

## Lab Testing Summary Report

February 2013

Report 130205

Product Category:

### Energy Efficient Switches

Vendor Tested:



Products Tested:

### HP 2920-48G Switch



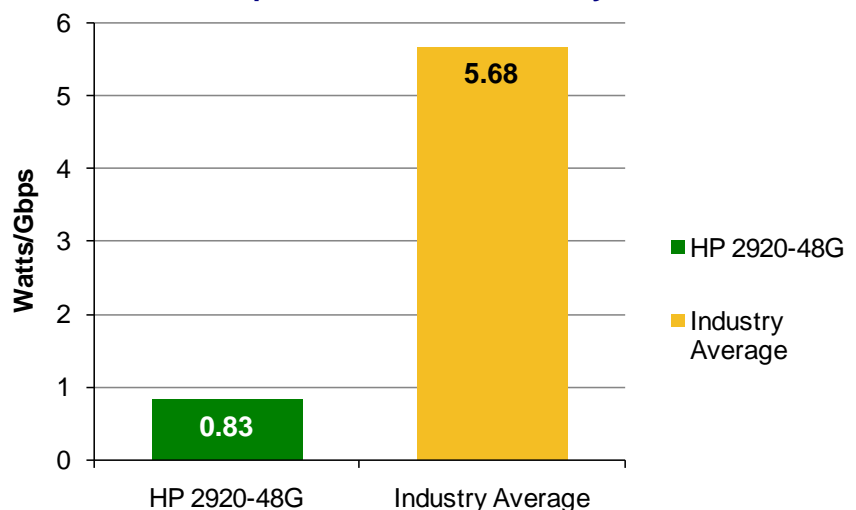
### Key findings and conclusions:

- HP 2920-48G switch can save an average of \$23 annually when compared to the Industry Average
- In product performance, the 2920-48G uses energy 85% more efficiently than similar switches
- Energy Efficient Ethernet feature allows the switch to consume 15.5 watts less, which results in a 24% power savings
- Switch operates at 32-131° F (0-55° C), requiring less cooling; variable speed fans allow switch to consume less energy

**H**ewlett-Packard 2920-48G switch was evaluated by Miercom under the Certified Green program for power consumption and energy efficiency. The 2920 access switch is offered in 24- and 48-port configurations with or without PoE+. The 2920-48G includes 44 auto-sensing 10/100/1000 ports and 4 dual-personality 10/100/1000 copper or fiber ports. Additionally, the switch has two upgradeable 10GbE module cards with two fiber ports (SFP+ or 10G BaseT). We analyzed the overall environmental impact and business-enabling green benefits that are offered by this HP 2920-48G switch.

In hands-on testing and data analysis, the HP switch proved to be an energy efficient, environmentally friendly and easily manageable Layer 2 and Basic Layer 3 Static IP and RIP Routing switch. The switch operates out-of-the-box with default settings. Additional configuration is provided through Command Line Interface (CLI) and Web browser GUI.

**Figure 1: HP 2920 Switch Power Efficiency**  
Watts/Gbps at 100% Load, 1518-byte Frame Size



Source: Miercom, February 2013

Power consumption of the HP 2920-48G switch utilizing Layer 2 traffic using 1518-byte frame size at maximum load as a function of throughput compared to the Industry Average (IA). Lower values indicate higher power efficiency.

## Power Consumption

Power measurements were taken of the HP 2920-48G switch using Layer 2 and 3 traffic with various frame sizes and loads. Power consumption of the product was measured while the switch was booting, idle with no link, idle with link and with 10%, 30%, 70% and 100% traffic load. Power consumption for this switch was recorded using 64-, 128-, 256-, 512-, 1024-, 1280-, 1518-, 9198- (the largest packet size for Layer 3 testing), 9216-byte frames (the largest packet size for Layer 3) and IMIX traffic in bursts with tests repeated to ensure accurate results. The switch was loaded at 10%, 30%, 70% and 100% to determine a typical operating power consumption and maximum power consumption. Power consumption is shown in a comparative chart in [Table 1](#) below and in [Figure 2](#) on [page 3](#).

The HP 2920-48G supports Energy Efficient Ethernet (EEE), which is a green feature that reduces power consumption during low link utilization. EEE reduces overall power when an EEE supported device is connected to the switch. All 48 copper ports on the switch support EEE and can decrease power to a specific port during times of little or no network usage.

We tested EEE by sending L2 traffic with a varying Inter-Burst Gap (IBG) between each burst of 1,000 frames. Theoretically, the shorter IBG consumes more power, while the longer IBG consumes less when EEE is enabled. The switch was tested with and without EEE. We saw a maximum power savings of 15.5 watts per port at the 100ms IBG, which resulted in a 24.1% power saving. See [Figure 4](#) on [page 4](#) for the power savings for each IBG tested.

## Product Performance

Product performance of the HP 2920-48G switch was compared to the Industry Average using Watts/Gbps at 100% load using a Layer 2 1518-byte frame size. The 2920-48G consumes 0.83 Watts/Gbps. [Figure 1](#) on [page 1](#) shows a comparison of power efficiency between the HP 2920 and the Industry Average.

Switch Model	Efficiency Improvement
2920-48G	85%

*Using 1518-byte frames with 100% Layer 2 load, the HP switch is 85% more efficient in Watts/Gbps comparison to the Industry Average.*

The HP 2920-48G, when compared to the Industry Average, shows a 85% improvement in power efficiency. The HP switch uses less power to maintain throughput when in use. See [Figure 1](#) on [page 1](#) for the efficiency advantage of the 2920 switch.

## Product Efficiency

During testing we measured the efficiency of the switch during boot, idle (no link), idle (with link), with 10%, 30%, 70% and 100% loads. Testing the switches at various loads provides the data needed to calculate the annual running cost. See the Business Case on [page 4](#) for additional annual cost breakdown. Note that the initial boot power reading is to learn how many watts are used during the boot process and is not used to calculate annual cost.

When comparing 10% to 100% traffic load, there was an average of a 7.16 watts increase for all frame sizes tested.

Being able to operate between 32° and 131° F (0° and 55° C) allows the switch to run with little or no

**Table 1: Layer 2 Power Consumption of the HP 2920 Switch**

Power Consumption in Watts of the 2920-48G Switch at Frame Size:					
	256-byte	512-byte	1518-byte	9216-byte	IMIX
<b>Initial Boot</b>	38.9				
<b>Idle (No Link)</b>	43.6				
<b>Idle (with Link)</b>	65.0				
<b>10% Load</b>	65.6	65.8	65.8	65.8	65.7
<b>30% Load</b>	67.4	67.2	67.0	67.1	67.2
<b>70% load</b>	71.0	70.0	69.5	69.7	70.3
<b>100% load</b>	72.4	71.9	71.8	71.9	72.4

*Power consumption measurements with Layer 2 traffic using various frame sizes.*

Source: Miercom, February 2013

fan usage. The 2920-48G supports variable speed fans. These fans are useful when the switches are idle or not operating at full load. This allows the switch to scale down fan operation, reducing noise and overall power consumption.

The HP switch is fully manageable either through a secure Web browser interface, the CLI via serial console, Telnet or SSH, or any network management solution.

## Adaptive-Power Architecture

The Adaptive-Power Architecture from HP Networking was inspired by the realization that, for the majority of time networking equipment operates, it does not experience maximum processing load or throughput. The 2920 switch is based on this architecture.

With HP Networking Adaptive-Power Architecture, power consumption scales automatically with ports active, traffic intensity, type of traffic, Layer 2 and Layer 3 active table depths, classification complexity, and application environment. The architecture is based on:

- Efficient memory architecture
- Optimized silicon processes
- Smart gating architecture
- Adaptive-Power Silicon Port Power Control

## Business Processes

HP networking products are shipped using processes that utilize recyclable packaging

materials, as well as the reduction of documentation shipped with the switch. To protect employees and customers, all HP networking products are in compliance with Restriction of Hazardous Substances (RoHS) directives which restrict the use of certain hazardous substances in electrical and electronic equipment. HP is also affiliated with the Waste Electrical and Electronic Equipment Directive (WEEE) that placed collection, recycling and recovery goals for all types of electrical goods.

HP networking products have factory trade programs for compliance with Hewlett-Packard Supply Chain Social and Environmental Responsibility Policy. Along with offering trades, HP has programs to allow for switch returns for cash, as well as recycle or donate options for disposing of old equipment, while minimizing impact on the environment.

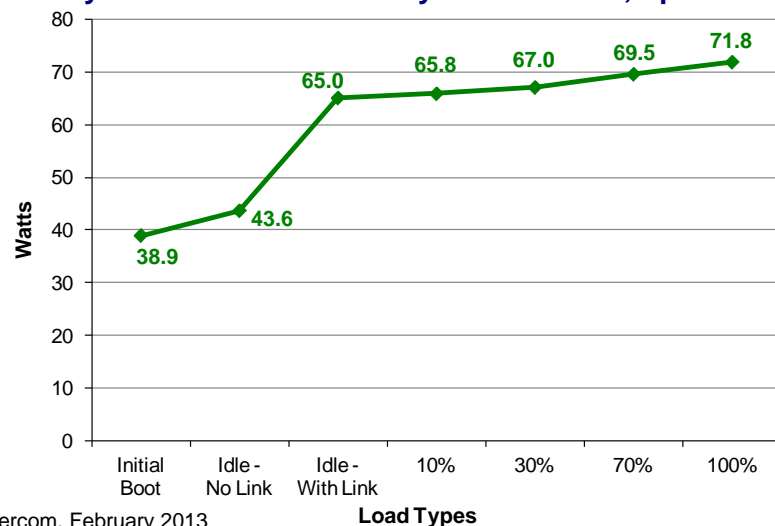
## Green Innovation

HP is focused on holistic innovation around energy savings that includes products, solutions and services. Specifically for the HP 2920 switch, the device is able to run at higher temperature values, and variable speed fans provide power efficient cooling with minimal noise. In addition, it supports EEE 802.3az for power savings during low link utilization.

The HP 2920-48G is capable of operating at higher temperatures, allowing fans to run at slower speeds, reducing the overall energy consumption of the switch.

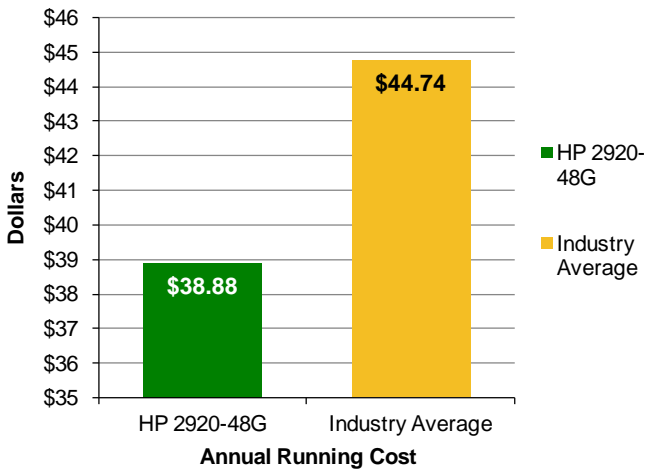
*Watts used by the HP 2920-48G switch under different loads utilizing Layer 2 traffic.*

**Figure 2: HP 2920 Switch Power Consumption**  
Layer 2 Traffic with 1518-byte Frame Size, Specified Load



Source: Miercom, February 2013

**Figure 3: HP 2920 Switch Power Efficiency  
100% Load, 1518-byte Frame Size**



Source: Miercom, February 2013

Annual costs for the HP 2920-48G switch compared to the Industry Average. Cost is based on 9.83 cents per kWh. See Business Case on page 5 for more details.

### Business Case

The annual running cost is calculated based on the projected use of the switch in a business environment. The assumption is the switch will be in operation 12 hours daily during the work week. Of those 60 hours, 10 hours out of the week will be operating at 100% and the remaining 50 hours will be at 70%. For the other 108 hours, (48 hours weekend and 12 hours weekday) the switch will

be considered idle. We are using a rate of 9.8 cents per kWh, currently considered as a national average. Your calculation may vary depending upon the rate in your area.

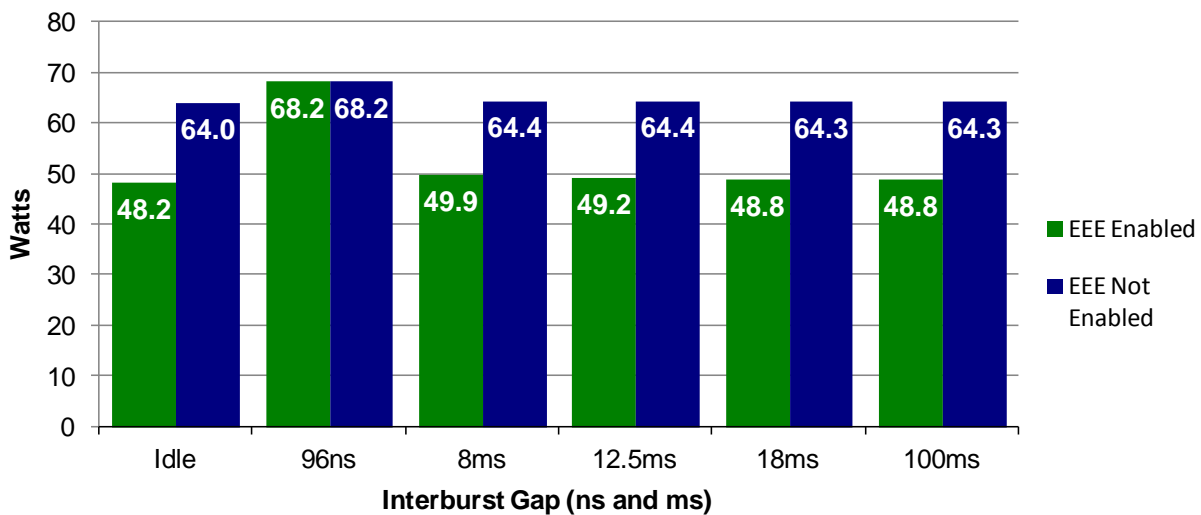
As shown in *Figure 3*, the HP 2920 switch has lower running costs. The dollar amount savings is approximately \$6 yearly. On average the HP 2920-48G switch can save 13%.

### Certified Green

Miercom conducts environmental analysis on products using a holistic view, considering power efficiency, manufacturing, and other factors which are part of the product and its lifecycle. Power consumption and power efficiency are important metrics when comparing products. Typically, other reports only address these metrics in their documents. Miercom, however, believes in a more comprehensive approach, which reveals the true business case savings including discussion of other environmental benefits that the product may afford.

Competitive indexing with industry average is achieved by comparing measured results from products in a similar class. This comparison allows a single view of the annual cost for power consumption of a product, and comparison information that will help the user understand if the evaluated product affords an overall advantage for power efficiency.

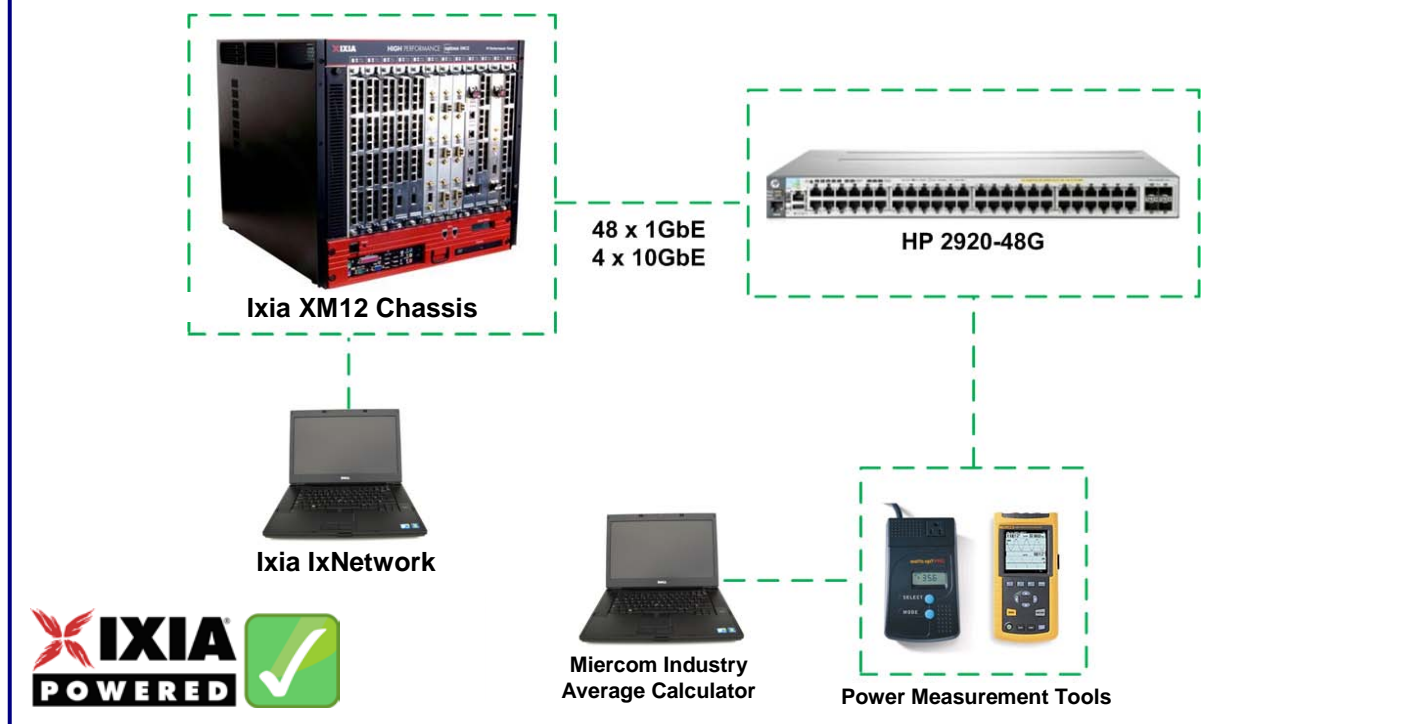
**Figure 4: HP 2920-48G Switch – Energy Efficient Ethernet (EEE)  
Using 64-byte Frame Size**



Source: Miercom, February 2013

In nearly all IBG intervals, power was saved when the EEE feature was enabled. During low network link utilization, we saw a maximum savings 15.5 watts when EEE was enabled.

## Test Bed Diagram



## How We Did It

HP 2920-48G switch was evaluated for total environmental impact by testing the product's individual components, as well as evaluating the other features and capabilities. Testing was performed at Miercom lab and focused on power consumption and efficiency of the product. A full audit was additionally conducted to analyze the overall product-specific environmental impact.

Lab testing was conducted for power consumption under load. Measurements and audit results were verified with site survey assessments. HP 2920-48G was configured and was tested using 48 x 1GbE and 4 x 10GbE ports. We measured power consumption changes by transmitting various traffic loads while the switch had power saving features enabled and disabled. Specifically, we measured the power consumption at idle with no traffic, no links, partial load and full load under all standard frame sizes between 64-bytes to 9216-bytes. Power consumption of the HP switch was measured with varying network and link loads that a switch would typically experience in a real-world deployment. The SUT was loaded with traffic at various rates and packet sizes in accordance with RFC 2544 Benchmarking Methodology for Network Interconnect Development.

Power consumption was measured while running Layer 2 traffic from the Ixia XM12 traffic generator. Miercom recognizes Ixia ([www.ixia.com](http://www.ixia.com)) as an industry leader in energy efficiency testing of networking equipment. Ixia's unique approach utilizes coordination of energy measurements with network traffic load – allowing energy consumption to be graphed against network traffic volume. Real-world traffic is generated by Ixia's test platform and test applications, principally IxNetwork for Layer 2 and 3 switching and routing traffic.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Current or prospective customers interested in repeating these results may contact [reviews@miercom.com](mailto:reviews@miercom.com) for details on the configurations applied to the Device Under Test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a product selection.

## Miercom Certified Green

The HP 2920-48G switch was evaluated by Miercom according to the Certified Green Program. Based on the observations and audit analysis, this switch has been proven to be energy efficient and is an environmentally sound network product.

HP 2920-48G provides operations at higher temperatures, has Energy Efficient Ethernet to reduce power consumption during low link utilization, and has variable fan speeds to conserve energy.



**HP 2920-48G Switch**



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## About Miercom's Product Testing Services

Miercom has hundreds of product-comparison analyses published over the years in leading network trade periodicals including Network World, Business Communications Review, Tech Web - NoJitter, Communications News, xchange, Internet Telephony and other leading publications. Miercom's reputation as the leading, independent product test center is unquestioned.

Miercom's private test services include competitive product analyses, as well as individual product evaluations. Miercom features comprehensive certification and test programs including: [Certified Interoperable](#), [Certified Reliable](#), [Certified Secure](#) and [Certified Green](#). Products may also be evaluated under the [NetWORKS As Advertised](#) program, the industry's most thorough and trusted assessment for product usability and performance.



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