

## NREL Research Support Facility (RSF) Energy Efficiency Manual

The Research Support Facility (RSF) building was designed with energy efficiency and sustainability in mind. Many of the innovative technologies included in the RSF utilize passive and active processes to provide energy for the operation of the building, such as electricity, heating and cooling. The goal of this unique office building is to reach net zero energy usage by partnering these technologies with staff practice – you are an active part in this living laboratory that shows the world that a large office building can achieve high energy efficiency. This page details the ways that you will interact with the RSF to help NREL achieve our goal through efficient use of lighting, cooling and ventilation and electric device usage.

### Lighting

#### Offices and Workstations:

The RSF uses natural daylighting streaming from the north and south windows as its primary lighting strategy on sunny days. On overcast days and early or late in the day in the winter when sunshine is limited, electrical lighting is used in conjunction with daylighting, as needed. Refer to Figure 1 for an illustration of how daylighting works in the RSF.

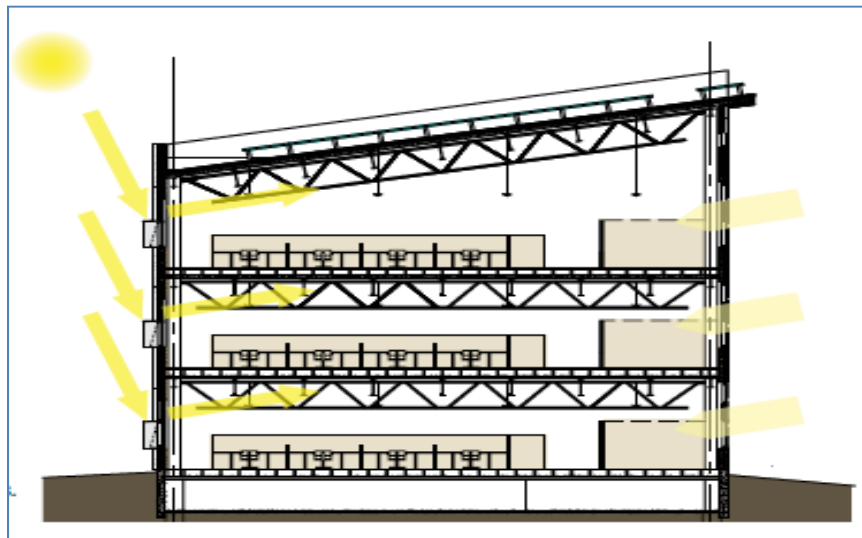


Figure 1. RSF daylighting concept

Each work zone is equipped with light switches that help you interact with the RSF's energy saving features. Status lights show you the lighting mode, as follows.

- **Red light:** The lights are on
- **Green light:** The lights are currently off and can be turned on, if needed
- **No light:** The switch is disabled and cannot be turned on.



**Figure 2. Work zone light switches**

The building's lighting control system automatically dims or turns off the office lights when daylighting provides all necessary lighting. The control system also identifies when more lighting is needed throughout the building and automatically turns overhead lighting on for the length of time it is needed. During sunny days when the building has turned off all the overhead lights, the overhead light switches in the private offices and corridors are disabled. Light switch status lights are enabled, but you cannot turn them on until the daylighting diminishes.

The RSF lighting control system is programmed to turn all the lights off starting at 6 p.m. The lights will blink five minutes before the building sweeps the lights off. If you need to work after 6 p.m., use the overhead lighting switch to override the automatic off sweep for an additional two hours of lighting .

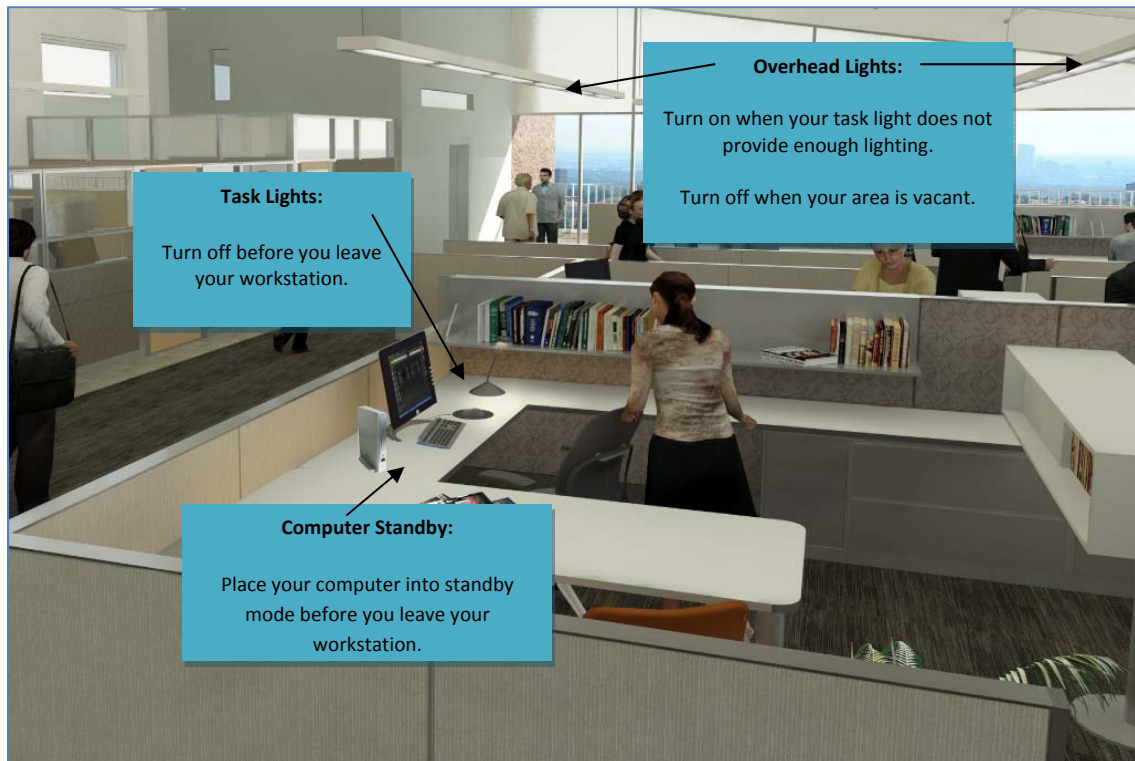
The following are ways you can support the energy goals of the RSF when you feel that additional electrical lighting is needed.

1. Start with your workstation task light, which targets light where you need it and uses much less energy than the overhead lighting.
2. If additional lighting is needed, each group of workstations has an overhead lighting system that is turned on by local light switches in each zone.
3. Always turn your task light off when you leave. If you are the last person to vacate an open office zone, turn off the overhead lighting switches before you leave.

*Note: If you leave the overhead light on over your private office and are gone for at least 15 minutes, the light switch will identify the lack of motion and will automatically turn the overhead lights off (but not the task light). You can help save even more energy by manually turning the light off when you leave.*

The following summarizes the lighting control steps to support net zero energy usage in the RSF:

1. All lights are off and daylighting provides all necessary lighting on sunny days. Use workspace-specific LED task lights for additional lighting, when needed.
2. Use the overhead lights during low to no daylighting periods by turning on the local zone light switches.
3. Turn off your task light when you leave your workstation, and turn off overhead lights in private offices.
4. If you are the last person to leave a conference room or work zone, turn off the overhead lights.



**Figure 3. Lighting and daylighting in the RSF**

#### **In the Common Areas:**

Light switches are provided for overhead and wall wash lighting in the huddle rooms, break rooms, storage rooms, connector corridors, lunch room, conference rooms, print rooms, and bathrooms. If daylighting is sufficient for the tasks in these areas, please do not turn on the overhead lights. If daylighting does not provide sufficient lighting, turn the overhead lights on. Although an occupancy sensor automatically turns the lights off 15 minutes after vacating the room, turning the lights off any time a room is vacant saves energy.

#### **After Hours Lighting Controls:**

Exterior lighting is located at the main entry and other work zone access points to ensure safety and security for staff. Interior night lights are located throughout the building and remain on all night. Light

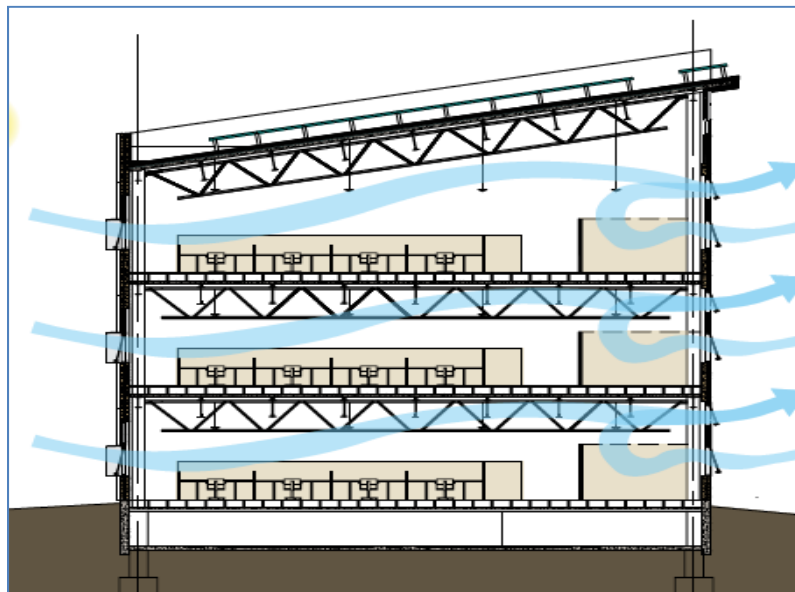
switches displaying a green status light are located right outside the work zone doors and on walls adjacent to individual zones.

When you reach your work area and turn on the associated zone of lights, the security exit lights remain illuminated to light your way back to the exit points. The local work zone lights remain on for a period of two hours and when the two hours are completed, the lights blink to warn you and will automatically shut-off. Use the local over-ride switch to turn the lights on for another two hours.

## Cooling and Ventilation

### Occupant-Controlled Windows:

Windows controlled both by staff and automatically are located in the open office areas, conference rooms, some huddle rooms, and connector common areas. Operable windows help the RSF reduce air conditioning and ventilation air delivery energy use during temperate outdoor air conditions and give you considerable control over your own comfort.






**Figure 4. Natural ventilation concept**

About two-thirds of the RSF's windows can be manually operated by staff, and the building control system automatically operates the remaining one-third of the windows when optimum conditions are met. You may open the windows under the following conditions:

- The outdoor temperature is 50°–78°F (current weather conditions are available on *theSOURCE* main page)
- The wind is calm
- The humidity level is low to moderate
- There is no precipitation.

To help you determine when weather conditions are optimum, an Open or Closed status icon appears in your Windows task bar with a popup message identifying when windows may be opened and when weather conditions necessitate that they be closed. Remember to close any windows you open either when prompted by the status icon or when you leave for the day.

	Keep window closed		OK to open window		Additional informational messages
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**Figure 5: Window control status icons**



**Figure 6. Windows XP taskbar showing Buildings Occupant Agent (BOA) message**



**Figure 7. Mac Snow Leopard task bar showing BOA message**

### Work Zone Floor Vents:

Floor vents are located throughout each work zone to facilitate fresh air distribution (these are not connected to the heating and cooling system). These floor vents can be opened and closed by staff, as desired.

## Computers, Monitors, and other Plug Loads

### iGo Power Smart Tower:

The most important way you can help support energy efficiency at the RSF is to reduce your energy usage (known as plug load) at your workstation. Just about every device you plug in uses power, even when it is turned off. Devices include your cell phone, MP3 player, and a personal fan or heater, along with the computer and telephone equipment installed at move in. Your workstation is equipped with the iGo Power Smart Tower to help reduce this “vampire” power usage.

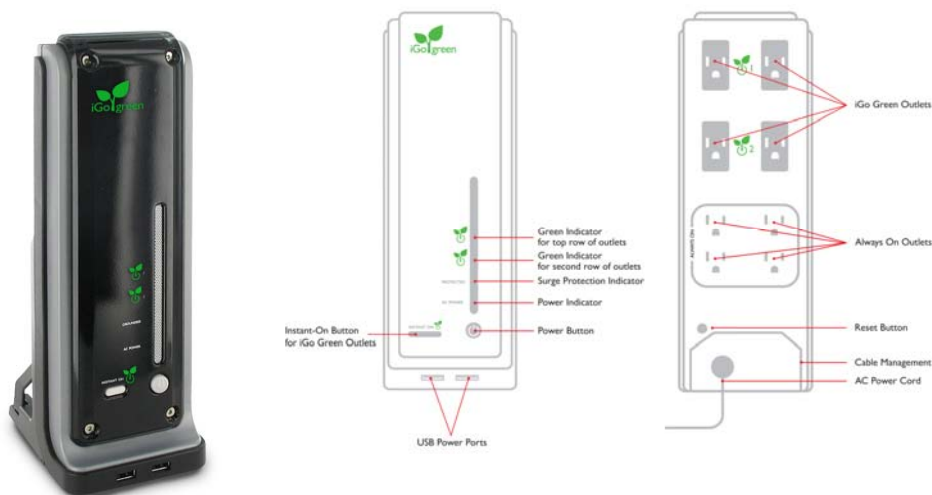
Here are some quick guidelines for using your Power Smart Tower.

1. Plug your laptop AC adapter or docking station into the top set (#1) of green outlets.
2. If you have a newer LCD monitor(s) (Dell G-series, Apple LED), plug your monitor(s) into the “always on” outlet. If you have an older LCD, plug your LCD monitor into one of the green outlets.
3. Plug accessories (LED task light, , cell phone chargers, headsets, etc.) into the second set (#2) of green outlets.
4. Use USB power ports to charge Blackberries, MP3 player, etc.; you may need a third-party cable to do this.
5. When you are done working for the day, turn the iGo Power Smart Tower off using the on/off power button located on the front of the tower. Performing this step completely turns off the power to your monitor, docking station, etc., and saves energy.
6. Although your workstation is equipped with additional baseboard plugs, please try to restrict electrical items to what can be connected to the iGo Power Smart Tower to take advantage of its energy-saving features.
7. Please do not plug additional power strips into the Power Smart Tower!

Contact Client Services at ext. 4171 if you are not sure how best to use your iGo Power Smart Tower. Refer to the <[http://corporate.igo.com/user\\_guides/Power%20Smart%20Tower%20UG.pdf](http://corporate.igo.com/user_guides/Power%20Smart%20Tower%20UG.pdf)> iGo Power Smart Tower User's Guide for additional information on properly connecting devices. You can power the green outlets on by pressing the Instant On button located on the front of the device.

Personal printers also use a large amount of power to run and are no longer being installed. Multifunction devices are located in convenient locations on your floor and can be configured to protect confidential documents using password protection. Client Services can assist you with using this feature.

When making decisions about the devices you plug in at your desk, please consider the environment and the excess energy usage the device may cause before attaching it to a power source.



**Figure 8. iGo Power Smart Tower Configuration and Controls**

## Computer Standby:

Your computer automatically enters standby mode after 15 minutes of inactivity. If you plan to be away from your workstation for more than 15 minutes, you can save additional energy by manually placing your computer into standby mode. Perform the following steps to set your computer on standby.

- If you have a PC, press Ctrl+Alt+Delete simultaneously on your keyboard. Click the "Shut Down" button and select *Stand by* from the drop down list.
- If you have a Mac, you can either choose Sleep from the Apple menu or press the power key and select "Sleep" from the popup.

Move your mouse or press the power button to wake your computer back up and enter your network password to begin working. If your computer is not consistently entering standby automatically, please contact Client Services at ext. 4171 for assistance.

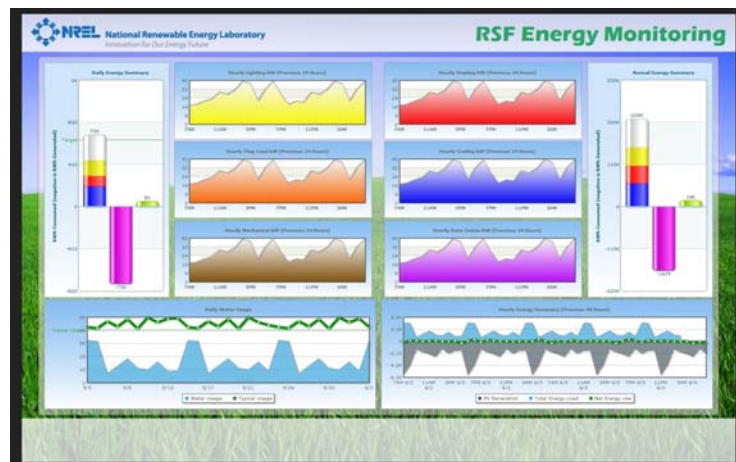
## More Energy Saving Opportunities:

The following are some additional ways you can contribute to the RSF's net zero energy use goal.

- Use the stairs whenever possible to reduce energy used by the elevators
- Check that shared printers, plotters, and other equipment enter standby mode during periods of inactivity and if you notice that they remain active (i.e., you are the first to in your area in the morning and no one has printed, but the printer is active, etc.).
- Please do not use a personal heater or fan. These devices use a significant amount of power and can also pose a safety hazard. If your workspace temperature is uncomfortable, please contact the Work Control Center at ext. 3232 or ext. 7344 for assistance. Please consider keeping a sweater at your desk for those chilly days and wearing layers for our changeable spring and summer days.

## Energy Performance Display

If you are interested in tracking the RSF's energy performance, two real time building energy monitoring displays will soon be located next to the elevators in the lobby. These displays show real time and historical energy use of the building's lighting, heating, cooling, plug loads, datacenter, and PV production.



## Share Your Energy Savings Ideas

The RSF's energy efficiency goals can only be realized with help from you. As you are working in the building, ask yourself the following questions and do what you can do to help meet net zero energy usage.

- Is something turned on when it should be turned off (devices, lights, etc.)?
- Is an unnecessary device using energy?
- Do you think the automatic windows should be open more often? Less often?
- Do you have any ideas about how to better use the RSF's features?
- Is there a better way help people remember how to best use the RSF's features?

Lessons you've learned can be shared to help us improve the RSF and other buildings.

If you have questions related to the RSF's energy-efficient operations or would like to suggest opportunities for additional energy efficiency, contact Jake Gedvilas, RSF Building Area Engineer, at [jake.gedvilas@nrel.gov](mailto:jake.gedvilas@nrel.gov).