# NEW DOCUMENTATION

### Curve:CubicLinear

This curve is a function of two independent variables. Input consists of the curve name, the six coefficients, and min and max values for each of the independent variables. Optional inputs for curve minimum and maximum may be used to limit the output of the performance curve (e.g., limit extrapolation). The equation represented by the cubic linear curve:

#### Field: Name

A user assigned unique name for an instance of a quadratic-linear curve. When a curve is used, it is referenced by this name.

#### Field: Coefficient1 Constant

The constant coefficient (C1) in the equation.

#### Field: Coefficient2 x

The coefficient C2 in the equation.

#### Field: Coefficient3 x\*\*2

The coefficient C3 in the equation.

#### Field: Coefficient4 x\*\*3

The coefficient C4 in the equation.

#### Field: Coefficient5 y

The coefficient C5 in the equation.

#### Field: Coefficient6 x\*y

The coefficient C6 in the equation.

#### Field: Minimum Value of x

The minimum allowable value of x. Values of x less than the minimum will be replaced by the minimum.

#### Field: Maximum Value of x

The maximum allowable value of x. Values of x greater than the maximum will be replaced by the maximum.

#### Field: Minimum Value of y

The minimum allowable value of y. Values of y less than the minimum will be replaced by the minimum.

#### Field: Maximum Value of y

The maximum allowable value of y. Values of y greater than the maximum will be replaced by the maximum.

#### Field: Minimum Curve Output

The minimum allowable value of the evaluated curve. Values less than the minimum will be replaced by the minimum.

#### Field: Maximum Curve Output

The maximum allowable value of the evaluated curve. Values greater than the maximum will be replaced by the maximum.

#### Field: Input Unit Type for X

This field is used to indicate the kind of units that may be associated with the x values. The only option at this time is **Dimensionless.**

#### Field: Input Unit Type for Y

This field is used to indicate the kind of units that may be associated with the x values. The only option at this time is **Dimensionless.**

#### Field: Output Unit Type

This field is used to indicate the kind of units that may be associated with the output values. The only option at this time is **Dimensionless.**

The IDD for this new input is shown below.

**Curve:CubicLinear,**

\memo Cubic-linear curve with two independent variables. Input consists of the

\memo curve name, the six coefficients, and min and max values for each of the

\memo independent variables. Optional inputs for curve minimum and maximum may

\memo be used to limit the output of the performance curve.

\memo curve = (C1 + C2\*x + C3\*x\*\*2 + C4\*x\*\*3) + (C5 + C6\*x)\*y

A1 , \field Name

\required-field

\type alpha

\reference CubicLinearCurves

\reference AllCurves

N1 , \field Coefficient1 Constant

\required-field

\type real

N2 , \field Coefficient2 x

\required-field

\type real

N3 , \field Coefficient3 x\*\*2

\required-field

\type real

N4 , \field Coefficient4 x\*\*3

\required-field

\type real

N5 , \field Coefficient5 y

\required-field

\type real

N6 , \field Coefficient6 x\*y

\required-field

\type real

N7 , \field Minimum Value of x

\required-field

\type real

\unitsBasedOnField A2

N8 , \field Maximum Value of x

\required-field

\type real

\unitsBasedOnField A2

N9 , \field Minimum Value of y

\required-field

\type real

\unitsBasedOnField A3

N10, \field Maximum Value of y

\required-field

\type real

\unitsBasedOnField A3

N11, \field Minimum Curve Output

\type real

\note Specify the minimum value calculated by this curve object

\unitsBasedOnField A4

N12, \field Maximum Curve Output

\type real

\note Specify the maximum value calculated by this curve object

\unitsBasedOnField A4

A2, \field Input Unit Type for X

\type choice

\key Dimensionless

\default Dimensionless

A3, \field Input Unit Type for Y

\type choice

\key Dimensionless

\default Dimensionless

A4; \field Output Unit Type

\type choice

\key Dimensionless

\default Dimensionless

In addition, the detailed ice storage input will be modified to accept either QuadraticLinear or CubicLinear curve input.

An example input for the new CubicLinear equation form is shown below.

Curve:CubicLinear,

InsideMeltIceDischarging, !- Name

0.108734675, !- Coefficient1 Constant

-0.989874286, !- Coefficient2 x

0.696303562, !- Coefficient3 x\*\*2

-0.134945307, !- Coefficient4 x\*\*3

1.724007415, !- Coefficient5 y

-1.094020457, !- Coefficient6 y\*x

0.25, !- Minimum Value of x

1, !- Maximum Value of x

0.69, !- Minimum Value of y

1.26, !- Maximum Value of y

0.0926, !- Minimum Curve Output

0.4938, !- Maximum Curve Output

Dimensionless, !- Input Unit Type for X

Dimensionless, !- Input Unit Type for Y

Dimensionless, !- Output Unit Type

# REVISED DOCUMENTATION (track changes shows changes)

### ThermalStorage:Ice:Detailed

The detailed ice storage model allows the users of EnergyPlus to model more closely specific manufacturers’ ice storage units. This is possible due to the use of curve fits to simulate the performance of the ice storage unit during charging and discharging. In this implementation, both charging and discharging are a function of the fraction charged/discharged as well as the log mean temperature difference across the storage unit. More information on the model is provided in the Engineering Reference for EnergyPlus. The remainder of this section describes the input required for the detailed ice storage model and the output that it can produce.

#### Field: Name

This field is the name of the detailed ice storage system given to it by the user.

#### Field: Availability Schedule Name

This field is the name of the schedule (ref: Schedule) that determines whether or not the ice storage system is available during a particular time period. This allows the system to be turned off during a particular season. A value of less than or equal to zero indicates that the ice storage system is not available. Any value greater than zero indicates that the system is available. If this field is blank, the schedule has values of 1 for all time periods.

#### Field: Capacity

This number is the maximum amount of latent thermal storage available in the ice storage system. This model does not allow the removal or addition of sensible energy from the tank. Thus, it is always assumed to be at the freezing temperature of the storage material. The capacity is expressed in units of GJ.

#### Field: Inlet Node Name

This is the name of the node that connects the ice storage system to the plant loop. It is the inlet node to the ice storage component. The next field defines the outlet node. Due to presence of an internal bypass in this model, there are other “nodes” that are handled internally within the program. Users do not need to define any nodes other than the inlet and outlet nodes.

#### Field: Outlet Node Name

This is the name of the other node that connects the ice storage system to the plant loop. It is the outlet node to the ice storage component.

#### Field: Discharging Curve Object Type

The detailed ice storage model in EnergyPlus takes advantage of the Curve feature of the program. Currently, the only two allowed curve fit types for the detailed ice storage model are the QuadraticLinear and the CubicLinear curves. More information on this curve can be found in the section on Curves.

#### Field: Discharging Curve Name

This field specifies the name of the actual curve fit to be used to model the discharging process of the detailed ice storage system.

#### Field: Charging Curve Object Type

The detailed ice storage model in EnergyPlus takes advantage of the Curve feature of the program. Currently, the only two allowed curve fit types for the detailed ice storage model are the QuadraticLinear and the CubicLinear curves. More information on this curve can be found in the section on Curves.

#### Field: Charging Curve Name

This field specifies the name of the actual curve fit to be used to model the charging process of the detailed ice storage system.

#### Field: Timestep of the Curve Data

This field defines what timestep was used to produce the curve fits named in the previous inputs. This parameter is important because the curve fit is non-dimensional. Thus, the data used to develop the curve fits were based on a specific length of time. In many cases, this is probably one hour or 1.0. The units for this parameter are hours.

#### Field: Parasitic Electric Load During Discharging

This field defines the amount of parasitic electric consumption (for controls or other miscellaneous electric consumption associate with the ice storage unit itself) during the discharge phase. This parameter is dimensionless and gets multiplied by the current load on the tank.

#### Field: Parasitic Electric Load During Charging

This field defines the amount of parasitic electric consumption (for controls or other miscellaneous electric consumption associate with the ice storage unit itself) during the charge phase. This parameter is dimensionless and gets multiplied by the current load on the tank.

#### Field: Tank Loss Coefficient

This field defines the loss of ice stored during a particular hour. This field is dimensionless (per hour). It is not multiplied by any temperature difference between the tank and the environment in which it might be located.

#### Field: Freezing Temperature of Storage Medium

This parameter defines the freezing/melting temperature of the ice storage medium in degrees Celsius. For most tanks, this is simply 0.0°C (the default value). However, some tanks may use other materials or salts which would change the freezing temperature. This can be changed using this parameter.

#### Field: Thaw Process Indicator

This input field assists in more accurate modeling of the charging process by defining how the thawing of ice takes place. There are two options for this input: **InsideMelt** and **OutsideMelt**. Some ice storage systems, by their nature, start the charging process with a bare coil or no ice left on the charging surface even though there is still ice stored in the tank. An example of such a system is sometimes referred to as an ice-on-coil inside melt system, and these systems would define this parameter using the “InsideMelt” option for this field. Other systems melt the ice from the outside, leaving ice still on the charging surface when charging begins. These systems are modeled using the “OutsideMelt” option. For systems that have a charging process that does not vary significantly with fraction charged can ignore this input by accepting the default value. The default value for this field is “OutsideMelt”.

An IDF example:

ThermalStorage:Ice:Detailed,

Ice Tank, !- Ice Storage Name

ON, !- Ice Storage availability schedule

0.5, !- Ice Storage Capacity {GJ}

Ice Tank Inlet Node, !- Plant Loop Inlet Node

Ice Tank Outlet Node, !- Plant Loop Outlet Node

QuadraticLinear, !- Discharging Curve Fit Type

DischargeCurve, !- Discharging Curve Name

QuadraticLinear, !- Charging Curve Fit Type

ChargeCurve, !- Charging Curve Name

1.0, !- Timestep of Curve Fit Data

0.0001, !- Parasitic electric load during discharging

0.0002, !- Parasitic electric load during charging

0.0003, !- Tank loss coefficient

0.0; !- Freezing temperature [C]