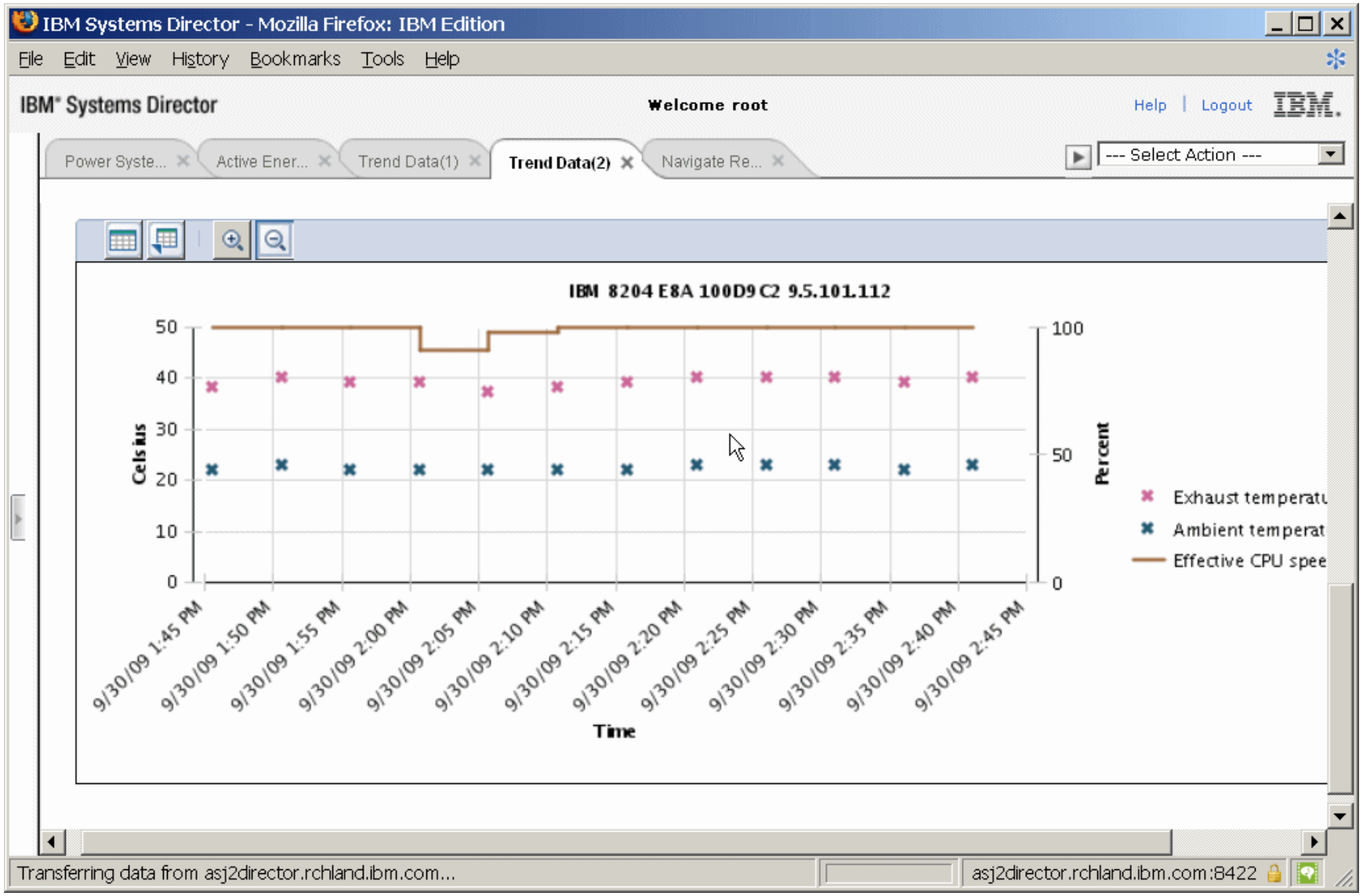
Trend Data – Custom Time Interval (2)



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Trend Data Export for System 0D9C2

Start Time	Stop Time	Average Input Power	Average Output Power	Minimum Output Power	Maximum Output Power	Power Cap	Minimum Power Cap	Minimum Guaranteed Power Cap	Maximum Power Cap	Event Text	Event Severity
1:45 PM	1:50 PM	1,137.56	964.037	932	996		287	1,423	1,695		
1:50 PM	1:55 PM	1,138.52	964.846	932	996		287	1,423	1,695		
1:55 PM	2:00 PM	1,136.04	962.746	932	996	1,358	287	1,423	1,695		
2:00 PM	2:05 PM	1,049.39	889.311	836	996	857	287	1,423	1,695		
2:00 PM	2:00 PM									Power capping was activated for IBM 8204 E8A 100D9C2 9.5.101.112	Information
2:05 PM	2:10 PM	1,113.23	943.415	836	996	1,046	287	1,423	1,695		
2:05 PM	2:05 PM									The power cap value for IBM 8204 E8A 100D9C2 9.5.101.112 changed from 1358 watts (4633 BTUs) to 857 watts (2924 BTUs)	Warning
2:10 PM	2:15 PM	1,134.15	961.144	932	996	1,046	287	1,423	1,695		
2:10 PM	2:10 PM									The power cap value for IBM 8204 E8A 100D9C2 9.5.101.112 changed from 857 watts (2924 BTUs) to 1046 watts (3568 BTUs)	Warning
2:15 PM	2:20 PM	1,134.19	961.179	932	996	1,046	287	1,423	1,695		
2:20 PM	2:25 PM	1,134.96	961.836	932	996	1,046	287	1,423	1,695		
2:25 PM	2:31 PM	1,137.02	963.58	932	996	1,046	287	1,423	1,695		
2:31 PM	2:36 PM	1,137.43	963.923	932	996		287	1,423	1,695		
2:34 PM	2:34 PM									Power Capping change is pending for resource IBM 8204 E8A 100D9C2 9.5.101.112	Information
2:36 PM	2:41 PM	1,135.77	962.521	932	996		287	1,423	1,695		
2:36 PM	2:36 PM									Power capping was deactivated for IBM 8204 E8A 100D9C2 9.5.101.112	Warning

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