

# Computer Power Management Standards At-A-Glance

What are the Desktop Power Management Standards?

- The standards provide minimum requirements for optimizing power consumption among the Commonwealth of Massachusetts' PCs and workstations.

Why should an agency make their desktop workstations energy efficient?

- Will result in \$2M reduction in energy costs and minimize the associated environmental impacts.
- Executive Order No. 484 challenges agencies to reduce energy consumption in state facilities.

How should an agency make their desktop workstations energy efficient?

- Use Statewide Contracts that require vendors to provide equipment that meets specific environmental criteria.
- Configure workstations to take advantage of available power management options when provisioned for employees.
- Shut down workstations during extended period of non use.
- Use Statewide Contracts to ensure that electronic equipment is recycled and disposed of in an environmentally responsible manner

**The Desktop Power Management Standards are organized into four sections, along with an area on Compliance:**

| Section  | Summary  |
|--|--|
| 1: Workstation Power Management Requirements         | ➤ <b>Identifies and explains the requirements agencies must apply to achieve the appropriate power management controls for the following scenarios: basic, remote desktop, special purpose and new workstations.</b> |
| 2: Workstation Acquisition and Disposal Requirements | ➤ <b>Requires agencies to purchase, lease and dispose of workstations and peripherals in compliance with the Operational Services Division policies and procedures.</b>  |
| 3: Implementation of Power Management Control        | ➤ <b>Identifies various options available to manage and monitor the adoption of the Desktop Power Management Standards within the workforce.</b>   |
| 4: Relevant Industry References for Power Management | ➤ <b>Provides information about the relevant national standards and definitions that are commonly referred to when discussing computer power management practices and standards.</b>                                 |
| Compliance   | ➤ <b>Identifies and explains how compliance with the standards must be evaluated and tracked by agencies.</b>  |

Commonwealth of Massachusetts  
Information Technology Division

**Enterprise Desktop Power Management Standards  
Version 1.0  
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The purpose of these standards is to establish minimum power management requirements that will result in significant reductions in the energy consumption of the thousands of Personal Computers (PCs) and workstations used throughout the Commonwealth of Massachusetts Executive Department agencies. Such energy reductions will also result in a significant reduction in energy costs and associated environmental impacts, such as greenhouse gas emissions.

State Government greenhouse gas emissions total more than 1 million tons per year, equivalent to the emissions generated by more than 200,000 cars driven for one year. Energy consumption directly impacts environmental and health issues including global climate change, regional mercury contamination, and asthma rates.

In response to such compelling evidence, Governor Deval L. Patrick issued Executive Order No. 484 in April of 2007 requiring state agencies to reduce energy consumption in state facilities as well as associated greenhouse gas emissions, expand use and purchase of renewable energy, adhere to green building standards, and reduce water use.

Nationally, office equipment (primarily PCs and monitors) consumes between 5 and 10% of the total annual electricity consumption in commercial buildings, consumption that grows when the increased cooling demand to address waste heat from equipment is considered. Fully active workstations (monitors and C.P.U.s) consume from 95 – 130 watts depending on the features included and the type of monitor (e.g. CRT vs. LCD). Implementation of power management options during periods of inactivity can reduce a machine's power consumption to less than 6 watts per workstation, an energy reduction of some 95%, and save as much as \$60 or more per computer per year.

These new power management standards, in combination with the Statewide Contracts that are used to acquire PCs and workstations and provide for their recycling/disposal, will address the environmental impact of PCs and workstations throughout their life.

All Executive Department agencies must:

- Use Statewide Contracts that will require vendors to provide equipment that meets specific environmental criteria, including those developed by the U.S. EPA's Energy Star Program and the Electronic Products Environmental Assessment Tool (EPEAT)
- Implement minimum power management standards that will ensure that:
  - Workstation configurations take advantage of available power management options when provisioned for employees
  - Workstations are shut down during extended periods of non-use
- Use Statewide Contracts to ensure that electronic equipment is recycled and disposed of in an environmentally responsible manner

By adhering to these standards for all applicable workstations, agencies will reduce the Commonwealth's overall environmental footprint. EPA modeling projections indicate that a statewide implementation of power management standards could reduce agency energy consumption by more than 12 million kWhs, and lower the Commonwealth's electricity bills by \$2 million each year.

These standards are effective as of the published date of this document. Workstations deployed within an agency prior to the effective date of these standards must be brought into conformance within 120 days of the publish date of these standards.

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These standards apply to all agencies within the Executive Department. We strongly recommend that the Constitutional Offices, the Judicial and Legislative branches, higher education institutions, and other governmental entities of the Commonwealth of Massachusetts adopt this or a similar policy.

Additional reference information that entities may find useful is listed at the end of this document.

## **1. Workstation Power Management Requirements**

It is important to recognize that not all workstations are used for the same purpose and therefore, power management must be administered in the manner that best aligns with needs of the agency.

All agency workstations in use by agency personnel must apply appropriate power management controls that are consistent with requirements of this section. In order to best meet the requirements of this section, agencies will need to have a general understanding of how their workstations are used, administered and accessed. Wherever possible, administrative activities should be scheduled, bundled, batched and planned to take into consideration the power management goals of the Commonwealth.

### **A. Existing Workstation Power Management**

#### **Basic Workstation Minimum Requirements**

Basic workstations can be described as workstations that are used in traditional ways, e.g. running general office suite applications or other conventional software. Basic workstations are accessed in person in the physical environment in which they sit. Basic workstations do not need to be accessed remotely in the manner described in Remote Access Workstation section. The following minimum standards are required for all basic workstations:

##### **Monitors**

- Monitors must be set to sleep after 10 minutes of inactivity.
- Monitors should be shut off whenever the workstation is completely powered down or is in standby mode.
- Screen saver options must not be enabled. This requirement applies to the traditional use of screen savers that are intended to minimize etching of images on a monitor. It does not refer to the screen displayed when a workstation is locked. Screen savers do not save energy; in fact, they may increase energy use of a system.

##### **CPU's/Base Unit's**

- CPU's/Base Unit's must be set to sleep (S3) after 30 minutes of inactivity.
- CPU's/Base Unit's must be shut down during non-business hours (when an employee leaves for the day/night) unless administrative activities need to be performed. After all network administrative activities have been completed, these units must be shut down until needed.

### **B. Remotely Accessed Workstation Minimum Requirements**

Workstations that are accessed using Remote Desktop require the ability to be accessed from locations external to their primary physical location. In order to be considered a Remote Desktop workstation, individuals must use the Remote Desktop software, or equivalent software, to allow them to access their primary workstation. This is not the same as using an SSL VPN solution alone, which provides users with access to their network drives from a remote location. Network access should not be affected by the state that an individual's workstation is in. The following minimum standards are required for all remotely accessed workstations:

##### **Monitors**

- Monitors must be set to sleep after 10 minutes of inactivity.
- Monitors should be shut off whenever the workstation is completely powered down or is in standby mode.
- Screen saver options must not be enabled. This requirement applies to the traditional use of screen savers that are intended to minimize etching of images on a monitor. It does not refer to the screen displayed when a workstation is locked.

#### **CPU's/Base Unit's**

- Agencies must identify users within their organizations who have remote access **and** use Remote Desktop, or equivalent software, to access their workstations remotely.
- CPU's/Base Units will need to remain active at any time that the user may require access.
- CPU's/Base Unit's should be shut down after periods of inactivity greater than 7.5 hours or during non-business hours, unless the user will need to remotely access their workstation using Remote Desktop or equivalent software. If users know that they will not require the use of their remote desktop capabilities, they should shut down their workstation completely unless administrative activities need to be performed and then, after all network administrative activities have been completed.

#### **C. Special Purpose Workstations Minimum Requirements**

Special Purpose Workstations can be described as workstations that are used to perform activities that are outside the normal confines of the basic functions. If it is deemed necessary, these workstations may be left in an active state because they perform an automated function or interact with other connected devices. Some examples of the types of activities performed by Special Purpose Workstations include but are not limited to workstations that are used: as servers; in the monitoring of medical equipment; for critical public safety purposes; and/or transportation related monitoring or management functions. Because workstations may be shared by multiple users, it is important to ensure that workstations themselves are set to enforce the power management policies rather than tying the policies to the users. For purposes of these standards, Special Purpose Workstations can be categorized in two ways, Workstations with Limited Power Management and Exempt Workstations.

#### **Workstations with Limited Power Management**

Workstations that have Limited Power Management capabilities are considered to be the workstations that can apply *some* level of power management but cannot perform necessary functions if required to maintain the basic workstation requirements identified in the preceding section. In such cases, agencies must implement the power management measures to the highest degree possible following an evaluation on the business impact. At a minimum the following requirements must be met:

##### **Monitors**

- Monitors must be set to sleep after 10 minutes of inactivity unless they need to remain active to support specific activities.
- Monitors should be shut off whenever the workstation is completely powered down or is in standby mode.
- Screen saver options must not be enabled. This requirement applies to the traditional use of screen savers that are intended to minimize etching of images on a monitor. It does not refer to the screen displayed when a workstation is locked.

##### **CPU's/Base Unit**

- Agencies must identify what level of power management can be achieved for this category of workstation based on a good faith analysis of the business requirements. Agencies may identify multiple workstation groups within this category to ensure that optimal power management controls can be implemented and controlled based on the group's requirements. The following standards should be considered whenever possible:
  - PC's/Base Unit's should be set to sleep (S3) after 30 minutes of inactivity unless the sleep setting will interfere with workstation processes.
  - PC's/Base Unit's should be shut down after periods of inactivity greater than 7.5 hours or during non-business hours unless system shut down will interfere with workstation processes.

#### **Exempt Workstations**

Agencies may have business reasons that prevent them from adhering to any of the requirements above. Some reasons that agencies may need to exempt some workstations are provided below.

- Security based activities that require a workstation to be active at all times.
- Workstations that perform automated activity critical to an agency's business during off-peak hours.
- Workstations that perform an operation that requires an extended timeframe to complete, e.g. queries.

If agencies are unsure of whether or not specific workstations should be exempt from these standards, they should send an email to [Standards@state.ma.us](mailto:Standards@state.ma.us) for guidance in this area.

#### **D. New Workstation Power Management**

The Operational Service Division (OSD) is responsible for establishing the minimum configuration requirements of all workstations that are either purchased or leased under a Statewide Contract. Therefore any clarification or terms or requirements regarding how contracted workstations should be configured upon delivery to the agency should reference the associated Statewide Contract or Statewide Contract manager. However, once the Agency has accepted delivery of workstations, the responsibility of ensuring that deployed workstations are in compliance with these standards is the responsibility of the Agency.

##### **1. Compliant upon End User Delivery**

- All new workstations that are purchased or leased under an OSD Statewide Contract must ensure that power management configurations are consistent with the requirements for Existing Workstation Power Management upon delivery to the end user.

##### **2. Wake on LAN functionality**

- The Wake on LAN functionality, which allows for administrative calls to a sleeping workstation, is part of the standard configuration and must not be disabled without carefully considering the impact of doing so.

## **2. Workstation Acquisition and Disposal Requirements**

For purposes of these standards, Agencies that acquire or dispose of workstations must do so in accordance with requirements of this section.

#### **A. Acquisition of Workstations**

- All workstations and peripherals must be purchased or leased in compliance with OSD policies and procedures. Such policies and procedures will require a minimum EPEAT silver rating as of the renewal of the statewide contract for computer equipment which is expected to take effect July 1, 2008.
- Agencies shall acquire for use only LCD screens, unless other technologies are required to meet the needs of a specific user or agency.

#### **B. Disposal of Workstations**

- All workstations and peripherals must be disposed of in compliance with OSD policies and procedures, which will require minimum environmental criteria for all equipment collection and recycling contractors.

## **3. Implementation of Power Management Control**

Agencies may choose to manage and monitor workstation power management in a variety of ways. Each agency will be responsible for evaluating what controls will best suit the business and cultural environment of their organization. In some cases, education, outreach and periodic spot checking will ensure that agency staff have adopted these standards. In other cases, the use of technological controls will be more effective and efficient. In all cases, agencies are encouraged to consider all viable options and will likely find that some combination of the methods below will be most manageable.

#### **A. Education and Manual Configuration**

This method is likely to be most effective for smaller agencies or for satellite locations that are not networked. It will require that:

- Administrators set power management options directly for each workstation.
- Resources are assigned to periodically spot check workstations to ensure that workstations have been left in the appropriate state.
- Ongoing communication and an organized educational approach to ensure that the behavioral aspect of the organization continues to enforce the requirements.

#### **B. Automated Power Management Options**

There are many automated power management methods that provide a wide range of functionality to support, track and enforce power management policies. Each agency must take the time to evaluate what tools will best fit their needs, budget and resources. Power Management Tool Options available to agencies include:

- Assigning internal agency staff to develop customized scripts that can be pushed out to agency workstations to accomplish some or all of the power management requirements.
- Using Group Policies to set and maintain some or all of the power management requirements.
- Free open source software called EZ GPO from the U.S. EPA Energy Star program
- Use of software or tools that can perform more sophisticated roll-out, maintenance and monitoring of the power management requirements. This option may require the acquisition of specialized, proprietary toolsets. Agencies are encouraged to consider all options including Open Source tools, tools that may come as part of an existing software package or suite, and/or free toolsets that may meet their needs.

### **4. Relevant Industry References for Power Management**

This section provides information about the relevant national standards and definitions that are commonly referred to when discussing computer power management practices and standards.

#### **A. Energy Star**

In 1992, the Federal Government established a voluntary program that partnered with businesses to identify and promote energy efficient products to reduce their environmental impact. Computers and monitors were the first products to be labeled. Beginning on July 20, 2007, Energy Star's new specifications for computers went into effect. By requiring efficiency savings across operating modes, the Federal Government predicts that the new computer specification is expected to save consumers and businesses more than \$1.8 billion in energy costs over the next 5 years and prevent greenhouse gas emissions equal to the annual emissions of 2.7 million vehicles.

Energy Star differentiates a computer's power settings in the following way:

**Idle State:** For purposes of testing and qualifying computers under this specification, this is the state in which the operating system and other software have completed loading, the machine is not asleep, and activity is limited to those basic applications that the system starts by default.

**Sleep Mode:** A low power state that the computer is capable of entering automatically after a period of inactivity or by manual selection. A computer with sleep capability can quickly "wake" in response to network connections or user interface devices. For the purposes of this specification, Sleep mode correlates to Advanced Configuration and Power Interface (ACPI) System Level S3 (suspend to RAM) state, where applicable.

**Standby Level (Off Mode):** The power consumption level in the lowest power mode which cannot be switched off (influenced) by the user and that may persist for an indefinite time when the appliance is connected to the main electricity supply and used in accordance with the manufacturer's instructions. For purposes of this specification, Standby correlates to ACPI System Level S4 or S5 states, where applicable.

## **B. Advanced Configuration and Power Interface (ACPI)**

This is an open industry specification co-developed by Hewlett-Packard, Intel, Microsoft, Phoenix, and Toshiba to standardize the way products operate in low-power modes controlled by the operating system. ACPI (somewhat similar to Energy Star) differentiates between the following “global states” for the computer:

### **Global States**

#### **G0 Working**

A computer state where the system dispatches user mode (application) threads and they execute.

#### **G1 Sleeping**

A computer state where the computer consumes a small amount of power, user mode threads are not being executed, and the system “appears” to be off (from an end user’s perspective, the display is off, and so on).

Within the “global state” G1, ACPI differentiates five “sleeping states” from very light sleep (S1) to what amounts to a “soft off” (S5). The descriptions below use the word “context” to mean basically “information that is not saved.”

### **Sleep States**

#### **S1 Sleeping State** – aka “Power on Suspend,” (Microsoft calls this “Standby”)

You can wake up the computer by moving the mouse, making a keystroke, etc. The S1 sleeping state is a low wake latency sleeping state. In this state, no system context is lost (CPU or chip set) and hardware maintains all system context.

#### **S2 Sleeping State** – aka “Standby” (Microsoft calls this “Standby” as well)

The S2 sleeping state is a low wake latency sleeping state. This state is similar to the S1 sleeping state except that the CPU and system cache context is lost (the OS is responsible for maintaining the caches and CPU context). Control starts from the processor’s reset vector after the wake event.

#### **S3 Sleeping State** – aka “Suspend to RAM” (Microsoft may call this “Standby” as well)

The S3 sleeping state is a low wake latency sleeping state where all system context is lost except system memory. CPU, cache, and chip set context are lost in this state. Hardware maintains memory context and restores some CPU and L2 configuration context. Control starts from the processor’s reset vector after the wake event.

#### **S4 Sleeping State** – aka “Suspend to Disk” (Microsoft calls this “Hibernate”)

The S4 sleeping state is the lowest power, longest wake latency sleeping state supported by ACPI. In order to reduce power to a minimum, it is assumed that the hardware platform has powered off all devices. User will need to hit the “power” button (or open the laptop) to turn the computer on again, but it “resumes” operation within seconds as opposed to booting up. Platform context is maintained.

#### **S5 Soft Off State**

The S5 state is similar to the S4 state except that the OS does not save any context. The system is in the “soft” off state and requires a complete boot when it wakes. Software uses a different state value to distinguish between the S5 state and the S4 state to allow for initial boot operations within the BIOS to distinguish whether or not the boot is going to wake from a saved memory image. S5 is basically “off” and, once you hit the “power” button, the computer will have to boot up before it becomes operational.

#### **G2/S5 Soft Off**

A computer state where the computer consumes a minimal amount of power.

ACPI support varies from one operating system to another.

- WindowsXP has full ACPI support.
- Windows2000 has full ACPI support.
- Windows95 does not support any ACPI power management state. Through Advanced Power Management (APM) it can access something very like S1.

- Windows98 can use S1 or S3, but S3 support is not recommended.
- WindowsME can use S1, S3 and S4 but not on all hardware. It shares 98's dislike of S3.
- Linux (2.4) can use S1 and S3, but not S4.

## Compliance

Executive Department agencies must be able to document the following information for all users within 6 months of the published date of these standards:

- Categories: Workstation categories implemented within the agency (Basic Workstations, Remotely Accessed Workstations, etc.).
- Count: Approximate breakout of workstations in each category.
- Configuration: Power management configuration applied to each category of workstation. The requirements listed in these standards are minimum requirements; therefore, if an agency has set more stringent parameters, the documentation should reflect that.
- Exemptions List: Identify the number of workstations that can not implement any power control measures and why.
- Date: Identify the date that workstations were or are planned to be in compliance.

Executive Department agencies must be able to produce the required compliance documentation when requested.

## Additional Information

For reference purposes, the following web sites and resources may be useful:

[Executive Order 484](#)

[APCI Web Site](#)

[Leading By Example Program Web Site](#)

[EPEAT Web Site](#)

[OSD Environmentally Preferable Products Purchasing Program Web Site](#)

[EPA Energy Star Website](#)

[EPA Energy Star Power Management Website](#)