

# Multifunction Hardcopy Device Green Issues

## Are your printers awake tonight?

Around the world, governments and corporations are concerned about “**carbon footprint**” issues. Government agencies and standards bodies have published numerous power management guidelines and standards for office equipment and other consumer electronic devices (e.g., US Energy Star). Most recently, IETF Energy Management Project was chartered in October 2010 to develop a solution *for all network-attached devices* that will include a new power management framework and several new SNMP MIBs. Increasingly, enterprises are instituting power management policies on their networks, both out of environmental concern and for cost savings. These policies must also apply to Printers and Multifunction hardcopy devices which, as they continue to evolve into more complex networked document management systems, have their own unique power state versus utilization preparedness characteristics.

Printers and multifunction hardcopy devices share many components in common with desktop computers, routers, and other office equipment (e.g., **Processors, Hard Disks, Network Interfaces, and Consoles**). But they also often include unique components (e.g., **Motors, High-Intensity Lights, Heaters, Automatic Document Feeders, and Finishers**).

Power management features offered by manufacturers and power usage ratings by independent labs now have a major influence on customer decisions to purchase new printers and multifunction hardcopy devices and to select existing devices for retirement and replacement.

Although current multifunction hardcopy devices support proprietary power management solutions, the lack of a standard set of solutions, consistently implemented, precludes fleet management tool support of vendor-neutral power management policies. The PWG has developed a Power Management Model for Hardcopy Devices that is intended to support standard, effective power management while optimizing accessibility.

Please respond to the power management survey associated with this article so that the PWG can present and substantiate the power management needs of managed print service providers, tool suppliers, and end users to manufacturers of multifunction hardcopy devices and network printers.

## PWG Power Management Model

The PWG has developed a Hardcopy Device Power Model <ftp://ftp.pwg.org/pub/pwg/wims/wd/lcrc-wimspower10-20101115.pdf> that is now coming up for approval by the PWG membership.

## Use Cases for Power Management

The PWG Power Management Project took the following use cases as representative of the types of situations that need be addressed :

- **Local Printer Use Case** – Graphic artists share a printer down the hall, but they often forget to put their printer into Hibernate on Friday nights They need power control capabilities based on time of day, day of the week and date (Calendar based.)
- **Remote Printer Use Case** – Engineers send their large documents to printers across the street in a data center. The operators there have to consider current power states when scheduling jobs (assigning, holding, releasing, etc.) and need to receive power state change notifications.
- **Fleet Management Use Case** – Network administrators use centralized management of power states on dozens of printers and multifunction hardcopy devices for many departments in a high-rise office building. Power consumption savings are a top priority with senior management so there must be some way of tracking power usage.
- **Tech Support Use Case** – Tech support staff at a large corporation handle trouble tickets for network peripherals (storage devices, printers, file servers, etc.) and would like to receive power state change notifications and collect power usage data, in order to detect device, network and usage anomalies (using custom-built and commercial tools).
- **Automatic Policy Use Case** – System administrators at a large corporation want to move beyond centralized power management of network printers to use new built-in features for automatic power state policy creation based on job/time history in the devices themselves.

## Terminology

The PWG Power Management Model (<ftp://ftp.pwg.org/pub/pwg/wims/wd/lcrc-wimspower10-20101115.pdf>) uses terminology consistent with the most prevalent public standards:

- **Physical structure** from IETF Printer MIB: **Component** (System or Subunit), **Subunit** (Console, Marker, etc.), and **System** (whole device).
- **Power modes** from IEEE 1621: **On Mode**, **Sleep Mode**, **Off Mode**.
- **Stable power states** from DMTF CIM: **On**, **Standby**, **Suspend**, **Hibernate**, **OffSoft**, **OffHard**.
- **Special power states** (orderly shutdowns and power resets) from DMTF CIM, including: **OffSoftGraceful**, **OffHardGraceful**, **ResetHard**, **ResetMBR**.
- **Operational states** of components from PWG Semantic Model: **Down**, **Idle**, **Processing**, **Stopped**, **Testing**.

The PWG Power Management Model also supports:

- **Vendor extensions** (e.g., **StandbyVendor1**) to standard *stable* power states, for high-fidelity mapping to existing vendor differentiation in power management features – but vendor extensions to *special* power states are prohibited, for interoperability.

## Power Management Property Classes

The PWG Power Management Model defines three classes of abstract properties:

- **Power Status** – current power state, power state log, state change counters, and power meters. These are read-only objects that allow applications to read the current power state, get a history of power state transitions, and determine power consumption.
- **Power Capabilities** – capabilities for each power state and transition times between states. These are read-only objects identifying the power characteristics of the device and the power operations/policies that are supported.
- **Power Settings** – power state change requests and power policies (timeout-, calendar-, and event-based power state changes). These are writable objects that allow forcing the device to a selected power state and setting up power policies causing power state change based on timeouts from operational state (e.g., switching to a lower power state when the device has been idle for a specified period), calendar (power state change based on time-of-day, day of week, date) and event (e.g., power state change on out of paper or other error or fault condition)

## Power Management Access Protocols

The abstract Model approach allows a device to support a consistent set of status, capabilities and setting objects independent of the protocol a management application may use to access these objects (protocol mappings.) The PWG Power Management Model already has two standard protocol mappings:

- **SNMP – PWG Imaging System Power MIB**  
A complete mapping of every property defined in the PWG Power Management Model into an SNMP MIB developed by the PWG Web-based Imaging Management Solutions WG.
- **Web Services – PWG Semantic Model XML Schema**  
A complete mapping of every property defined in the PWG Power Management Model into a set of XML Schema files and WSDL operation definitions – developed by the PWG Multifunction Device WG.

## More Information

[ACPI] Advanced Configuration and Power Interface Specification v4.0, June 2009.

<http://www.acpi.info/DOWNLOADS/ACPIspec40.pdf>

[DSP0004] DMTF Common Information Model (CIM) Infrastructure, DSP0004, May 2009.

[http://www.dmtf.org/standards/published\\_documents/DSP0004\\_2.5.0.pdf](http://www.dmtf.org/standards/published_documents/DSP0004_2.5.0.pdf)

[DSP1027] DMTF Power State Management Profile, DSP1027, September 2008.

[http://www.dmtf.org/standards/published\\_documents/DSP1027\\_1.0.1.pdf](http://www.dmtf.org/standards/published_documents/DSP1027_1.0.1.pdf)

[ESCOMPUTER] US EPA ENERGY STAR Program Requirements for Computers v5.0.

[http://www.energystar.gov/ia/partners/prod\\_development/revisions/downloads/computer/Version5.0\\_Computer\\_Spec.pdf](http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/computer/Version5.0_Computer_Spec.pdf)

[ESPRINTER] US EPA ENERGY STAR Program Requirements for Imaging Equipment v1.1.

[http://www.energystar.gov/ia/partners/product\\_specs/program\\_reqs/Imaging%20Equipment%20Specifications.pdf](http://www.energystar.gov/ia/partners/product_specs/program_reqs/Imaging%20Equipment%20Specifications.pdf)

[IEEE1621] Standard for User Interface Elements in Power Control of Electronic Devices Employed in Office/Consumer Environments, IEEE 1621, December 2004.

<http://standards.ieee.org/findstds/standard/1621-2004.html>

[IETF-EMAN-CHARTER] Charter of IETF Energy Management WG, October 2010.

<http://datatracker.ietf.org/wg/eman/charter/>

[PWG-POWER-MIB] PWG Imaging System Power MIB

<ftp://ftp.pwg.org/pub/pwg/wims/wd/lcrc-wimspowermib10-20101115.mib> (ASN.1 source)

<ftp://ftp.pwg.org/pub/pwg/wims/wd/lcrc-wimspowermib10-20101115.pdf> (MS Word document)

[PWG-POWER-MODEL] PWG Power Management Model for Imaging Systems

<ftp://ftp.pwg.org/pub/pwg/wims/wd/lcrc-wimspower10-20101115.pdf>

[PWG-MFD-WG] PWG Multifunction Device (MFD) Working Group Home Page

<http://www.pwg.org/mfd/index.html>

[PWG-SEMANTIC-MODEL] PWG Semantic Model XML Schema

<ftp://ftp.pwg.org/pub/pwg/mfd/schemas/PWG-SM2-Latest1.zip>

[PWG-WIMS-WG] PWG Web-based Imaging Management Solutions (WIMS) Working Group Home Page

<http://www.pwg.org/wims/index.html>

[RFC3805] IETF Printer MIB v2, RFC 3805, June 2004.

<http://www.ietf.org/rfc/rfc3805.txt>

# Survey Questions

1. On a scale of 1 to 5, where 1 corresponds to “no importance” and 10 corresponds to “critical consideration”, do your clients consider power usage important when making purchasing decisions for printers and multifunction hardcopy devices or services?
2. In the consideration of printers and multifunction hardcopy devices power usage, what factors are included?
  - a. published power consumption
  - b. ability to program power states
  - c. the “idle” or “hibernate” power consumption
3. Do you or your clients currently use fleet management tools that include power management for printers and multifunction hardcopy devices?
4. Do your clients want or do you need for your own purposes the capability of power state monitoring and logging for printers and multifunction hardcopy devices?
5. Do your clients want or do you need for your own purposes power usage meters for printers and multifunction hardcopy devices?
6. Do your clients want or do you need for your own purposes power state change notifications from printers and multifunction hardcopy devices?
7. Do your clients want or do you need for your own purposes to know detailed power state capabilities for printers and multifunction hardcopy devices?
8. Do your clients want or do you need for your own purposes to use remote power state change operations for printers and multifunction hardcopy devices?
9. Do your clients want or do you need for your own purposes to configure power state change policies for printers and multifunction hardcopy devices?
  - a. Calendar-based (e.g., Friday at 5pm --> Hibernate)?
  - b. Event-based (e.g., paper jam --> Suspend)?
  - c. Timeout-based (e.g., 300 seconds idle --> Standby)?
10. Are you or your clients aware of the ongoing PWG Power Management project?
11. Are you or your clients aware of the new IETF Energy Management project?
12. Are you or your clients aware of the DMTF CIM and ACPI power management standards?
13. Do your clients or does your company require that new hardcopy equipment be compliant with some power efficiency standard? If so, which one?