MISSOURI DOC SUB-RECIPIENT AGREEMENT FOR GRANT AWARD
ATTACHMENT D

SCOPE OF WORK

For the

Summersville R-2 School Biomass Boiler System Grant Award

1. PROJECT GOAL

The Summersville R-2 School District agrees to install two or more cordwood boilers at the elementary school and upgrade the hot water distribution controls in the high school. The systems will provide reduced Life Cycle operating costs, reduce the District's net carbon footprint, utilize a local fuel, and positively impact the local economy. In addition, the upgraded distribution controls will provide for a more efficient use of the existing system. The Summersville School Board will select an A/E firm to provide professional services for the design, permitting, construction, and commissioning of the district heating system.

The first goal of the project is to replace the existing propane boilers with two or more cordwood boilers in the elementary school. The new cordwood boilers will provide energy cost savings to the school.

The second goal of the project will result from the addition of pumps, controls and an outdoor heat dump (radiator) to the existing sawdust boiler in the high school. These upgrades will provide adequate flow of hot water which could extend the effective operating season of the sawdust boiler, thus offsetting the use of propane.

2. PROJECT FINANCING AND CONTRACTOR COMPENSATION

The project is to be financed in part by a Grant awarded by the MDC. The overall project and bid documents are required to conform to MDC grant requirements.

3. PROJECT TIMELINE

Funding for the project requires that the biomass boiler system and upgraded to the distribution controls be installed and operational by August 15, 2018. In order to meet this timeline, it is estimated that engineering work for design and permitting of the system should begin by March 15, 2018. A suggested project timeline to be determined; meeting the specified schedule is essential due to the time constraints of the MDC Grant Award.

4. DESCRIPTION OF BIOMASS SYSTEM AND HOT WATER DELIVERY SYSTEM

The grant requires with Option 1: the installation of two or more cordwood boilers and associated system upgrades to deliver heat to the elementary school and with Option 2: the installation of additional pumps, controls and an outdoor heat dump (radiator) to assist with heat delivery to the high school from the existing sawdust boiler.

The elementary school system upgrade will include the following features and will meet the intent of the system described in the Preliminary Analysis Memorandum provided to Summersville by MDC.
Option 1:

1. Two or more cordwood boilers will be installed in a new outbuilding on the east side of the elementary school.
    a. The cordwood boilers should be appropriately sized as discussed in the Preliminary Analysis Memorandum so as to cover a large percentage of the annual load, but should not be sized to cover the peak day's load of the school.
        i. The system should be sized by the A/E firm. The sizing must be based on a thermal energy demand model for the connected portions of the facility, and this model must be submitted to MDC for review.
    b. The combustion units should be designed for burning seasoned cordwood and be of the "gasification type" with two stage combustion or be EPA Certified models. The boilers must comply with all applicable state, local, and federal requirements and codes.
    c. Stacks should meet all applicable requirements from local and state building codes, extend to a minimum of 5 feet above the peak of nearby roof lines, and should not be capped.
    d. If installed in an enclosed area, the units should be approved for indoor installation.
    e. If interfaced directly with the hot water distribution system, the boilers and thermal storage must meet necessary pressure ratings and certifications, otherwise, they must be appropriately installed and isolated from the pressurized distribution system using a heat exchanger(s).

2. The cordwood boilers will heat a minimum of 110 gallons of thermal storage per cubic foot of firebox capacity on the largest cordwood boiler installed, with an additional 500 gallons for every additional unit, and will supply heat to the entire school.
    a. The volume of any system piping, shall not be counted in the volume of thermal storage.
    b. The thermal storage shall be able to act as a buffer to ensure that the combustion unit(s) maintain good combustion even if the school's load is fluctuating.
    c. The thermal storage shall be able to store water at a temperature higher than the system distribution temperature.
    d. The piping and controls design must be submitted to MDC for review to ensure the thermal storage will be able to function in this manner.

3. The outbuilding/boiler house will be a structure that will be large enough to accommodate two trailers of cordwood, any boilers/equipment as required, and temporary cordwood storage under roof. The school will purchase three trailers which will be rotated by the cordwood vendor as they are emptied.
4. Pre-insulated underground pipes from the boiler building to the school will interconnect with the existing hydronic system in the south boiler room.

5. The existing hydronic system will be modified to serve the overall system from the south boiler plant, address issues with water hammer, address controls in existing rooms, add a hydronic system connecting to the 1993 elementary expansion and to install 0.8-1.1 mmBtu/hr of new high efficiency propane boiler capacity across two or more units in the south boiler room. Following are the following key items of this modification:
    a. Installation of 0.8-1.1 mmBtu/hr of new high efficiency propane boiler capacity across two or more units in the south boiler room. The propane boilers shall be sized to provide 100% coverage of the school's load, and the final sizing shall be completed by the A/E Firm based on a building load model, which is to be submitted to MDC for review.
    b. Replumbing of the south boiler room to offer a primary-secondary arrangement for boilers and school hydronic distribution. The cordwood and propane boilers will be hydraulically separated from the building distribution system.
    c. Installation of two new ECM pumps in parallel (lead-lag) to feed the school hydronic distribution system.
    d. Replumbing of the north boiler room to allow removal of the pumps, boiler and expansion tank in that boiler room. All flow and heat for the system to now be provided from the south boiler room.
    e. New expansion tank capacity will be included in the south boiler room to serve the entire hydronic system.
    f. The pneumatic controls for the existing hydronic heating system will be decommissioned. The room controls in the existing hydronic heating system will be reworked to improve building efficiency and occupant comfort. An adjustable thermostat will be installed in each room to control a valve feeding the heat emitters for that room.
    g. A new hydronic heating system will be added to the 1993 elementary school addition. Each classroom will be retrofitted with a hydronic unit heater, radiant ceiling panels or another appropriate hydronic heating technology with individual room controls. The existing PTAC units will remain to provide backup heat, fresh air and cooling.
    h. monitoring and recording of thermal energy output is to be included

The hot water distribution controls upgrade will contain the following features and will meet the intent of the system upgrade described in the Preliminary Analysis Memorandum provided to Summersville by MDC.

Option 2:

1. Installation of a fixed speed boiler pump to ensure adequate flow through the boilers at all times.
2. Installation of a three-way mixing valve to regulate the temperature of water delivered from the boiler loop to the building based on the outdoor air temperature.
3. Install control valves and thermostats on the classrooms or zones to allow temperature control on a zone by zone basis.
4. Install an outdoor heat dump (radiator) to extract heat from the boiler loop, to ensure that the return water to the sawdust boiler does not exceed 180°F (adjustable).