System Advisor Model (SAM)

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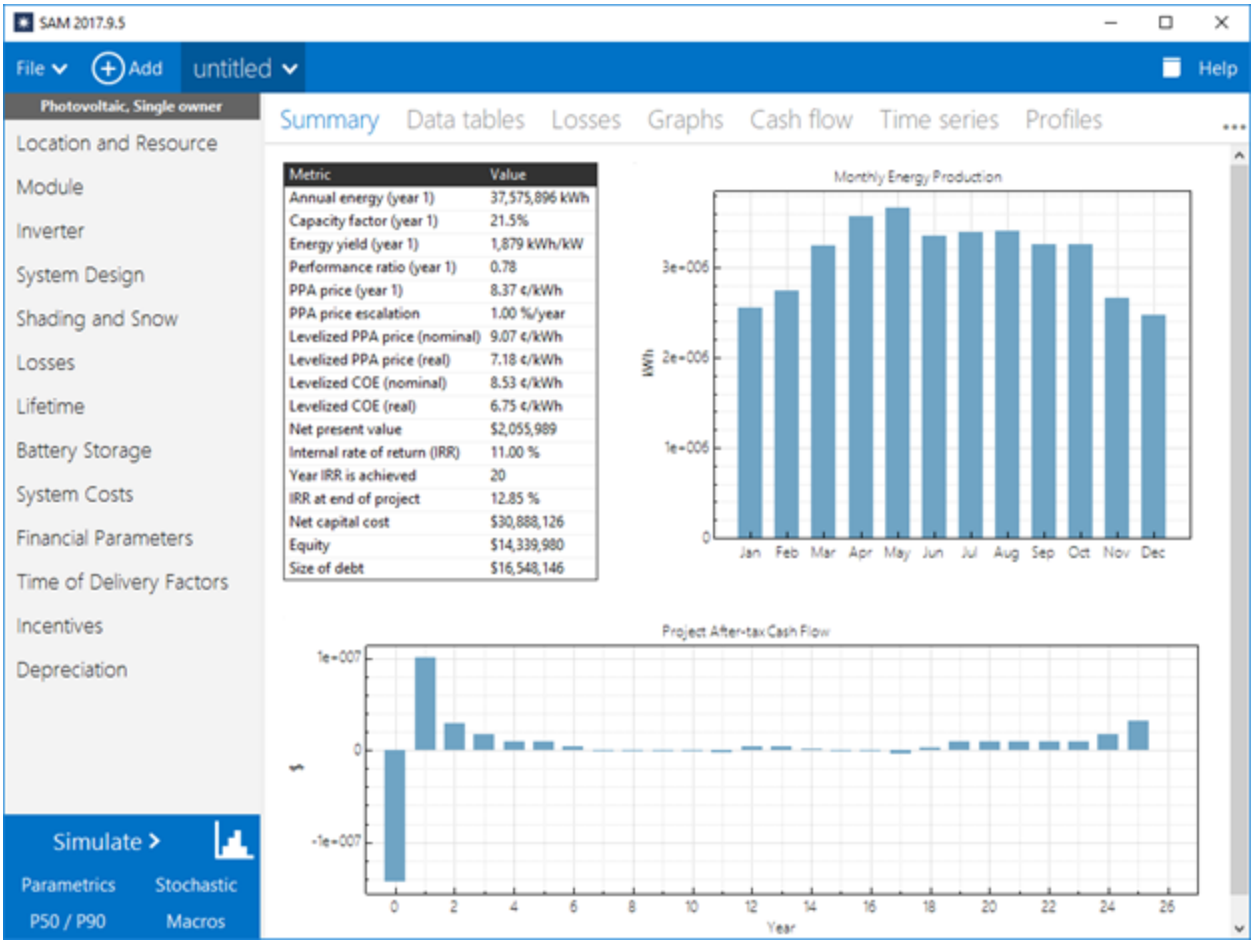

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1 Weather File Formats

A SAM weather file is a text file that contains data describing the solar, wind, or marine energy resource at a particular location for a period of one year. SAM uses the following weather file formats:

- SAM CSV format for solar resource data
- SRW format for wind resource data
- CSV format for marine energy resource data

For a description of how the different performance models use weather data, see Weather Data Elements.

You can use a spreadsheet program, text editor, or other software to create your own SAM weather file using data from a resource measurement program, meteorological stations, or other sources.

Other Weather File Formats

SAM can also read solar resource data from files in the TMY3 and TMY2 legacy formats from the NREL National Solar Radiation Database, and the EPW format developed for the Energy Plus software.

- The TMY3 file format is a comma-delimited text format with the extension .csv. The first row of a TMY3 file stores data describing the location's name, and the geographic coordinates, time zone, and elevation above sea level data required for sun angle calculations. The second row stores the column headings showing units for each data element. Rows 3-8762 store weather data elements used by SAM's performance models. Many of the data elements are not used by the SAM performance models. Note. Opening and saving a TMY3 file in Excel can cause formatting changes that renders the file unreadable by SAM's weather file reader. Use SAM's time series data viewer to explore the data without modifying it, or to export it to CSV or Excel files. For a complete description of the TMY3 file format, see the TMY3 user's manual (PDF 1.7 MB) Tables 1-1 and 1-2 (p 3) describe the header data, and Table 1-3 (p 4-7) describes the weather data elements.
- The TMY2 file format is a text format with the extension .tm2. The TMY2 format is not delimited, which makes the data in the text file difficult to read. You can use SAM's time series data viewer to examine and export the data in a TMY2 file. For a description of the data elements in the TMY2 format, see the TMY2 user's manual. The header elements are described in Table 3-1, and the weather data elements are described in Table 3-2.
- The EPW file format was developed for the U.S. Department of Energy's EnergyPlus building simulation model. EPW files store comma-delimited data, and use the extension .epw. The first eight rows of a file in EPW format stores header data. SAM's performance models use only the latitude, longitude, elevation, and time zone data from the header to calculate solar angles. The remaining 8,760 rows store weather data used by the SAM performance models and other data describing the quality of the data that SAM ignores. For more details about the EPW format see the Weather Data Format Definition page.

You can use the **Solar Resource File Converter** macro to convert files from any of the following formats to the SAM CSV format:

- TMY2 Legacy
- TMY3 Legacy
- EPW
- PVsyst CSV

- PVGIS 5 CSV
- SolarAnywhere

1.1 SAM CSV Format for Solar

The SAM CSV format is a comma-separated text format for SAM's solar performance models. It uses a standard CSV format that you can edit in any spreadsheet program, text editor, or other appropriate software.

phoenix_az_33.450495_-111.983688_psmv3_60_tmy.csv

```
1  Source,Location ID,City,State,Country,Latitude,Longitude,Time Zone,Elevation,Local Time Zo
2  NSRDB,78208,-,-,-,33.45,-111.98,-7,358,-7,c,w/m2,w/m2,w/m2,c,mbar,Degrees,m/s,N/A,v3.0.0
3  Year,Month,Day,Hour,Minute,DNI,DHI,GHI,Dew Point,Temperature,Pressure,Wind Direction,Wind
4  2012,1,1,0,30,0,0,0,-2,7,970,180.1,1.5,0.174
5  2012,1,1,1,30,0,0,0,-2,6,970,183.4,1.5,0.174
6  2012,1,1,2,30,0,0,0,-3,6,970,188.4,1.5,0.174
7  2012,1,1,3,30,0,0,0,-3,6,970,195.9,1.5,0.174
8  2012,1,1,4,30,0,0,0,-4,6,970,203.1,1.6,0.174
9  2012,1,1,5,30,0,0,0,-4,6,970,207.9,1.6,0.174
10 2012,1,1,6,30,0,0,0,-4,6,970,207.4,1.5,0.174
11 2012,1,1,7,30,0,0,0,-5,7,970,199.9,1.4,0.174
12 2012,1,1,8,30,638,39,144,-5,11,970,191.9,1.9,0.174
13 2012,1,1,9,30,833,56,327,-4,15,970,178,2.4,0.174
14 2012,1,1,10,30,918,66,477,-3,20,970,176.2,2.5,0.174
15 2012,1,1,11,30,925,81,568,-4,23,970,181.4,2.9,0.174
16 2012,1,1,12,30,935,84,601,-4,25,970,177.2,3,0.174
17 2012,1,1,13,30,923,82,570,-5,26,970,173.2,3,0.174
18 2012,1,1,14,30,898,72,478,-4,25,970,172.4,2.5,0.174
19 2012,1,1,15,30,813,61,330,0,23,970,167.4,1.5,0.174
20 2012,1,1,16,30,616,42,149,5,19,970,152.1,1.2,0.174
21 2012,1,1,17,30,0,0,0,1,16,970,136.1,1.4,0.174
22 2012,1,1,18,30,0,0,0,0,14,970,131.9,1.5,0.174
23 2012,1,1,19,30,0,0,0,0,12,970,136.3,1.6,0.174
24 2012,1,1,20,30,0,0,0,0,12,970,148.5,1.7,0.174
```

For examples of files in the SAM CSV format, see files in the *solar_resource* folder of your SAM installation folder.

The SAM CSV format supports hourly and sub-hourly data with up to a one-minute resolution. SAM recognizes the weather file's time resolution based on the number of data rows in the weather file. For example, SAM recognizes a file with 8,670 data rows as an hourly data file, and a file with 35,040 rows as 15-minute data. A minute column is optional for hourly data, and required for sub-hourly data. By default, for hourly data SAM calculates sun position angles at the mid-point of the hour. However, if you specify the optional minute column for the hourly data, SAM calculates the sun position at the minute indicated in that column. For sub-hourly data, sun angles are calculated for the minute indicated in the Minute column. See Time Convention and Sun Position for additional details.

SAM requires a valid value for all time steps for each data element. It does not fill data gaps. It does perform some checks on the weather data before running a simulation, and displays messages about problems with the data in the simulation notices. You can also run the **Solar Resource File Checker** macro to perform the checks without running a simulation.

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 and with any capitalization:

- *Latitude*
- *Longitude*
- *Time zone*
- *Elevation*

The optional **Units flag** indicates that your weather file includes an extra header row for measurement units. By default, the SAM CSV format does not include a row for measurement units in the header. To include a units row in the header, add *hasunits* to Row 1, and set its value in Row 2 to *yes*. Then add a row after the data column heading row (described as Row 3 below) with units for each column. If *hasunits* is *no*, or is omitted from Row 1, SAM assumes that the header does not include a row for units. SAM ignores the information in the units row, but it can be useful to help you keep track of units.

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. The required latitude, longitude, time zone, and elevation are numbers that SAM uses in sun position calculations during simulations:

- 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

The remaining header fields, such as source, location ID, city, state, and others listed in the table below are text values (strings) that provide information about the data, but that SAM does not use in calculations. These values are not required for SAM simulations, and can be omitted from the weather file.

Header Field	Units	Accepted Labels for Row 1
Latitude	degrees	*latitude, lat*
Longitude	degrees	*longitude, lon, long ,lng*
Time zone	hours offset from GMT	*tz, timezone, time zone*
Site elevation	meters above sea level	*el, elev, elevation, site elevation*
Year	n/a	*year*
Location ID	n/a	*id ,location, location id, station,station id, wban, wban#*
City	n/a	*city*
State	n/a	*state, province, region*
Country	n/a	*country*
Source	n/a	*source, src*
Description	n/a	*description, desc*
URL	n/a	*url*
Units flag	yes or no	*hasunits, units*

Solar Resource Data

Row 3

Labels identifying the data columns. SAM uses the labels to identify the columns, so they can be in any order. SAM 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. See the description of the **Units flag** above if you want to include an additional row for units in your file.

Row 4-8,760 (for hourly data, more rows for sub-hourly data)

Data identified in Row 3. For example:

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

SAM assumes that the weather data uses the following units:

Note. The format does not require leading zeros in one-digit numbers.

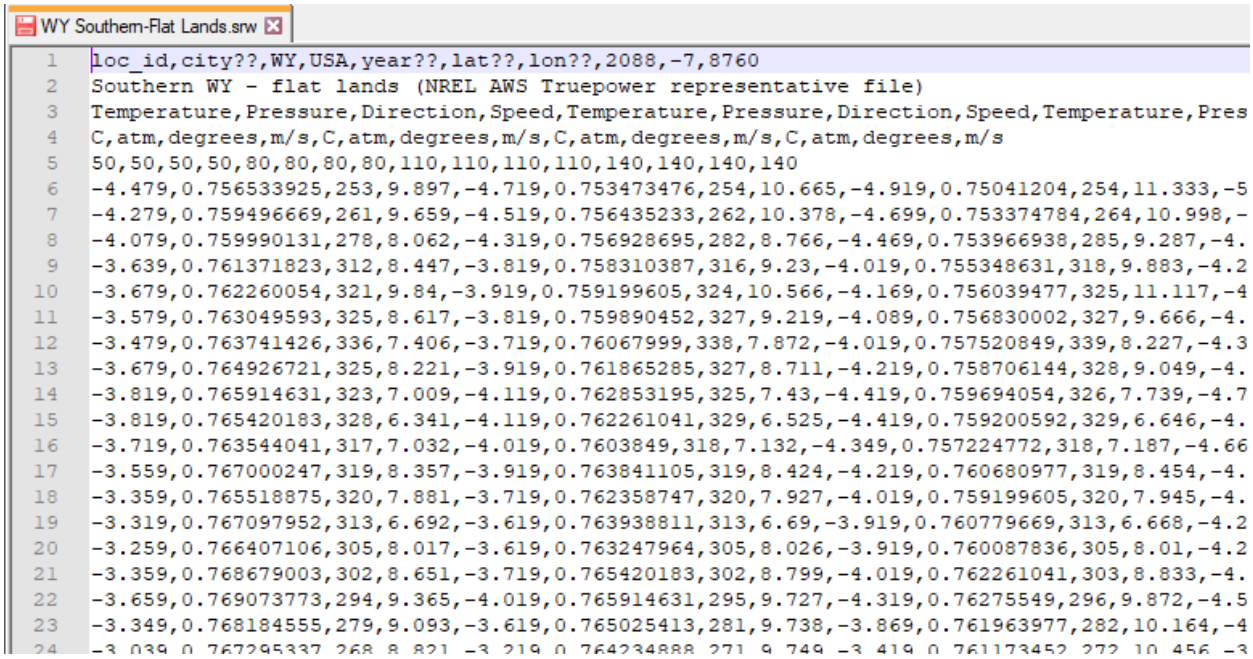
- Year is a four-digit number (1988)
- Month is a one- or two-digit number (Month = 1 is January)
- Day is a one- or two-digit number indicating the day of month (Day = 1 is the first day of the month).
- Hour is a one- or two-digit number indicating the hour of day (Hour = 0 is the first hour of the day, or the hour ending at 1 am).

- Minute is a one-or two-digit number indicating the minute (Minute = 0 is the first minute of the hour). This value is required for sub-hourly data, and optional for hourly data. For hourly data, the minute column indicates the time you want SAM to use for sun position calculations. If you omit the value for hourly data, SAM uses the midpoint of the hour for the calculations. See Time Convention and Sun Position for details.
- Solar irradiance in W/m^2. SAM's photovoltaic models assume instantaneous irradiance. The CSP models assume average irradiance over the time step.
- Temperature in °C.
- Relative humidity in %.
- Atmospheric pressure in millibar.
- Wind speed at 10 meters above the ground in m/s.
- Wind direction at 10 meters above the ground in degrees east of North, with zero degrees indicating wind from the north.
- Snow depth in centimeters.

Data Field	Units	Accepted Labels for Row 3
Year	1950-2050	*year, yr*
Month	1-12	*month, mo*
Day	1-31	*day*
Hour	0-23	*hour, hr*
Minute	0-59	*min, minute*
Global horizontal irradiance	W/m²	*gh, ghi, global, global horizontal, global horizontal irradiance*
Beam normal irradiance	W/m²	*dn, dni, beam, direct normal, direct normal irradiance*
Diffuse horizontal irradiance	W/m²	*df, dhi, diffuse, diffuse horizontal, diffuse horizontal irradiance*
Plane-of-array irradiance	W/m²	*poa, pa, plane,plane of array,plane of array irradiance*
Ambient dry bulb temperature	°C	*tdry, dry bulb, dry bulb temp, temperature, ambient, ambient temp*
Wet bulb temperature	°C	*twet, wet bulb, wet bulb temperature*
Dew point temperature	°C	*Tdew ,dew point, dew point temperature*
Wind speed	m/s	*wspd, wind speed*
Wind direction	degrees	*wdir, wind direction*
Relative humidity	%	*rh, rhum, relative humidity, humidity*
Atmospheric pressure	Millibar	*pres, pressure*
Snow depth	cm	*snow, snow cover, snow depth*
Ground reflectance (albedo)	0..1	*albedo, alb, surface albedo*
Aerosol optical depth	0..1	*aod, aerosol, aerosol optical depth*

1.2 SRW Format for Wind

The SRW format is a comma-delimited text format with the extension .srw for the wind power performance model.


WY Southern-Flat Lands.srw

```
1  loc_id,city??,WY,USA,year??,lat??,lon??,2088,-7,8760
2  Southern WY - flat lands (NREL AWS Truepower representative file)
3  Temperature,Pressure,Direction,Speed,Temperature,Pressure,Direction,Speed,Temperature,Pres
4  C,atm,degrees,m/s,C,atm,degrees,m/s,C,atm,degrees,m/s,C,atm,degrees,m/s
5  50,50,50,50,80,80,80,80,110,110,110,110,140,140,140,140
6  -4.479,0.756533925,253,9.897,-4.719,0.753473476,254,10.665,-4.919,0.75041204,254,11.333,-5
7  -4.279,0.759496669,261,9.659,-4.519,0.756435233,262,10.378,-4.699,0.753374784,264,10.998,-
8  -4.079,0.759990131,278,8.062,-4.319,0.756928695,282,8.766,-4.469,0.753966938,285,9.287,-4.
9  -3.639,0.761371823,312,8.447,-3.819,0.758310387,316,9.23,-4.019,0.755348631,318,9.883,-4.2
10 -3.679,0.762260054,321,9.84,-3.919,0.759199605,324,10.566,-4.169,0.756039477,325,11.117,-4
11 -3.579,0.763049593,325,8.617,-3.819,0.759890452,327,9.219,-4.089,0.756830002,327,9.666,-4.
12 -3.479,0.763741426,336,7.406,-3.719,0.76067999,338,7.872,-4.019,0.757520849,339,8.227,-4.3
13 -3.679,0.764926721,325,8.221,-3.919,0.761865285,327,8.711,-4.219,0.758706144,328,9.049,-4.
14 -3.819,0.765914631,323,7.009,-4.119,0.762853195,325,7.43,-4.419,0.759694054,326,7.739,-4.7
15 -3.819,0.765420183,328,6.341,-4.119,0.762261041,329,6.525,-4.419,0.759200592,329,6.646,-4.
16 -3.719,0.763544041,317,7.032,-4.019,0.7603849,318,7.132,-4.349,0.757224772,318,7.187,-4.66
17 -3.559,0.767000247,319,8.357,-3.919,0.763841105,319,8.424,-4.219,0.760680977,319,8.454,-4.
18 -3.359,0.765518875,320,7.881,-3.719,0.762358747,320,7.927,-4.019,0.759199605,320,7.945,-4.
19 -3.319,0.767097952,313,6.692,-3.619,0.763938811,313,6.69,-3.919,0.760779669,313,6.668,-4.2
20 -3.259,0.766407106,305,8.017,-3.619,0.763247964,305,8.026,-3.919,0.760087836,305,8.01,-4.2
21 -3.359,0.768679003,302,8.651,-3.719,0.765420183,302,8.799,-4.019,0.762261041,303,8.833,-4.
22 -3.659,0.769073773,294,9.365,-4.019,0.765914631,295,9.727,-4.319,0.76275549,296,9.872,-4.5
23 -3.349,0.768184555,279,9.093,-3.619,0.765025413,281,9.738,-3.869,0.761963977,282,10.164,-4
24 -3.039,0.767295337,268,8.821,-3.219,0.764234888,271,9.749,-3.419,0.761173452,272,10.456,-3
```

The format allows you to use wind resource data at one or more heights above the ground, and is designed to be flexible enough to handle a range of data.

- The file stores four data types: wind speed, wind direction, air temperature, and atmospheric pressure.
- The data can be for one measurement height or multiple heights. The measurement heights can be different for the different types of data. The file can contain air temperature, atmospheric pressure, and wind direction data at one height, and wind speed data at multiple heights.
- The file stores 8,760 values for a single year of hourly data.
- The file must contain a least one complete set of the four data types with 8,760 values.
- The direction measurement height must be within 10 meters of the nearest wind speed measurement height.
- The file must contain a wind speed measurement height within 35 meters of the turbine hub height.
- The file does not contain time zone information. The NREL WIND Toolkit data assumes data time steps are in UTC, where Row 1 is the hour ending at 1 a.m.

Note. Although the weather file format allows for wind resource data at time steps smaller than one hour, the current version of SAM's wind power model is designed for hourly simulations, so the wind resource data must use a time step of one hour with 8,760 values.

After running a simulation, SAM reports the hourly wind speed and wind direction on the Results page tables and time series graphs so you can see what values it used in the simulation. For a general description of how the wind power model uses the data in the file, see Wind:

- For a description of how SAM determines wind speed at hub height, see Hub Height and Wind Shear.
- For a description of how SAM uses temperature and pressure data from the weather file, see Elevation above Sea Level.

Header Rows 1 and 2

The first two rows of the file store information about the location, and descriptive text that you can use for any purpose. SAM displays some of this information in the fields on the Wind Resource page. You can use the weather data viewer to examine the data in the file before running a simulation.

Row 1

<location id>,<city>,<state>,<country>,<year>,<latitude>,<longitude>,<elevation>,<time step in hours>,<number of rows>

SAM displays the eight location-related values on the Wind Resource page, but does not use these values in calculations.

SAM uses the <timestep in hours> and <number of rows> to determine the data's temporal resolution, but does not use any of the other values in calculations. SAM requires hourly data, so the time step must be 1, and the number of rows must be 8760.

You must provide a value for each column: If you do not have a value for a column, you can use an indicator like n/a or ?? for the missing value.

SAM ignores the extra commas at the end of the row that your spreadsheet software may insert.

Note. SAM uses the air temperature and atmospheric pressure data for each time step to adjust the turbine power curve. It does not use the elevation above sea level for this purpose.

Row 2

<data source>

One line of descriptive text that SAM displays on the Wind Resource page. You may leave this line blank.

SAM ignores the extra commas at the end of the row that your spreadsheet software may insert.

Header Rows 3 - 5

Rows 3 and 4 tell SAM what data each column contains. SAM determines the type of data for each column based on the information in Rows 3 and 4. Rows 3 and 4 must have the same number of columns as the resource data rows 6 - 8765.

Row 3

The resource data type definition for each column of Rows 6 - 8765. Each column in Row 3 must contain one of the following text values (not case-sensitive) that corresponds to the resource data type in that column: temperature, pressure, speed, or direction. The resource data types do not have to be in any particular order, and can be in a different order for each hub height.

Row 3 must contain at least one column for each of the four data types. For a weather file with data at more than one height above the ground, Row 3 must contain a set of column definitions for each height.

Row 4

Measurement units for the resource data in each column corresponding to the resource data type in Row 3. Each column in Row 4 must contain a text value describing the measurement units. SAM displays this text in graphs and tables. For example: atm, m/s, degrees, Celsius, etc.

Note. SAM assumes that the resource data are in the units described below regardless of the values you specify in Row 4.

Row 5

Measurement height above the ground in meters for the resource data for each column defined in Row 3. Each column in Row 5 must contain an integer or decimal value.

Resource Data Rows 6 - 8765

The resource data rows store the wind speed, wind direction, air temperature, and atmospheric pressure values.

Row 6 should contain data for the hour ending at 1 am on January 1. (For time-dependent pricing calculations, SAM's financial models assume that January 1 is a Monday.)

The 8,760 resource data rows store integers or decimal values with the following units:

- Wind speed in meters per second (m/s).
- Wind direction in degrees east of north (degrees), with zero degrees indicating wind from the north, and 90 degrees indicating wind from the east.
- Atmospheric pressure in in atmospheres.
- Ambient temperature in degrees Celsius.

1.3 CSV Format for Marine Energy

SAM's marine wave energy resource file format is a comma-separated (CSV) text format.
The wave energy resource file stores data for joint probability distribution plots of the wave resource at a site as described in Dallman, A.; Neary, V. (2014) Characterization of U.S. Wave Energy Converter (WEC) Test Sites: A Catalogue of Met-Ocean Data. 125 pp.; SAND2014-18206. Sandia National Laboratories. (PDF 8 MB)

CalWave_California_Wave Resource _SAM CSV.csv

```
Name,City,State,Country,Latitude,Longitude,Nearby Buoy Number,Average Power Flux (kW/m),Bath
CalWave Central Coast South,Lompoc,California,United States,34.521 N,120.689 W,NDBC 46218,35
Hs/Te,0.5,1.5,2.5,3.5,4.5,5.5,6.5,7.5,8.5,9.5,10.5,11.5,12.5,13.5,14.5,15.5,16.5,17.5,18.5,1
0.25,0,0,0,0,0.11,0.18,0.12,0.09,0.11,0.05,0.07,0.06,0.07,0.07,0.02,0.02,0.01,0,0,0,0
0.75,0,0,0,0,0.04,0.16,0.13,0.05,0.12,0.1,0.07,0.15,0.17,0.08,0.03,0.02,0,0,0,0,0
1.25,0,0,0,0,0.15,0.26,0.26,0.93,1.26,1.24,1.05,1.32,1.51,0.91,0.73,0.27,0.2,0.06,0.03,0,0
1.75,0,0,0,0,0.11,1.16,1.42,2.4,3.5,3.63,2.55,2.19,2.8,1.93,1.63,0.7,0.45,0.21,0.11,0.01,0
2.25,0,0,0,0,0,0.38,2.21,2.59,2.79,3.33,3.84,3.3,2.29,1.34,1.1,0.61,0.4,0.18,0.09,0.02,0
2.75,0,0,0,0,0,0,0.43,1.78,1.84,1.76,2.84,3.01,2.37,1.28,0.76,0.33,0.27,0.09,0.05,0.02,0
3.25,0,0,0,0,0,0,0.03,0.37,0.86,0.76,1.29,2.55,2.37,1.09,0.75,0.28,0.15,0.06,0.03,0,0
3.75,0,0,0,0,0,0,0,0.05,0.25,0.34,0.4,1.1,1.41,0.9,0.54,0.17,0.1,0.03,0,0,0
4.25,0,0,0,0,0,0,0,0,0.04,0.2,0.13,0.3,0.92,0.46,0.45,0.19,0.06,0.01,0,0,0
4.75,0,0,0,0,0,0,0,0,0,0.01,0.05,0.06,0.13,0.53,0.33,0.23,0.09,0.02,0.01,0,0,0
5.25,0,0,0,0,0,0,0,0,0,0,0.02,0,0.04,0.17,0.18,0.11,0.03,0.01,0,0,0,0
5.75,0,0,0,0,0,0,0,0,0,0,0,0.01,0.02,0.08,0.14,0.07,0.03,0.01,0,0,0,0
6.25,0,0,0,0,0,0,0,0,0,0,0,0,0.02,0.12,0.05,0.03,0.01,0,0,0,0
6.75,0,0,0,0,0,0,0,0,0,0,0,0,0.01,0.01,0.06,0.04,0.01,0,0,0,0,0
7.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0.01,0.03,0,0,0,0,0,0
7.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
9.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
9.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

For examples of files in the CSV wave energy resource format, see files in the *wave_resource* folder of your SAM installation folder.

The file contains the wave resource matrix, which is a table of joint probability distributions of significant wave height and wave energy period.

Row 1

The first column of Row 1 contains the header *Hs/Te*, and the remaining columns contain wave energy period values in seconds in increasing order. This example is for 21 samples ranging from 0s to 21s in bins at the 0.5s mark:

Hs/Te,0.5,1.5,2.5,3.5,4.5,5.5,6.5,7.5,8.5,9.5,10.5,11.5,12.5,13.5,14.5,15.5,16.5,17.5,18.5,19.5,20.5

Rows 2 and higher

The first column of Rows 2 and higher contains the significant wave height in meters in increasing order. The remaining columns contain the joint probability distribution (JPD) of sea states representing a frequency of occurrence as a percentage. For example, Rows 4 and higher for a range of 20 wave heights from 0.25 m to 9.75 m would be:

0.25,0,0,0,0,0.11,0.18,0.12,0.09,0.11,0.05,0.07,0.06,0.07,0.07,0.02,0.02,0.01,0,0,0,0

0.75,0,0,0,0,0.04,0.16,0.13,0.05,0.12,0.1,0.07,0.15,0.17,0.08,0.03,0.02,0,0,0,0,0

1.25,0,0,0,0,0.15,0.26,0.26,0.93,1.26,1.24,1.05,1.32,1.51,0.91,0.73,0.27,0.2,0.06,0.03,0,0

1.75,0,0,0,0,0.11,1.16,1.42,2.4,3.5,3.63,2.55,2.19,2.8,1.93,1.63,0.7,0.45,0.21,0.11,0.01,0

2.25,0,0,0,0,0,0.38,2.21,2.59,2.79,3.33,3.84,3.3,2.29,1.34,1.1,0.61,0.4,0.18,0.09,0.02,0

2.75,0,0,0,0,0,0,0.43,1.78,1.84,1.76,2.84,3.01,2.37,1.28,0.76,0.33,0.27,0.09,0.05,0.02,0

3.25,0,0,0,0,0,0,0.03,0.37,0.86,0.76,1.29,2.55,2.37,1.09,0.75,0.28,0.15,0.06,0.03,0,0

3.75,0,0,0,0,0,0,0,0.05,0.25,0.34,0.4,1.1,1.41,0.9,0.54,0.17,0.1,0.03,0,0,0

4.25,0,0,0,0,0,0,0,0,0.04,0.2,0.13,0.3,0.92,0.46,0.45,0.19,0.06,0.01,0,0,0

4.75,0,0,0,0,0,0,0,0,0.01,0.05,0.06,0.13,0.53,0.33,0.23,0.09,0.02,0.01,0,0,0

5.25,0,0,0,0,0,0,0,0,0,0.02,0,0.04,0.17,0.18,0.11,0.03,0.01,0,0,0,0

5.75,0,0,0,0,0,0,0,0,0,0,0.01,0.02,0.08,0.14,0.07,0.03,0.01,0,0,0,0

6.25,0,0,0,0,0,0,0,0,0,0,0,0,0.02,0.12,0.05,0.03,0.01,0,0,0,0

6.75,0,0,0,0,0,0,0,0,0,0,0,0.01,0.01,0.06,0.04,0.01,0,0,0,0,0

7.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0.01,0.03,0,0,0,0,0,0

7.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

8.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

8.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

9.25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

9.75,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Special Format for Wave Energy Resource Library Files

If you want to add a file to the wave energy resource library so you can choose it from the library list on the Wave Resource page instead of checking **Choose wave energy resource file**, you must create a special library version of the file that includes two additional header rows with 13 columns each and put it in the *wave_resource* library folder of your SAM installation folder. These extra rows provide location information and metadata that SAM uses to display for reference on the Wave Resource page, but does not use for the performance simulation.

Notes.

You only need the optional header rows if you are making a special file for the wave energy resource library.

For information about where to store your wave energy resource files, see Managing Wave Resource Files.

Row 1 for special library file

Row contains labels for the 13 required metadata variables. Row 1 must contain the following text, with column names in the following order:

Name,City,State,Country,Latitude,Longitude,Nearby Buoy Number,Average Power Flux (kW/m),Bathymetry,Sea Bed,Time Zone,Data Source,Notes

Row 2 for special library file

Row 2 contains values for the metadata identified by the labels in Row 1. The file must contain values for this metadata for SAM's file reader to work correctly.

To ensure SAM can read the data correctly, do not enclose values in quotation marks.

Row 3 for special library file

Same as row 1 described above.

Rows 4 and higher for special library file

Same as rows 2 and higher described above.

Header Label	Description
Name	Name of wave resource site
City	Name of city onshore nearest the site
State	State name or abbreviation
Country	Country name
Latitude	Latitude, for example 35.4 N, 25.6 S
Longitude	Longitude, for example 120.689 W, 64.3 E
Nearby Buoy Number	Identification number for nearest marine observation buoy
Average Power Flux (kW/m)	The average annual power flux measured at the site
Bathymetry	The submarine topography at the site
Sea Bed	The soil composition of the sea bed
Time Zone	The time zone of the site, for example -7, 2
Data Source	The source of wave resource data
Notes	Additional information about the data