Before the 20th century, 90% of Americans burned wood to heat their homes. As fossil fuel use rose, the percentage of homes using wood for fuel dropped, falling to less than 1% of all households by 1970. During the energy crises of the 1970s, interest in wood and biomass heating resurfaced as a renewable energy option.

That interest has slowly grown (about 2% of Minnesota households now heat with wood or biomass products) and a whole new generation of wood- and pellet-burning appliances is available today.

Wood and biomass systems can be either space heaters (such as fireplaces or standalone stoves) or they can provide the fuel for furnaces or boilers for central heating.

**Fireplaces**

Traditional fireplaces draw as much as 300 cubic feet per minute of heated room air for combustion, and send it straight up the chimney. Although some fireplaces can be fitted with dedicated air supplies, glass doors, and heat recovery systems, wood fireplaces are nearly always net energy losers—especially at the end of a burn cycle when very little heat is being generated.

Only high efficiency fireplace inserts increase the heating efficiency of older fireplaces. The inserts function like wood stoves, fitting into the masonry fireplace and using the existing chimney. Proper installation of fireplace inserts is very important to increase efficiency and reduce risks associated with chimney failures.

**Wood stoves**

A step up in efficiency from a traditional fireplace, modern wood stoves offer many features that increase safety and efficiency. Catalytic wood stoves may have efficiencies of 70%-80%, for example.

Catalytic stoves burn both combustible gases and the wood particulates before they exit the chimney. The design has a metal channel that heats secondary air and feeds it into the stove above the fire. This heated oxygen helps burn the volatile gases above the flames without slowing down combustion. However, the advanced combustion design only works efficiently when the wood fire burns very hot—upwards to 1,100 degrees F.

**Wood stoves, air pollution and building codes**

Wood-burning appliances and fireplaces can produce large quantities of air pollutants. Wood smoke contains nitrogen oxides, carbon monoxide, organic gasses, and particulate matter, each of which has serious health effects, especially to those who have compromised respiratory conditions.

Some cities restrict wood heating appliances when local air quality becomes unhealthy. Others restrict or ban the installation of wood-burning appliances in new construction.

Before installing a wood- or pellet-burning system, contact your local building codes department about regulations that may apply in your area.

**Pellet fuel appliances**

Pellet fuel appliances burn small pellets (less than 1 inch) that are made from compacted sawdust, wood chips, bark, agricultural crop waste, and other organic materials. They have a much higher combustion and heating efficiency than ordinary wood stoves or fireplaces and produce very little air pollution. In fact, pellet stoves are the cleanest of all solid fuel-burning residential heating appliances. They are also exempt from United States Environmental Protection Agency (EPA) smoke-emission testing requirements.

(over)
Many pellet burners can be direct-vented and do not need an expensive chimney or flue. They are available as freestanding stoves, fireplace inserts, or pellet-fired furnaces and boilers.

All pellet fuel appliances have a hopper to store the pellets until they are needed for burning. Most hold enough fuel to last a day or more under normal operating conditions. A feeder device, like a large screw, drops a few pellets at a time into the combustion chamber for burning. Advanced models have a small computer and thermostat to govern the pellet feed rate.

Pellet appliance exteriors stay relatively cool while operating and, because they burn fuel so completely, very little creosote builds up in the flue and there is less of a fire hazard.

**Maintenance of wood and biomass systems**

Newer wood- or pellet-burning systems are efficient if regularly maintained. Before each heating season have a chimney sweep (certified by the Chimney Safety Institute of America) inspect your wood-burning system. A certified chimney sweep will help make sure your appliance, hearth, connecting pipe, air inlets, chimney, and all other components are functioning efficiently and safely.

Catalytic combustors need to be inspected at least three times every heating season and replaced according to the manufacturer’s recommendations. Most catalytic stoves or inserts have a view window or thermometer to help you check the combuster.

Cleaning out the inside of the appliance with a wire brush periodically will also help your wood-burning appliance heat your home efficiently. Even a one-tenth inch of soot can drop the heat transfer efficiency of the metal by 50%.

**Access and storage of biomass fuels**

Before purchasing any type of wood or pellet heating system, ensure that you will have long-term access to the fuels and that you have considered the costs of delivery and storage—including protection from weather.

Additionally, determine if your municipality has any restrictions for on-site storage of wood or pellets. Some cities prohibit the transport or storage of wood products that might harbor damaging insects or disease.