SAM Input Variables description

This document is created to list the format of SAM input variables, since they don't always look like the same as can be seen from the SAM software.

Import the SAM generated JSON file to the software.

The approach to generate the input JSON file from SAM(Version 2020.2.29) software is:

1. Click the Dropdown Menu of your SAM project
2. Select 'Generate Code'
3. Choose 'JSON for inputs'
4. Select a folder to keep the file

Weather Data Format for Static Collector Models

The valid format of weather file for static collector models is very closed to the SAM CSV format. The model recognizes the weather file's time resolution based on the number of data rows in the weather file.

Header

The header rows provide location information and metadata, and identify the data columns.

Row 1

Row 1 contains labels for the location data and metadata, and must include at least the following, which may be in any order:

- Latitude
- Longitude
- Time zone
- Elevation

For example, a valid Row 1 might look like this:

Source,Location ID,City,State,Region,Country,Latitude,Longitude,Time Zone,Elevation

See the table below for a complete list of Row 1 header fields, accepted labels, and and units.

Row 2

Row 2 contains values for the location data and metadata identified by the labels in Row 1.

- Latitude is a value between -90.0 and 90.0 decimal degrees north of the equator, e.g., 39.75 for Denver, and -33.95 for Sydney, Australia.
- Longitude is a value between -180.0 and 180.0 decimal degrees East of the prime meridian, e.g., -104.95 for Denver, and 116.28 for Beijing, China.
- Time zone is for standard time in hours ahead of GMT, e.g., -7 for Denver, and 5.5 for India.
- Elevation is in meters above sea level, e.g., 1615 for Denver.

For example, given the Row 1 example above, Row 2 for Phoenix, Arizona might look like this:

TMY2,23183,Phoenix,AZ,USA,33.433333,-112.016667,-7,339

Row 3

Labels identifying the data columns. The model uses the labels to identify the columns, so they can be in any order. It requires a complete column of data for each data element. The Minute column is optional for hourly data.

For example, a valid Row 3 might look like this:

Year,Month,Day,Hour,Minute,GHI,DNI,DHI,Tdry,Tdew,RH,Pres,Wspd,Wdir,Snow Depth

See the table below for a complete list of valid Row 3 header values and units.

Row 4 - 8,763

Data identified in Row 3. For example:

1988,1,1,0,0,0,0,5.6,-3.3,53,983,2.1,200,0

- Year is a four-digit number (1988)
- Month is a one- or two-digit number (Month = 1 is January)
- Day is a one- or two-digit number indicating the day of month (Day = 1 is the first day of the month).
- Hour is a one- or two-digit number indicating the hour of day (Hour = 0 is the first hour of the day, or
- the hour ending at 1 am).
- Minute is not required but just for record.
- Solar irradiance in W/m2. SAM's photovoltaic models assume instantaneous irradiance. The CSP models assume average irradiance over the time step.
- Temperature in °C.

Data Field	Units	Accepted Labels for Row 3
Year		Year
Month	1 - 12	Month
Day	1 - 31	Day
Hour	0 - 23	Hour
Minute	0 - 59	Minute
Global horizontal irradiance	W/m2	GHI
Beam normal irradiance	W/m2	DNI
Diffuse horizontal irradiance	W/m2	DHI
Ambient dry bulb temperature	°C	Tdry

SAM – IPH Linear Fresnel Direct Steam

Tab - Collector and Receiver

Values in this tab need to be created in the format of $[\,[value],\ [0]\,]$, if $value$ is a number. If $value$ is an array, the second item in the big brackets should be an array of zeros with the same size. Please see more descriptions below:

Section – Boiler Geometry and Optical Performance

- Optical characterization method: Input $value$ with 1-3 for 3 different methods:
  1: Solar position table
  2. Collector incidence angle table
  3. Incidence angle modifers
  For example: Input $[\,[1],\ [0]\,]$ to choose the solar position table method

- Values of the optical efficiency table: Input is required if method 1 or method 2 is selected for optical characterization. Input $value$ as an array of two integers, each of which stands for the number of rows and columns in the data table.

Section – Incidence Angle Modifier Coefficients

- Transverse and longitudinal incident angle modifiers: $value$ is an array of 5 values, which are the 0th, 1st, 2nd, 3rd and 4^{th} order terms of method 3

SAM – Detailed PV model

Tab – System Design

Section – DC Sizing and Configuration

Sub-section – Tracking & Orientation

- Optical Tracking mode for arrays:
  - 0: Fixed
  - 1: 1 Axis
  - 2: 2 Axis
  - 3: Azimuth Axis
  - 4: Seasonal Tilt

The variable “Monthly tilt input” is only required when you select seasonal tilt mode.

SAM – Parabolic Trough model

Tab – Collectors (SCAs)

The input variables on this tab need to be an array with a length of 4. Each element in the array represents the values for different types of collectors (From Type 1 to Type 4). Only 1 type of collector is specified in the default inputs, so the values are identical for Type 2,3 and 4.

If you wish to specify a different collector as Type 2, please change the 2nd element in each array accordingly. Type 2 collector can then be applied in the loop configuration by editing the Tab **- Solar Field – Single Loop Configuration**.

Parabolic Trough model

Tab – Receivers (HCEs)

4 types of receivers can be specified for the receivers. (From Type 1 to Type 4)

Section – Parameters and Variations

- Absorber emittance for receiver type x variation 1: Input an array of [Temp °C, Emittance] pairs. For example:
  [[100, 0.064], [150, 0.065], [200, 0.07]]
- Other parameters in the sub-section Absorber Parameters: Input the value with 2 brackets as [[value]]
- Envelope Parameters: Input an array of 4 arrays, each of which stands for one type of the receiver and also has a length of 4 (for 4 variations), for example for the Glazing intact flag:
  [[1, 1, 0, 1], [1, 1, 0, 1], [1, 1, 0, 1], [1, 1, 0, 1]]

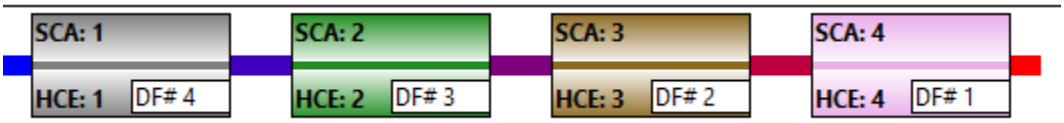
Section – Receiver Geometry

- Flow type through the absorber: choose 0 or 1 for different types
  0: Annular flow
  1: Tube flow
  For each type of receiver, the input needs to be an array of the corresponding type with the length of 4, for example:
  [[1, 1, 1, 1], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]
  It means Type 1 receiver has tube flow while the other three types have annular flow.
- Absorber material type: choose 1 to 4 for different types
  1: 304L
  2: 216L
  3: 321H
  4: B42 Copper
  The format of input is the same as above, for example:
  [[1, 1, 1, 1], [2, 2, 2, 2], [2, 2, 2, 2], [2, 2, 2, 2]]
- Other variables on this page: Input an array of 4 for each type of receiver

Parabolic Trough model

Tab – Solar Field

- Field HTF fluid: Input value to choose different fluids:
  - 18: Hitec Solar Salt
  - 19: Caloria HT 43
  - 20: Hitec XL
  - 21: Therminol VP-1
  - 22: Hitec
  - 23: Dowtherm Q
  - 24: Dowtherm RP
  - 30: Therminol 59
  - 29: Therminol 66
  - 31: Pressurized Water
  - "Input Nothing": User-defined
- Single Loop Configuration:
  Trough loop configuration: Input an array which starts with the number of SCAs specified, followed by the type of collector, type of receiver, order number of the assembly, from the last assembly to the first assembly
  For example: the following configuration would convert to an input array of:
  [4, 1,1,4, 2,2,3, 3,3,2, 4,4,1], where type of collector, type of receiver are specified in the Tab-Collectors and Tab-Receivers



  Receiver and collector type for each assembly in loop: Input an array of
  [[type of collector, type of receiver]] pairs

Linear Fresnel Molten Salt

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SAM – Industrial Process Heat - Parabolic Trough model

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- Other parameters: Input an array of 4 arrays, each of which stands for one type of the receiver and also has a length of 4 (for 4 variations), for example for the Glazing intact flag:
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  [[1, 1, 1, 1], [0, 0, 0, 0], [0, 0, 0, 0], [0, 0, 0, 0]]
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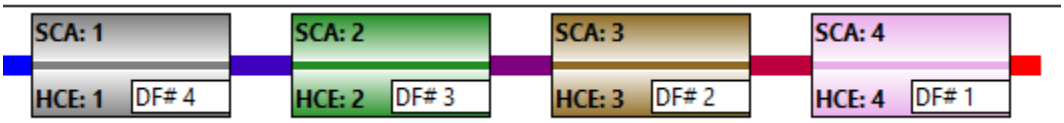

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