



# Summer Shutdown for Energy Savings

## Energy Savings Guide for K-12 Schools



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UTILITY

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## Background

Many public and private organizations have closed their facilities due to the current COVID-19 pandemic. These closures have a significant impact on business operations and revenue streams. As a result, organizations are looking for ways to reduce expenses. One opportunity is to reduce energy costs.

The DC Sustainable Energy Utility (DCSEU) has developed this Energy Savings Guide to help schools save energy through easily implemented steps that also protect the building infrastructure. These recommendations focus on shutting off non-vital energy systems including lighting, heating, and air conditioning systems. Since all buildings are unique, there are several assumptions noted for each recommendation.

The DCSEU's recommendations are based on four guiding principles to reduce energy use: turning off, turning down, tuning up, and tearing out. During a temporary closure, we recommend focusing on the first three. However, if you are planning on making upgrades to your lighting, HVAC, refrigeration, or other systems, please reach out to take advantage of no-cost technical assistance and potential rebates/incentives available from the DCSEU.

**Please note:** this document is provided as guidance only. Your building engineers and maintenance staff know your building best and should be consulted before making any of the changes outlined in this guide.

## Turning Off

The greatest energy savings will result from simply turning a device off. This is a very low-to-no-cost step to implement.

## Turning Down

Ensuring unnecessary lighting is turned off, lowering thermostats during unoccupied hours, reducing set-points on hot water heaters and boilers, etc. will result in savings. Again, these are low- or no-cost steps to save energy.

## Tuning Up

Completing the often-deferred maintenance tasks will help to keep equipment and systems operating at peak performance. Proper maintenance of mechanical and electrical equipment done regularly can yield significant energy savings in both the short-term and long-term.

## Tearing Out

In most cases, replacing equipment is a last resort and significant savings must be anticipated before replacement is considered.

Turning off and turning down recommendations can be implemented through programming changes to the building automation system (BAS) or at the electrical panel, thermostat, or even at the equipment itself. The DCSEU also encourages organizations to use this time to revisit deferred maintenance.



## Turning Off Recommendations

Heating, ventilation, and air conditioning (HVAC) systems still operate in some capacity in many unoccupied buildings. Outside of lighting, these systems use the most energy at a facility. Therefore, modifying the current HVAC system may result in energy savings.

### Assumption: There is both heating and cooling occurring

Many HVAC systems are designed to super-cool incoming air (for dehumidification) and then reheat it for delivery to the individual spaces via variable air volume (VAV) boxes. In this type of system, each air handler unit (AHU) has both a heating coil and a cooling coil to accomplish this.

In other cases, hot water is sent directly out to individual spaces via a 3-pipe system during the heating season until a designated date. On that date, the system is switched over to cooling. Due to the timing of building closures, some HVAC systems may still be in heating mode.

Unoccupied buildings do not require heating or strict humidity control. However, simultaneous heating and cooling may still be inadvertently happening. Buildings only require minimal ventilation and cooling to maintain a habitable space and avert unwanted contaminants.

#### Recommendation #1: Turn off boilers

This recommendation may not be possible in all cases but should be considered. If the boilers are fired on #6 fuel oil, which is common in dual-fuel systems, or if the facility stores #6 fuel on site, then it may need to be heated with steam/hot water to keep it fluid. If the boilers are turned off, it may be necessary to empty and flush the fuel pumping system to prevent it from solidifying. This may be advisable as part of re-commissioning the system but can be cost-prohibitive.

#### Recommendation #2: Close all steam/hot water valves at the Air Handling Unit (AHU)

If the boilers can't or won't be turned off, then it's important to prevent hot water or steam from entering the heating coils at the AHUs. The heating valves should be set in the closed position. If the system has been in operation for many years, the valves may be stuck. Closing the valves through a BAS may not always work, therefore, the valve position should be visually confirmed by inspecting the AHUs.

### Assumption: There is unnecessary cooling happening

If a building was occupied, the internal heat load caused in part by building occupants would necessitate some amount of mechanical cooling. But without typical building occupants, opening windows or circulating air in the building can create reasonable cooling levels. (On days when outside air temperatures are above 80 Degrees F., we recommend simply keeping the buildings closed-up and allowing the thermal mass of the structure to maintain cooler inside temps. Maintenance work and cleaning activities do not require full cooling levels.

#### Recommendation #3: Turn off mechanical cooling

This can be accomplished by simply de-energizing the cooling machines (RTUs, VRF units, chiller, etc.). Care should be exercised to confirm that associated pumps and systems (for example, cooling towers) are also de-energized and taken out of service. For facilities where there is a building automation system (BAS), turning off cooling can be accomplished by simply raising the temperature setpoints above 85 degrees F. which will signal to the entire system that cooling is not required.



### **Assumption: Outside air is being brought into the building through the AHUs**

During business hours, the HVAC system should be programmed to bring in fresh air. The system is likely still doing so even though the building is now unoccupied. It is also likely that there is no “unoccupied mode” set-up in the BAS for the HVAC system.

Building code requires that a certain amount of outside air must be brought into the building during occupied hours. This outside air is conditioned (heated or cooled) at the AHU and then sent out to the building. Air returning to the AHU from the space is then exhausted out of the building. This process of conditioning outside air and refreshing the space uses a lot of electricity. The outside air in the summer is warmer than the air in the space so it must be cooled before it can be used, and the opposite is also true during the heating season.

When the building is unoccupied, the building does not need or require outside air to be brought in. The air inside the building can be recirculated and re-cooled or re-heated, if needed. This saves considerable energy since the air in the building is already at or close to the desired temperature setpoint.

#### **Recommendation #4: Close all outside air dampers and open mixed air dampers**

Outside air dampers should be in the closed position and the existing air in the building should be reused. If the system has been in operation for many years, these dampers could be stuck or otherwise not functioning correctly. Closing the dampers through a BAS may not always work, therefore, the damper position should be visually confirmed by inspecting the AHUs.

Note: Some AHUs may rely exclusively on outside air and do not have a mixed air damper (typically, these serve critical care areas such as labs, gymnasiums, and locker rooms where 100 percent fresh air is required). Where possible, these areas should be either minimally cooled or shut down entirely.

### **Assumption: Conditioned air is being exhausted out the building through exhaust fans**

It's likely that there are exhaust fans throughout the facility that run 24/7 and independently from the HVAC system. These exhaust fans may serve storage closets, restrooms, and other areas that are now unoccupied. All air that is exhausted by these devices needs to be replaced by bringing in more outside air. This outside air is conditioned (heated or cooled) at the AHU and then sent out to the building, using more energy than if the air had not been exhausted at all.

#### **Recommendation #5: Turn off all exhaust fans**

Using a BAS to turn off exhaust fans may not always work. There may also be fans that run independent of the BAS. Therefore, exhaust fans should be visually confirmed as closed.

Note: Some exhaust fans may need to run to dissipate contaminants in areas like chemical storage rooms and labs.

### **Assumption: AHUs are running but not cooling**

If heating or cooling is not needed in an area of the facility, the AHU serving that area should be turned off. By running the fan on this AHU, unconditioned (hot) air is being sent to unoccupied spaces but has the ancillary effect of circulating that hot air inside the building.

#### **Recommendation #6: Turn off all AHU fans where heating and cooling is not needed**

Using a BAS to turn off AHU fans may not always work. There may also be fans that run independent of the BAS. Fan status should be visually confirmed by inspecting the unit.





All these recommendations are made with the goal of reducing the inflow of outside air which then must be mechanically heated or cooled. Reducing the inflow of outside air will allow the building to stabilize indoor temperature. A reasonably comfortable indoor environment can be maintained with minimal heating or cooling due to the thermal mass of the building itself.

If fresh air must be brought into the building, its recommended to do so at night when outside air is coolest (during the cooling season).

### **Assumption: Appliances and electronics are still operating**

Most buildings have appliances and electronics that are used daily when the facility is in operation. Unless there is an absolute need for these devices to remain on and operating, they are using electricity unnecessarily even if the device is in power-save mode.

**Recommendation #6: Unplug appliances and any electronic devices that do not need to be powered-up**  
Standby power, also called a phantom load, refers to the way electric power is consumed by electronic and electrical appliances while they are switched off (but are designed to draw some power) or in standby mode. This occurs because some devices even if “switched off”, are in fact still drawing some power which allows internal clocks to keep running or enable the device to “instantly” power back on when needed. Unplugging the appliances and other electronic devices ensure that no power whatsoever is being consumed.

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## **Turning Down Recommendations**

The following recommendations are focused on reducing energy use for building mechanical systems that cannot or should not be turned off completely. Turning them down will still result in reduced energy use.

### **Room Temperature**

Room temperature setpoints can be reset to 80 degrees Fahrenheit (or the unoccupied setting through the BAS) and still maintain reasonable comfort and humidity control. The temperature should be verified to match the BAS. It is likely that thermostats are out of calibration where terminal devices are controlled by pneumatics. This could result in some unoccupied rooms calling for cooling.



## Chilled Water Temperature

The chilled water temperature setpoint should be at 45-47 degrees Fahrenheit or higher. Due to the system's need to sub-cool and reheat, the current chilled water setpoint could be as low as 40 degrees. This setpoint can be raised to increase the chiller's efficiency and thereby save energy.

## Water Temperature

Reset the return water temperature setpoint on the condenser water for chiller. Verify that cooling tower fans are not running when outside air temperatures are below 80 Degrees Fahrenheit. Even where space cooling is required, the cooling tower fan does not need to run except on very hot days.

## Condenser Loops

Verify that the condenser loops and tower are fully filled with water, as makeup water controls sometimes fail. It's also likely that multiple condensing units provide cooling to various critical systems of the facility—such as the computer server and elevator. These units are typically very energy efficient and, therefore, use minimal electricity. Doors to these spaces should be kept closed to contain the necessary air conditioning in these critical spaces.

## Discharge Air Temperature

Discharge air temperature at the AHUs (supply air) is typically 55 degrees Fahrenheit or lower in occupied mode for proper space comfort and dehumidification. Raising this setpoint to 57-60 Degrees Fahrenheit (or simply putting the building into unoccupied mode 24/7 via the BAS) will result in energy savings while still maintaining reasonable space comfort and humidity control.

## Cooling Spaces

Areas where cooling is absolutely required should be physically separated from other unoccupied spaces. Doors between these spaces should be kept closed.

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## Tuning Up Recommendations

The DCSEU recommends servicing any refrigeration equipment (compressors and controls) to not only extend its life, but also to maximize energy efficiency. This service should include the existing compressors for both the space cooling equipment—chillers and RTUs—and kitchen walk-in units and the roof mount condenser units.

Additional items to consider:

- Change furnace filters regularly (this task is often neglected)
- Verify that the chilled water loops are fully filled with water, as makeup water controls sometimes fail
- Verify that the chiller and RTU refrigerant is fully charged as refrigerant leaks are inadvertent, unavoidable, and usually not detected until the cooling fails

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## Conclusion and Next Steps

The DCSEU is here to help your school cut its energy costs. Please do not hesitate to contact us with questions. For more information on technical assistance, incentives for shutting down your facility, and incentives for efficient equipment upgrades and capital improvements, please contact:

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