

# IMPLEMENT & INTEGRATE

Info-Tech Advisor Premium - Implement



## About this research note:

Implement & Integrate notes provide comprehensive, step-by-step guidance on the best practice implementation of technologies, tools, and processes.

## PC Power Saving Plans Reduce Costs and Environmental Impact

Last Revised: December 19, 2007

PC power savings aren't well understood by many organizations, but are easy to achieve and result in reduced energy consumption, cost savings, and lessened environmental impact. Learn about the techniques for PC power saving and how to execute a PC power saving plan.

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## Executive Summary

Since the introduction of Advanced Configuration and Power Interface (ACPI) ten years ago, desktops and laptops have had advanced power management capabilities. However, these capabilities are not leveraged in many organizations. IT can implement a PC power saving plan that reduces energy consumption, utility bills, and environmental impact. This research note on PC power management includes:

- The background of PC power management.
- Current power management capabilities of popular Windows versions and the scheduling software that can further extend energy savings.
- An action plan for understanding and selecting power management techniques, determining PC power management settings, a user communications plan, and a procedure for handling user exceptions after implementation.
- Potential pitfalls in implementing a PC power saving plan.

PC power management represents one of the fastest and easiest ways to green IT.



## Implementation Point

### PC Power Management: A Brief Introduction

PC power management relies on the premise that energy use during idle time can be reduced or eliminated, without interfering with a user's work. However, a significant proportion of PCs sit idle, with little productive activity taking place. In fact, a recent Info-Tech study demonstrated that between 30% and 40% of organizations do not even have a policy of advising users to turn off PCs. Carbon Trust, a British government-sponsored non-profit, estimates that PCs and monitors consume close to 15% of power in the UK; this is expected to double by 2020.

A surprising amount of power is wasted by individual, idling PCs. As an example, assume that a desktop PC, with monitor attached, consumes 100 watts. According to the US Department of energy, the average US electricity price in 2006 was \$0.0931 per kWh. If left on continuously, this 100 watt desktop will burn \$81.56 in energy yearly. While that may not seem like much, a 1,500 desktop organization would be faced with a \$122,000 power bill under such conditions. Even cutting that figure by one-third would result in \$40,000 in savings which might, for example, cover an additional full-time technician or 40 new computers.

Table 1 demonstrates that a 1,500 PC organization with energy costs of 9.5 cents per kWh could save \$54,000 yearly. This assumes an average desktop wattage of about 130 watts (desktop PC and monitor) and a cost of \$10 per PC for power management software. The payback on this investment is just 15 weeks, and \$54,000 savings will accrue yearly, once this is paid off. Moreover, the organization takes the equivalent of 64 cars off the road. (Note: These results were calculated using an Info-Tech tool, which will be introduced later in this note).

**Table 1. PC Power Management Saving estimates for 1,500 PCs**

Source: Info-Tech Research Group

	Current State	Power Saving Plan Implemented	Savings
Yearly energy Cost	\$80,000	\$26,000	\$54,000
Yearly energy Consumption	841,000 kWh	274,000 kWh	567,000 kWh
Yearly CO2 emissions	1,110,000 lb	361,000 lb	749,000 lb

In the past, IT found it hard to actively engage in PC power management because of differing standards in disparate BIOS firmware that predominantly managed power settings. However, that changed in 1996,



with the development of Advanced Configuration and Power Interface (ACPI). This open, industry-standard specification defines common interfaces for power management. Most importantly, ACPI puts the OS, instead of the BIOS, in control of power management. The BIOS provides the OS with the methods needed to directly control detailed settings for various pieces of hardware within PCs.

## Key Considerations

### PC Power Management Capabilities Today

ACPI provides the functionality to reduce power consumption by slowing processors, spinning down hard disks, and shutting off monitors and displays during short idle periods. During longer idle times, such as during evenings and weekends, power consumption can be cut altogether using standby and hibernation modes. Besides reducing power consumption, PCs and monitors that spend less time running produce less heat, thus reducing air conditioning costs. Moreover, equipment that runs less often tends to experience less wear and tear, lowering maintenance costs. Finally, a reduction in power consumption has the benefit of mitigating the organization's environmental footprint.

Microsoft has integrated ACPI since Windows 98; most Windows configurations provide timers for turning off monitors and spinning down hard disks after a set period of time. See Table 2 for a summary of power management modes in 2000, XP, and Vista.

**Table 2. Power Management Modes in Windows**

Source: Info-Tech Research Group

2000 & XP		Vista
<b>All Machines</b>	<b>Laptops</b>	<b>Desktops</b>
<ul style="list-style-type: none"><li>Standby: Places the PC in a low-power state &amp; keeps OS and applications in memory. Allows a rapid return</li></ul>	<ul style="list-style-type: none"><li>Retains the 2000/XP Standby &amp; Hibernate modes. Laptops require rapid power-downs without writing the system state to disk, but Vista laptops detect a low-battery state while in Standby and automatically Hibernate, writing the system state to disk to</li></ul>	<ul style="list-style-type: none"><li>Sleep: Users no longer choose between Standby and Hibernate. Vista combines the best of Standby and Hibernate modes. The system state is stored to both RAM and hard disk when the computer is placed in Sleep. Using the state stored in RAM, the PC resumes quickly (usually 20 seconds or less). Since the system state is written to disk, resume can</li></ul>



to operation.

- **Hibernate:** Writes the contents of memory to disk and powers down to an essentially "off" state. Typically returns to operation in less than 30 seconds.

prevent data loss. When plugged in, laptops revert to a power management scheme similar to desktops.

also occur without data loss, even if the computer has experienced a loss of power.

Most new hardware and peripherals support power management functionality. Chipmakers such as Intel and AMD have built stepping techniques into processors, whereby CPUs ramp up computing power and resulting energy consumption on demand. Typically, this feature is enabled by default on most PCs. Additionally, most other hardware components are ACPI-compliant; for example, network cards can wake-on-LAN, meaning they power up a computer when called upon by the network. Keyboards, LANs, and USB devices can usually be set to wake the computer, provided it has not been mechanically turned off via a physical rocker switch or button.

### Classic Problems with PC Power Management

Although all versions of Windows in current rotation feature useful power management options, these are not aggressively set in desktop setups. The following issues prevent widespread enabling of power conservation features:

- **Underestimated cost savings.** IT doesn't understand the true costs of running PCs. The energy cost for PCs has never been calculated, and IT can't tell how much a power saving plan might save. As a result, a power saving plan is not an important mandate for IT management.
- **IT doesn't have the right tools to enable effective power management.** Although Group Policy allows control of individual power settings in XP and Vista machines, it does not provide



scheduling abilities to toggle machines on and off for working hours and off-peak updates. Without this functionality, aggressive power management often interferes with user needs and routine upgrades.

- **Lack of user education.** Afraid of losing data or enduring lengthy startup times, users disable power management settings; in fact, some believe screen savers are good for monitors. Users don't realize that Standby and Hibernate modes avoid data loss and lengthy restart times while securing desktops with a password (if enabled). Moreover, IT hasn't educated users on how power management works or that it reduces energy costs and associated environmental impact.
- **Lack of user compliance.** Even if the organization has a policy to turn off PCs when not in use, many users tend to balk at such a policy and leave their PCs on overnight and on weekends. Many claim that their computers take too long to boot, for example. Enforcing such a policy requires policing by IT or management staff, and will annoy users.
- **The needs of the few outweigh the needs of the many.** Machines with a reason to stay turned on outside business hours may need an exception from aggressive power management. Incompatibilities and hardware conflicts may prevent the odd PC from properly hibernating or standing by. However, the needs of a few machines often create a mentality that says power management is unnecessary for all PCs.

These issues are resolved through a straightforward action plan. IT must understand main power saving techniques and estimate the savings arising from such techniques. Once power saving is understood, IT can save money and reduce the organization's environmental footprint by:

- Developing a PC power saving policy.
- Developing and deploying user education.
- Implementing the power saving plan.
- Carefully managing user and hardware exceptions.

Follow Info-Tech's PC Power Saving Action Plan to implement a successful PC power management strategy.

## Implementation & Integration

### PC Power Saving Implementation Plan

1. **Understand the key power management techniques.** There are two main methods of power saving on individual PCs. To accurately calculate savings in a business case, understand both methods, and how much benefit each will produce. The methods are as follows:



- Optimize power management settings. Aggressively setting Standby, Hibernate, and monitor and hard disk turn-off idle times on some or all PCs saves energy during business hours. For Windows XP, [two free tools](#) are available from the EPA. These tools apply uniform settings for some or all PCs on a network. The Group Policy Management Console (Windows Server 2003 and newer) can modify settings on Vista, without any additional software.
- Power down machines when not in use. The biggest energy savings will arise from turning off computers during evenings and weekends. While organization-wide power settings can be optimized using the above methods, network-based scheduling applications allow even greater energy savings through tight control over individual machines. For example, machines can be scheduled to turn on at 8 a.m. and off at 6 p.m.

A number of packages are available for this level of control. [SMS Expert SMS Companion](#) runs through Microsoft Systems Management Server (SMS), recently renamed System Center Configuration Manager 2007. It offers scheduling functionality, at about \$7 per PC. [Verdiem SURVEYOR](#) and [1E NightWatchman](#) provide similar features in standalone packages; pricing varies between \$10 and \$25 per PC. Keep in mind that all three of these offerings, as well as others, have valuable functionality beyond scheduling and should be examined for additional uses. For example, SMS Companion can turn on PCs long enough to push out upgrades overnight. Most packages also delay shutdowns if users are still actively using a PC (that is, providing user inputs) and will shut down once the computer is idle for a certain period of time.

Understand that these techniques are appropriate for laptops as well. When laptops are plugged in, they essentially function as desktops with a lower power draw. The same power management techniques should be applied to laptops for maximum energy savings across the organization.

2. **Use Info-Tech's calculator to estimate power saving, and build a business case if necessary.** Use the Info-Tech tool, "[PC Power Saving Plan Calculator](#)," to estimate savings for the organization. This tool considers the number of PCs and monitors, wattages, usage patterns, the cost of scheduling software, and more. The tool should be used separately to estimate savings for laptops and desktops, because laptops draw lower wattages and may not necessarily be paired to an external monitor.

If most PCs in the organization are set to turn off at the end of the day and on weekends, and standby or hibernate when idle, savings will accrue quickly. This is especially true in organizations without a policy advising users to turn off their machines. Note that Info-Tech's



calculator does not consider reduced demand on air conditioning, which will further shrink energy requirements.

Proceeding with the implementation of a PC power saving plan will make sense for most organizations; even the minor savings experienced in small businesses will help the budget. If necessary, results from the calculator can be used to build a business case.

- 3. Determine PC power saving settings.** Figure out what settings are appropriate based on the work patterns and needs of the organization. This may be done across the business, or even by department. Determine idle time settings for Sleep, Hibernate, monitor and hard disk shutoff, and establish schedules for shutdowns and startups. Also, decide how exceptions will be handled and figure out how users will voice exceptions, such as through a help desk ticket.

Energy savings through laptops will be less, due to the lower wattage of these devices. However, this will be an important part of the power saving plan if the organization is laptop-heavy.

- 4. Deploy user education on power management and the new power saving policy.** Messaging around the new power saving plan should communicate that compliance is required. Some users will initially balk at having their machines turned off and on or hibernating, so explain that this should not affect their work. Since shutdown and startup occurs outside of work hours, they will not be affected by such measures. In addition, they will be happier with a power saving plan if they understand the energy-saving benefits.

Communications can consist of e-mails, handouts, content in newsletters, or other vehicles, but must be distributed before implementation. Communications should explain:

- How Hibernate and Sleep modes work, and that these modes allow computers to return to full operation in several seconds without data loss.
- Idle time settings for Hibernate, Sleep, and monitor sleep, and the schedule for nighttime and weekend shutdowns and startups.
- How users can request an exception to the power saving policy (via a Help Desk ticket) because of the type of work they do.
- How users can request changes to PC settings if a hardware issue arises (for example, if the PC freezes upon returning from Sleep or Hibernate).
- The cost and CO2 emissions savings that each user will generate. This can be estimated using Info-Tech's "[PC Power Saving Plan Calculator](#)."

Communications should also include a notice of power savings plan implementation one or two days before it actually occurs, as a reminder.



5. **Implement the power saving plan and carefully manage exceptions.** IT can implement these changes quickly, using the tools discussed earlier.

Although most hardware made in the past several years will be fully ACPI-compliant, a few user issues may arise after settings and scheduling are implemented. This is more likely if older hardware is still present in the organization. Handle these machines on an exception basis; disable the applicable power settings, shutdown and startup schedules, or both, using Group Policy tools and the scheduling management app. Some users will require exceptions to perform their jobs on an ongoing basis. Continue to use the method communicated to users, such as a Help Desk ticket, to handle these types of exceptions.

### **Avoid the Pitfalls of PC Power Management**

If done correctly, implementing a PC power saving plan should be a trouble-free affair. However, some issues can occur. To prepare IT and users when the switch is flipped on the saving plan, learn about them up front.

1. **Unnamed hardware is difficult to control.** Before setting up a PC power saving plan, revisit the hardware naming scheme. Without a coherent and logical naming scheme, it is difficult to manage user exceptions to the power saving policy. Consider assigning names based on workstation and department, for example. Whatever the naming scheme, ensure that desktops are physically labeled in a visible place, so users can identify their machines when requesting an exception or reporting a problem. IT can identify and manage PCs using Group Policy or scheduling management tools much more easily when the computer in question is named.
2. **Wake-On-LAN must be enabled.** Wake-On-LAN (WoL) is a universal feature that allows the network card to receive startup instructions while the computer is off. Depending on the organization's setup, enabling WoL may be possible through Group Policy. However, not all configurations can be enabled this way. In some Windows setups, IT may need to set WoL in the power management settings of the network adapter. Older hardware, while ACPI compliant, may require that this setting also be enabled manually on the BIOS.
3. **ACPI is not flawless.** ACPI requires a high level of cooperation between device drivers, hardware, and the OS itself. Although ACPI is a boon for power management, its specifications are not always correctly implemented in all drivers. The Windows Driver Foundation programming model, introduced in 2006, alleviates many of these issues, particularly in Vista. However, stability is not guaranteed. For example, some versions of XP freeze when coming back from certain low-power states. Software and firmware updates may resolve ACPI-related issues, as many vendors attempt to correct fundamental issues, such as freezing after returning



from Hibernate or Sleep. Find out if these are available, and ensure that an appropriate exception- handling process is in place, as noted in the action plan.

4. **The power saving plan only works if it's enforced.** Such a plan will start with good intentions. However, without firm user enforcement and an effective exception process, power saving settings may be disabled and many machines could end up remaining on overnight and on weekends. Ensure power management settings are locked down through policy management, while providing an efficient way for users to obtain exceptions if necessary.

## Bottom Line

PC power savings aren't well understood by many organizations, but are easy to achieve and result in reduced energy consumption, cost savings, and lessened environmental impact. Learn about the techniques for PC power saving and how to execute a PC power saving plan.