## Enable Condenser Water Temperature Reset

### Description

This energy efficiency measure (EEM) adds an integrated water-side economizer to the model in order to take advantage of free cooling present when the outdoor air wet-bulb temperature is low enough. By providing a heat exchanger between the condenser loop and the chilled water loop, when specific outdoor air conditions are met, the compressors can be partially or completely bypassed. This operation uses less energy to provide the same amount of cooling to the building.

### Modeler Description

This EEM adds an integrated water-side economizer (WSE) to the model and also inserts EMS logic to control WSE operation. The added logic first checks the outdoor air wet-bulb temperature (OAWBT). If 6.0 °C ≤ OAWBT ≤ 22.7 °C then the WSE is made unavailable, the chilled water loop setpoint temperature is set to 6.67 °C, and the condenser loop setpoint temperature is set to 26.7 °C. If the OAWBT < 6.0 °C, the WSE is made available, the chilled water loop setpoint temperature is set to the maximum of the OAWBT °C + 4.5 AND 6.67 °C, and the condenser loop setpoint temperature is set to the chilled water loop setpoint minus 0.5 °C.

### Use Case Types

Retrofit, New Construction

### Arguments

No arguments

### Initial Condition Message

The initial model contained a cooling tower and a water-cooled chiller; this measure is applicable.

### Final Condition Message

An integrated water-side economizer was added to the model by inserting a HeatExchanger:FluidToFluid object. The affected condenser loop was named {Condenser Loop Name}. The affected chilled water loop was named {Chilled Water Loop Name}.

### Not Applicable Messages

* No cooling tower objects found. EEM not applied.
* No water-cooled chiller objects found. EEM not applied.
* EMS control logic modifying the economizer’s availability schedule already exists in the model. EEM not applied.

### Warning Messages

### Information Messages

### Error Messages

### Code Outline

* Look for a chiller object with a “Condenser Type” field set to “WaterCooled”. If found, verify that a cooling tower exists in the model.
* Insert a HeatExchanger:FluidToFluid object. The supply side nodes need to be connected upstream of the supply side splitter. The demand side nodes (those attached to the condenser loop) need to be attached such that the HeatExchanger:FluidToFluid object is connected in series with any existing chiller(s).
* In the HeatExchanger:FluidToFluid object, set the “Heat Exchange Model Type” to “CounterFlow” and the “Minimum Temperature Difference to Activate Heat Exchanger {deltaC}” to 5 °C.
* In the CondenserLoop object, set the “Minimum Loop Temperature” to 4 °C.
* Insert the following EMS code:

EnergyManagementSystem:Sensor,

TWb, !- Name

\*, !- Output:Variable or Output:Meter Index Key Name

Site Outdoor Air WetBulb Temperature; !- Output:Variable or Output:Meter Name

EnergyManagementSystem:ProgramCallingManager,

WSE\_Manager, !- Name

BeginTimestepBeforePredictor, !- EnergyPlus Model Calling Point

WSE\_Control; !- Program Name 1

EnergyManagementSystem:Program,

WSE\_Control,

IF TWb < 6,

SET WSE = 1,

SET ChWT = @Max Twb+4.5 6.67,

SET TowerT = ChWT - 0.5,

ELSE,

SET WSE = 0,

SET TowerT = 26.7,

SET ChWT = 6.67,

ENDIF;

EnergyManagementSystem:Actuator,

WSE, !- Name

{Heat Exchanger Availability Schedule Name}, !- Actuated Component Unique Name

Schedule:Constant, !- Actuated Component Type

Schedule Value; !- Actuated Component Control Type

EnergyManagementSystem:Actuator,

TowerT, !- Name

{Condenser Loop Setpoint Temperature Schedule Name}, !- Actuated Component Unique Name

Schedule:Compact, !- Actuated Component Type

Schedule Value; !- Actuated Component Control Type

EnergyManagementSystem:Actuator,

ChwT, !- Name

{Plant Loop Setpoint Temperature Schedule Name}, !- Actuated Component Unique Name

Schedule:Compact, !- Actuated Component Type

SChedule Value; !- Actuated Component Control Type

### Tests

**This measure applies to:**

1. Large Office
2. Hospital

**This measure does not apply to:**

1. Small Office
2. Medium Office
3. Primary School
4. Secondary School
5. Stand-Alone Retail
6. Strip Mall
7. Supermarket
8. Quick Service Restaurant
9. Full Service Restaurant
10. Small Hotel
11. Large Hotel
12. Outpatient Healthcare
13. Warehouse
14. Midrise Apartment

**Test results:**