**Facility:**

**Commissioning Provider: Date:**

DIRECTIONS: Address each item listed or note why it was not tested/investigated. Add other items that were tested/investigated. Note what testing/investigation was done, how these were conducted and results of the testing/investigation. Indicate any operating parameters found. Put in EEI# for improvements to resolve items that are not optimal or explain why no improvements are recommended. Complete full EEI description and information in PSE NC Post Occ EEI Details form. Include other capital improvements that may be cost effective. Expand to fit information or note specific location of information. (Handwritten legible notes are acceptable.)

**SYSTEM TYPE: Boiler Plant (ID # or plant name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)**

**EQUIPMENT & SEQUENCES INVESTIGATED** *(be specific)***:**

**Equip ID#s:** *Example: B-1, 2 & 3; BP-1, 2 & 3, P-1 etc.*

**Area Serves/occupancy type:** *Example: north tower, out-patient services*

**Describe System:** *Example: 3 gas boilers (condensing), primary & secondary flow (building loops)*

**Sequences:** *Example: On/Off Schedule, Boiler Staging, HW reset, OA lockout*

**FINDINGS, TESTS and INVESTIGATION RESULTS:**

**Working Optimally?**

**Yes No N/A EEI# \_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**GENERAL SYSTEM CONDITION**: Equipment is generally in good shape and does not exhibit any abnormal nose or vibration. System is not in need of over-all replacement in the near future. Safety guards are in place. Working on and around equipment can be done safely.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SENSOR CALIBRATION & PT-to-PT**: Key controlling sensors are calibrated and in appropriate locations. Points are mapped correctly to the DDC front-end and boiler interface panel. Other sensor outputs seem reasonable. Key sensors include: Hot water supply and return temperatures (HWS and HWR), flow meters, heat exchanger inlet and outlet temperatures.

Sensors checked: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**OUTSIDE AIR TEMPERATURE (OAT) SENSOR CALIBRATION & PT-to-PT:** OA temperature controlling sensor(s) is calibrated and in appropriate locations. Point is mapped correctly to the DDC front-end and/or boiler.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PT-to-PT** **OTHER**: Other critical points (boiler, pump, etc.) are mapped correctly to the DDC front-end and reflect existing system condition.

Points checked: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SCHEDULING**: Operating schedule matches occupancy schedule including holiday scheduling. Boilers and boiler pumps and all parts of Boiler plant are off in unoccupied mode as evidenced by energy internal data or walk-through (night typically).

Schedule: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**LOCK-OUT**: Plant shuts down based on OAT or other indicator of load to prevent heating of water when not needed. Optimal configuration of lock-out based on actual cooling load, not OAT alone, in place.

Lockout criteria:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**OPTIMUM START/STOP – WARM-UP:** System is on as little as possible, prior to occupancy, to warm up building. System is not on for a lot of hours or being driven by one space keeping system on too long. System start time adjusts based on minimum time required to warm up the space by occupancy.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**NIGHT MODE & SETBACK**: Boiler plant shuts down completely when the building is unoccupied. Night walkthrough and early morning reveal nothing on unless needed. For night heating, the boiler comes on only for heating demand from AHUs and boxes with hot water heating.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HW (Hot Water) TEMPERATURES**: Hot water temperatures are controlled and optimized to minimize boiler operation, pumps and AHU fans combined. HWS temperature reset controls are in place. HWS reset temperature is based on actual load, not OAT. For condensing boilers, HWR temperature allows boiler operation in the condensing range (below 140° F) as much as possible. HWS temperature reset range is approximately 60-70° F. HW temperature setpoint reset schedule: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**BOILER STAGING**: Boilers stage to use the most energy efficient boilers or run the boilers in most efficient mode and match actual load. Standard boilers stage to run at full load as much as possible. Condensing boilers stage to have as many boilers at as low a load as possible (typically all boilers staged on and all ramp up together). Configuration minimizes excessive cycling. Turn-down is as low as possible.

Boiler Staging Scheme:

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DELTA T**: Temperature rise across boiler is near design or appropriate.

Design/Appropriate delta T:\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HW PLANT FLOW**: Boiler close off valves are not leaking by and are opening and closing as needed. Water flow is per design and as low as possible. Boilers can be isolated so flow only goes through the boilers that are running. By-pass valves are set for proper flow or eliminated/closed if possible.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PUMPING HEAD**: Pumping head of primary and secondary pumps is reasonable/not too high. “Non-Balancing valves” are not being used for balancing or other reasons (no throttling). All balancing valves are necessary. No unnecessary flow restrictors. Appropriate head: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PUMPING CONTROL**: Variable flow is in place on pumps where flow could vary to meet building load. Differential pressure setpoint is as low as possible. Pumping is varying speed to meet actual load. VFD’s speed and pumping head of primary and secondary pumps is reasonable and not over-pumping.

Differential setpoint:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**WATER TREATMENT**: Water treatment is in place and operating. Water quality appears good. Regular checks are in place.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**BOILER DRAFT**: Boiler has draft damper that closes when boiler is not running.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**BOILER OA INTAKE**: Boiler OA intake has a damper to close when boiler is not needed. Damper closes when boiler is off and OA is not required.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**BOILER COMBUSTION**: Boiler combustion is as efficient as possible with proper OA ratios. Stack temperature is reasonable. Boilers are firing optimally at all stages (low, medium and high). Combustion test performed in the last year and is scheduled annually.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**STEAM TRAPS**: Steam Traps are not leaking or plugged.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**SIMULTANEOUS HEATING & COOLING**: Boiler plant is not running at the same time as the cooling plant. If both systems are operating and it is necessary do so, explain why.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**HEAT EXCHANGERS**: Heat exchangers are clean with expected temperature rise (delta T) cross them. Regular blow downs are in place. Regular check of tubes is in place. Appropriate Delta T: \_\_\_\_\_\_\_\_\_\_

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**OVERRIDES**: Controls, setpoints and equipment that can be easily overridden or circumvented are in normal/automatic operating mode. Examples – pump differential pressure, pump enable, boiler enable.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**INSULATION**: All pipes and storage are adequately insulated. Insulation is around valves but with removable covers so it can be replaced easily after accessing valves.

Tests Conducted /Results/Findings:

**Yes No N/A EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**LOOP TUNING**: Loops are adequately tuned to prevent equipment breakdown and poor control.

Tests Conducted /Results/Findings:

**Yes No EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***OTHER****: Describe other things tested/investigated.*

Tests Conducted /Results/Findings:

**Yes No EEI#\_\_\_\_\_\_\_ Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***OTHER****: Describe other things tested/investigated.*

Tests Conducted /Results/Findings:

**CAPITAL EE IMPROVEMENTS**

**EEI# \_\_\_\_\_\_** *Brief Description of Capital Improvement*

Notes/Comments:

**EEI# \_\_\_\_\_\_** *Brief Description of Capital Improvement*

Notes/Comments:

**TRAINING**

**Yes No Date(s)/time(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Staff (occupants and O&M) fully understands how the system works.**

**Staff (occupants and O&M) fully understands how to run the systems efficiently.**

Specific Staff evaluated:

Comments:

**Specific Training needs of staff (occupants and O&M):**

**Ideas for Facility Guide/Operational Aides/Persistence:** What needs to be added (for example: sensors or specific trends, explanation on DDC graphic, or signage), provided (for example: minimum flow rate) or done (for example: putting check in maintenance schedule) to help the operators keep the systems operating efficiently over time?