The descriptions of the existing section Chiller:Electric:ReformulatedEIR needs to be revised (around Page 593). Modifications are shown below using Track Changes.\_\_\_Rongpeng Zhang, Feb. 19, 2015

### Chiller:Electric:ReformulatedEIR

This chiller model, developed through the CoolTools™ project sponsored by Pacific Gas and Electric Company (PG&E), is an empirical model similar to EnergyPlus’ Chiller:Electric:EIR model. The model uses performance information at reference conditions along with three curve fits for cooling capacity and efficiency to determine chiller operation at off-reference conditions. The model has the same capabilities as the Chiller:Electric:EIR model, but can potentially provide significant accuracy improvement over the Chiller:Electric:EIR model for variable-speed compressor drive and variable condenser water flow applications. Chiller performance curves can be generated by fitting manufacturer’s catalog data or measured data. Performance curves developed from manufacturer’s performance data are provided in the EnergyPlus Reference DataSets (Chillers.idf and AllDataSets.idf). This chiller model can be used to predict the performance of various chiller types (e.g., reciprocating, screw, scroll, and centrifugal) with water-cooled condensers.

The main difference between this model and the Chiller:Electric:EIR model is the condenser fluid temperature used in the associated performance curves: the Chiller:Electric:ReformulatedEIR model uses the LEAVING condenser water temperature while the Chiller:Electric:EIR model uses the ENTERING condenser water temperature.

Note: Chiller:Electric:Reformulated EIR objects and their associated performance curve objects are developed using performance information for a specific chiller and should almost always be used together for an EnergyPlus simulation. Changing the object input values, or swapping performance curves between chillers, should be done with extreme caution. For example, if the user wishes to model a chiller size that is different from the reference capacity, it is highly recommended that the reference flow rates be scaled proportionately to the change in reference capacity. Although this model can provide more accurate prediction than the Chiller:Electric:EIR model, it requires more performance data to develop the associated performance curves (at least 12 points from full-load performance and 7 points from part-load performance).

#### Field: Chiller Name

This alpha field contains the identifying name for this chiller.

#### Field: Reference Capacity

This numeric field contains the reference cooling capacity of the chiller in Watts. This should be the capacity of the chiller at the reference temperatures and water flow rates defined below. Alternately, this field can be autosized.

#### Field: Reference COP

This numeric field contains the chiller’s coefficient of performance. This value should **not** include energy use due to pumps or cooling tower fans. This COP should be at the reference temperatures and water flow rates defined below.

#### Field: Reference Leaving Chilled Water Temperature

This numeric field contains the chiller’s reference leaving chilled water temperature in Celsius. The default value is 6.67°C.

#### Field: Reference Leaving Condenser Water Temperature

This numeric field contains the chiller’s reference leaving condenser water temperature in Celsius. The default value is 35°C.

#### Field: Reference Chilled Water Flow Rate

For a variable flow chiller this is the maximum water flow rate and for a constant flow chiller this is the operating water flow rate through the chiller’s evaporator. The units are in cubic meters per second. The minimum value for this numeric input field must be greater than zero, or this field can be autosized.

#### Field: Reference Condenser Water Flow Rate

This numeric field contains the chiller’s operating condenser water flow rate in cubic meters per second. The units are in cubic meters per second. The minimum value for this numeric input field must be greater than zero, or this field can be autosized.

#### Field: Cooling Capacity Function of Temperature Curve Name

The name of a biquadratic performance curve (ref: Performance Curves) that parameterizes the variation of the cooling capacity as a function of the leaving chilled water temperature and the leaving condenser water temperature. The output of this curve is multiplied by the reference capacity to give the cooling capacity at specific temperature operating conditions (i.e., at temperatures different from the reference temperatures). The curve should have a value of 1.0 at the reference temperatures and flow rates specified above. The biquadratic curve should be valid for the range of water temperatures anticipated for the simulation (otherwise the program issues warning messages).

#### Field: Electric Input to Cooling Output Ratio Function of Part Load Ratio Curve Type

This choice field determines which type of the Electric Input to Cooling Output Ratio Function of Part Load Ratio Curve is used in the chiller modeling. Two curve types are available: (1) Type LeavingCondenserWaterTemperature is based on the leaving condenser water temperature. (2) Type Lift is based on the normalized lift, which is the temperature difference between the leaving condenser water temperature and the leaving evaporator water temperature.

#### Field: Electric Input to Cooling Output Ratio Function of Temperature Curve Name

The name of the Electric Input to Cooling Output Ratio Function of Part Load Ratio Curve. The form of this curve is based on the input for Electric Input to Cooling Output RatioFunction of Part Load Ratio Curve Type. For the type of LeavingCondenserWaterTemperature, the curve object type should be Curve:Bicubic or Table:TwoIndependentVariables that parameterizes the variation of the energy input to cooling output ratio (EIR) as a function of the leaving chilled water temperature and the leaving condenser water temperature. For the type of Lift, the curve object type should be Curve:ChillerPartLoadWithLiftCurves or Table:MultiVariableLookup that parameterizes the variation of EIR as a function of the normalized fractional Lift, normalized Tdev and the PLR. Tdev is the difference between Leaving Chilled Water Temperature and Reference Chilled Water Temperature. Lift is the Leaving Condenser Water Temperature and Leaving Chilled Water Temperature. The EIR is the inverse of the COP. The output of this curve is multiplied by the reference EIR (inverse of the reference COP) to give the EIR at specific temperature operating conditions (i.e., at temperatures different from the reference temperatures). The curve should have a value of 1.0 at the reference temperatures and flow rates specified above. The biquadratic curve should be valid for the range of water temperatures anticipated for the simulation (otherwise the program issues warning messages).

#### Field: Electric Input to Cooling Output Ratio Function of Part Load Ratio Curve Name

The name of a bicubic performance curve (ref: Performance Curves) that parameterizes the variation of the energy input ratio (EIR) as a function of the leaving condenser water temperature and the part-load ratio (EIRfTPLR). The EIR is the inverse of the COP, and the part-load ratio is the actual cooling load divided by the chiller’s available cooling capacity. This curve is generated by dividing the operating electric input power by the available full-load capacity (do not divide by load) at the specific operating temperatures. The curve output should decrease from 1 towards 0 as part-load ratio decreases from 1 to 0. The output of this curve is multiplied by the reference full-load EIR (inverse of the reference COP) and the Energy Input to Cooling Output Ratio Function of Temperature Curve to give the EIR at the specific temperatures and part-load ratio at which the chiller is operating. This curve should have a value of 1.0 at the reference leaving condenser water temperature with the part-load ratio equal to 1.0. An ideal chiller with the same efficiency at all part-load ratio’s would use a performance curve that has a value of 0 when the part-load ratio equals 0 (i.;e., a line connecting 0,0 and 1,1 when plotted as EIRfTPLR versus PLR), however, actual systems can have part-load EIR’s slightly above or below this line (i.e., part-load efficiency often differs from rated efficiency). The bicubic curve should be valid for the range of condenser water temperatures and part-load ratios anticipated for the simulation (otherwise the program issues warning messages).

Note: Although a bicubic curve requires 10 coefficients (ref. Curve:Bicubic), coefficients 7, 9 and 10 are typically not used in the performance curve described here and should be entered as 0 unless sufficient performance data and regression accuracy exist to justify the use of these coefficients. Additionally, coefficients 2, 3, and 6 should not be used unless sufficient temperature data is available to accurately define the performance curve (i.e., negative values may result from insufficient data).

#### Field: Minimum Part Load Ratio

This numeric field contains the chiller’s minimum part-load ratio. The expected range is between 0 and 1. Below this part-load ratio, the compressor cycles on and off to meet the cooling load. The Minimum Part Load Ratio must be less than or equal to the Maximum Part Load Ratio. The default value is 0.1.

#### Field: Maximum Part Load Ratio

This numeric field contains the chiller’s maximum part-load ratio. This value may exceed 1, but the normal range is between 0 and 1.0. The Maximum Part Load Ratio must be greater than or equal to the Minimum Part Load Ratio. The default value is 1.0.

#### Field: Optimum Part Load Ratio

This numeric field contains the chiller’s optimum part-load ratio. This is the part-load ratio at which the chiller performs at its maximum COP. The optimum part-load ratio must be greater than or equal to the Minimum Part Load Ratio, and less than or equal to the Maximum Part Load Ratio. The default value is 1.0.

#### Field: Minimum Unloading Ratio

This numeric field contains the chiller’s minimum unloading ratio. The expected range is between 0 and 1. The minimum unloading ratio is where the chiller capacity can no longer be reduced by unloading and must be false loaded to meet smaller cooling loads. A typical false loading strategy is hot-gas bypass. The minimum unloading ratio must be greater than or equal to the Minimum Part Load Ratio, and less than or equal to the Maximum Part Load Ratio. The default value is 0.2.

#### Field: Chilled Water Side Inlet Node

This required alpha field contains the identifying name for the chiller plant side (chilled water) inlet node.

#### Field: Chilled Water Side Outlet Node

This required alpha field contains the identifying name for the chiller plant side (chilled water) outlet node.

#### Field: Condenser Side Inlet Node

This required alpha field contains the identifying name for the chiller condenser side inlet node.

#### Field: Condenser Side Outlet Node

This required alpha field contains the identifying name for the chiller condenser side outlet node.

#### Field: Fraction of Compressor Electric Power Rejected by Condenser

This numeric input represents the fraction of compressor electrical energy consumption thatmust be rejected by the condenser. Enter a value of 1.0 when modeling hermetic chillers. For open chillers, enter the compressor motor efficiency. This value must be greater than 0.0 and less than or equal to 1.0, with a default value of 1.0.

#### Field: Leaving Chilled Water Lower Temperature Limit

This numeric field contains the lower limit for the leaving chilled water temperature in Celsius. This temperature acts as a cut off for heat transfer in the evaporator, so that the water doesn’t get too cold. This input field is currently unused. The default value is 2°C.

#### Field: Chiller Flow Mode Type

This choice field determines how the chiller operates with respect to the intended fluid flow through the device’s evaporator. There are three different choices for specifying operating modes for the intended flow behavior: “NotModulated,” “ConstantFlow,” and “LeavingSetpointModulated.” NotModulated is useful for either variable or constant speed pumping arrangements where the chiller is passive in the sense that although it makes a nominal request for its design flow rate it can operate at varying flow rates. ConstantFlow is useful for constant speed pumping arrangements where the chiller’s request for flow is stricter and can increase the overall loop flow. LeavingSetpointModulated changes the chiller model to internally vary the flow rate so that the temperature leaving the chiller matches a setpoint. In all cases the operation of the external plant system can also impact the flow through the chiller -- for example if the relative sizes and operation are such that flow is restricted and the requests cannot be met. The default, if not specified, is NotModulated.

#### Field: Design Heat Recovery Water Flow Rate

This is the design heat recovery water flow rate if the heat recovery option is being simulated. If this value is greater than 0.0 (or autosize), a heat recovery loop must be specified and attached to the chiller using the next two node fields. The units are in cubic meters per second. This field is autosizable. When autosizing, the flow rate is simply the product of the design condenser flow rate and the condenser heat recovery relative capacity fraction set in the field below.

#### Field: Heat Recovery Side Inlet Node

This alpha field contains the identifying name for the chiller heat recovery side inlet node. If the user wants to model chiller heat recovery, a heat recovery loop must be specified and it can only be used with a water-cooled condenser.

#### Field: Heat Recovery Side Outlet Node

This alpha field contains the identifying name for the chiller heat recovery side outlet node. If the user wants to model chiller heat recovery, a heat recovery loop must be specified and it can only be used with a water-cooled condenser.

#### Field: Sizing Factor

This optional numeric field allows the user to specify a sizing factor for this component. The sizing factor is used when the component design inputs are autosized: the autosizing calculations are performed as usual and the results are multiplied by the sizing factor. For this component the inputs that would be altered by the sizing factor are: Reference Capacity, Reference Chilled Water Flow Rate and Reference Condenser Water Flow Rate. Sizing Factor allows the user to size a component to meet part of the design load while continuing to use the autosizing feature.

#### Field: Condenser Heat Recovery Relative Capacity Fraction

This field is optional. It can be used to describe the physical size of the heat recovery portion of a split bundle condenser section. This fraction describes the relative capacity of the heat recovery bundle of a split condenser compared to the nominal, full load heat rejection rate of the chiller. This fraction will be applied to the full heat rejection when operating at nominal capacity and nominal COP to model a capacity limit for the heat rejection. If this field is not entered then the capacity fraction is set to 1.0.

#### Field: Heat Recovery Inlet High Temperature Limit Schedule Name

This field is optional. It can be used to control heat recovery operation of the chiller. The schedule named here should contain temperature values, in C, that describe an upper limit for the return fluid temperatures entering the chiller at the heat recovery inlet node. If the fluid temperature is too high, then the heat recovery will not operate. This is useful to restrict the chiller lift from becoming too high and to avoid overheating the hot water loop. This limit can be used with or without the alternate control using leaving setpoint that is set in the next field.

#### Field: Heat Recovery Leaving Temperature Setpoint Node Name

This field is optional. It can be used to refine the model and controls for heat recovery operation of the chiller. The node named here should have a setpoint placed on it by a setpoint manager. If the plant loop’s demand calculation scheme is set to SingleSetpoint, then a single setpoint manager should be used. If the plant loop’s demand calculation is set to DualSetpointDeadband then a dual setpoint manager should be used and the upper setpoint is used for control. When this field is used, a different model is used for determining the distribution of rejected heat between the two bundles that is more appropriate for series bundle arrangements and for chiller’s that are able to produce relatively higher temperature heated fluilds.

An example of this statement in an IDF is:

Chiller:Electric:ReformulatedEIR,

Main Chiller, !- Chiller Name

50000, !- Reference Capacity {W}

3.99, !- Reference COP

6.67, !- Reference Leaving Chilled Water Temperature {C}

35.0, !- Reference Leaving Condenser Water Temperature {C}

0.00898, !- Reference Chilled Water Flow Rate {m3/s}

0.01122, !- Reference Condenser Water Flow Rate {m3/s}

Main Chiller RecipCapFT, !- Cooling Capacity Function of Temperature Curve

Main Chiller RecipEIRFT, !- Electric Input to Cooling Output Ratio Function of

Temperature Curve

LeavingCondenserWaterTemperature !- Electric Input to Cooling Output Ratio Function of Part

Load Ratio Curve Type

Main Chiller RecipEIRFPLR, !- Electric Input to Cooling Output Ratio Function of Part

Load Ratio Curve Name

0.01, !- Minimum Part Load Ratio

1, !- Maximum Part Load Ratio

1, !- Optimum Part Load Ratio

0.07, !- Minimum Unloading Ratio

Main Chiller ChW Inlet, !- Chilled Water Side Inlet Node

Main Chiller ChW Outlet, !- Chilled Water Side Outlet Node

Main Chiller Cnd Inlet, !- Condenser Side Inlet Node

Main Chiller Cnd Outlet, !- Condenser Side Outlet Node

1, !- Fraction of Compressor Electric Power Rejected by Condenser

2, !- Leaving Chilled Water Lower Temperature Limit {C}

ConstantFlow; !- Chiller Flow Mode

! Cooling capacity to rated capacity function of Temperature Curve

! x = Leaving Chilled Water Temperature and y = Leaving Condenser Water Temperature

Curve:Biquadratic,

Main Chiller RecipCapFT, !- Name

0.958546443, !- Coefficient1 Constant

0.035168695, !- Coefficient2 x

0.000124662, !- Coefficient3 x\*\*2

-0.00274551, !- Coefficient4 y

-0.00005000, !- Coefficient5 y\*\*2

-0.00017234, !- Coefficient6 x\*y

5.00, !- Minimum Value of x

10.0, !- Maximum Value of x

20.00, !- Minimum Value of y

40.94; !- Maximum Value of y

! Energy Input to Cooling Output Ratio Function of Temperature Curve

! x = Leaving Chilled Water Temperature and y = Leaving Condenser Water Temperature

Curve:Biquadratic,

Main Chiller RecipEIRFT, !- Name

0.732700123, !- Coefficient1 Constant

-0.00834360, !- Coefficient2 x

0.000638530, !- Coefficient3 x\*\*2

-0.00303753, !- Coefficient4 y

0.000484952, !- Coefficient5 y\*\*2

-0.00083584, !- Coefficient6 x\*y

5.00, !- Minimum Value of x

10.0, !- Maximum Value of x

20.00, !- Minimum Value of y

40.94; !- Maximum Value of y

! Energy Input to Cooling Output Ratio Function of Part Load Ratio Curve

! x = Leaving Condenser water Temperature and y = Part Load Ratio

Curve:Bicubic,

Main Chiller RecipEIRFPLR, !- Name

0.070862846, !- Coefficient1 Constant

0.002787560, !- Coefficient2 x

-0.00000891, !- Coefficient3 x\*\*2

0.230973399, !- Coefficient4 y

1.250442176, !- Coefficient5 y\*\*2

-0.00216102, !- Coefficient6 x\*y

0.000000, !- Coefficient7 x\*\*3

-0.56300936, !- Coefficient8 y\*\*3

0.000000, !- Coefficient9 x\*\*2\*y

0.000000, !- Coefficient10 x\*y\*\*2

20.00, !- Minimum Value of x

40.94, !- Maximum Value of x

0.01, !- Minimum Value of y

1.0; !- Maximum Value of y