DDC Meeting Agenda 9/8/2005 *– Prepared by Seth Carson*

1. Introductions and Project Procedures

2. Project Description, Grant, Goals, and Final Energy Information Demonstration

   A. Energy Monitoring/Usage, Energy Management Tool
   B. DDC Controls and Heat Pump Status, ex. web Kiosk
   C. Cogeneration Demonstration

3. DDC Specifications Request by LCCC Team

   A. Four Main Focus Include Streamline Remote Maintenance, System Demonstration and Monitoring, Energy Management

   B. This Includes the Following:

   The heat pumps and controls should have the following data streams to and through the controls in a Modbus and/or N2 protocol, web friendly output.

   1. Space temp in all zones.
   2. Leaving hp water temperature.*
   3. Entering hp water temperature.*
   3. Discharge air temperature.
   4. Command of space temperature setpoint through controls.
   5. Cooling Status.
   6. Heating Status.
   7. Low temperature sensor alarm.
   8. Low pressure sensor alarm.
   9. High pressure sensor alarm.
   10. Condensate overflow alarm.
   11. Hi/low voltage alarm.
   12. Fan ON/AUTO position of space thermostat as specified above.
   13. Unoccupied/occupied command.
   14. Cooling command.
   15. Heating command.
   16. Fan ON/AUTO command.
   17. Fault reset command.
   18. Itemized fault code revealing reason for specific shutdown fault.

   The mechanical room controls should have the following data streams to and through the controls in a Modbus and/or N2 protocol, web friendly output.

   1. Entering ground loop field temperature.
   2. Exiting ground loop field temperature.
   3. Entering/exiting ground loop field flow rate.
   4. Pump status/speeds

The HRV-1,2 controls should have the following data streams to and through the controls in a Modbus and/or N2 protocol, web friendly output.

1. Entering outside air temperature.
2. Exiting exhaust building air temperature.
3. Discharge duct air temperature.
4. Pre-heater Status.
5. Itemized fault code revealing reason for specific shutdown fault.

Thank you all and let me know what questions you may have. 307-760-5998.

Seth Carson

4. UW Requirements for Heat Pump System "Analysis and Demonstration"

A. UW Grant Purpose, funds, etc.

During run time of both the actual building and scaled laboratory system/building, as a minimum, the following data will be recorded at five-minute intervals:

i) Heat pump entering/exiting fluid temperatures on both load and source sides. This will allow for the performance assessment of the heat pump system, specifically the heat pump coefficient of performance (COP), as the difference between entering and exiting heat pump temperatures is measure of heat pump energy consumption.

ii) Ground heat exchanger entering/exiting fluid temperatures for the analysis of possible heat losses or gains between the heat pump unit and the ground coupling. It will provide information on the thermal stability of the ground and possibly on the impact of available underground water flow on a short and long term basis.

iii) Entering/exiting fluid temperatures to the supplemental system components. These temperatures are primary influence parameters for the performance analysis of solar thermal and thermal energy storage systems.

iv) Entering/exiting fluid temperatures to the building side of the system for the assessment of energy conversion efficiency for isolation heat exchangers used between the building side and supplemental system components.

v) Fluid flow rate on the building side. The fluid flow rate allows for the analysis of the total building thermal load. Typically, the fluid flow rate

will be changing continuously as the building thermal load changes with weather conditions and space use characteristics.

vi) Fluid flow rate on each supplemental system component. The fluid flow rate on each thermal supplemental system (solar thermal collectors) is required for the assessment of the total each transfer via the supplemental system component. In addition, assessment of supplemental system operating efficiency will be possible as the efficiency varies with the fluid flow rate.

vii) Fluid flow rate on the ground heat exchanger. The magnitude of the heat exchange to/from the ground via the ground heat exchangers is directly proportional to the flow rate of the fluid circulating in the ground.

viii) Ambient dry and wet bulb temperatures. (Weather data obtained via the on-site weather)

ix) Solar radiation intensity. (Weather data obtained via the on-site weather)

x) Ambient wind conditions specifically wind speed and direction. (Weather data obtained via the on-site weather)

xi) Heat pump compressor and building side energy consumption. This will allow for direct comparisons between actual and calculated heat pump energy consumptions.

xii) Energy consumption on fluid circulation pumps. This will be measured directly from the shaft of each fluid circulation pump in the system.

xiii) Energy production on the supplemental photovoltaics system.

xiv) Energy production on the wind turbine system. This will be measured directly from the shaft of the wind turbine.

xv) Heat transfer rates on the building envelope. Zones within the actual building where zone thermal loads provide maximum contribution to the overall building thermal, a series of heat flux measurement devices will be installed on the interior and the exterior walls, and fenestrations for monitoring actual zone thermal loads through measurements of heat transfer rates through the building envelope.

xvi) Occupancy rates in primary building thermal zones.

B. Specification will utilized the above LCCC information stream and in addition, include the following.

The building envelop controls should have the following data streams to and through the controls in a Modbus and/or N2 protocol, web friendly output.

1. Ten Building or five pairs of envelop temperature** readout on each sides of the building and one of the roof. There will be four in pairs with one being placed on the outside of the building envelop (outside building surface), and one in the building wall cavity. The last pair will be for the roof with one being on the surface of the roof and one being on the metal decking. The wall and roof performance will be measured and compared with the space temperature provided above and calculations can be made to determine the actual thermal performance of the wall/roof system.

**These specific locations and temperature gauges will be provided by Seth Carson and the University of Wyoming when needed. Coordination will be made with CW to provide the correct temperature devises. If, CW can provide these devises, it would be helpful.

5. Roles, Responsibilities, Timelines, Costs, etc.