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Material

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ApacheSim:  
Systems Templates

# Systems Templates

When you start your project, you choose to either use a simplified (AP Systems) or detailed (ApacheHVAC) methodology for HVAC. This can be changed later if desired. When choosing the ApacheHVAC system methodology, the roles of these Apache Systems are taken by the ApacheHVAC system.

Spaces using either system methodology are assigned an Apache System for the supply of domestic hot water (DHW).



You can access Apache systems directly from the Apache toolbar, or from within either the BTM or tabular BTM, just click on the Apache Systems button to open this dialogue box. Apache Systems allows you to create systems and set their properties, to describe the characteristics of systems supplying the heating, ventilating, hot water and air conditioning requirements of spaces.

Each system is linked to an **energy meter**, allowing later comparison between modelled values and meter readings. This can assist in refining models to improve accuracy.



The Tabular Apache Systems allows you to rapidly inspect any system templates in your models.

It provides access to the same information in a modeless, tabular form, suitable for import/export to spreadsheet programs.

Is Default?	System Name	System ID	NCM Type	Is Proxy For ApacheHVAC System?	Heating Fuel	Heat Pump?	Seasonal Eff	Delivery Eff	SCoP kW/kW	Gen. Size kW	Vent Heat Recovery Eff	Vent Heat Recovery Air Temp °C	Used With CHP?	Aler CH/CJP Plant Ranking
<input checked="" type="checkbox"/>	Main system	SYST0000	Notset	<input type="checkbox"/>	Natural Gas: Meter 1	<input type="checkbox"/>	0.8900	0.8989	0.8000	0.00	0.0000	21.00	<input type="checkbox"/>	1
<input type="checkbox"/>	NCM Constant...	SYST0001	Constant volu...	<input type="checkbox"/>	Natural Gas: Meter 1	<input type="checkbox"/>	0.8100	0.9070	0.7995	0.00	0.0000	21.00	<input checked="" type="checkbox"/>	1
<input type="checkbox"/>	Central heatin...	SYST0002	Central heatin...	<input type="checkbox"/>	Oil: Meter 1	<input type="checkbox"/>	0.8100	0.8923	0.7228	0.00	0.0000	21.00	<input type="checkbox"/>	1

These systems can then be assigned to rooms, either in Space Data or indirectly via the assignment of room templates. The system specifications entered within Apache Systems, are used for sizing central plant and calculating fuel consumption and carbon emissions.

The **Tabular Space Data** is used to assign systems to spaces: one Apache System for space conditioning and a second Apache System for the conditioning of auxiliary ventilation air. These systems handle the space's heating, cooling and air conditioning needs in the loads analysis applications ApacheSim ASHRAE Loads and CIBSE Loads.

Input values include parameters such as boiler size and maximum flow rate.

Remember that the air supply here is addressing the air supplied to the heating, cooling and ventilation systems – infiltration is accounted for elsewhere, in the **BTM**.

The Apache System generic heating and cooling model has three key parameters, which can be defined in summary as follows:

- SCoP – the efficiency of the heating system
- SSEER – the efficiency of the cooling system (if present)
- Auxiliary Energy Value – energy required for fans, pumps and controls

These are the most important parameters featuring in the calculation of the energy consumed by the space heating and cooling systems. Taken together with the fuels specified for heating and cooling, they encapsulate most of the important data about system performance in relation to carbon emissions.

# Space Condition Templates (AP Systems)



Apache Systems



Tabular Apache Systems

The Apache Systems dialog can be accessed by clicking on the icon **Apache Systems** or choosing from the **Edit** menu in Apache or <VE>Compliance view.

The main dialog area displays the properties of the currently selected system and allows them to be edited.

Boxes labelled in blue represent autosized parameters calculated by the loads analysis programs.

The values of autosized parameters do not affect simulation performance or compliance/certification results.

They may not be edited in this dialog. They may, however, be reset to zero or wound back to the values applying before the last loads analysis using options on the ASHRAE and CIBSE Loads dialogs.

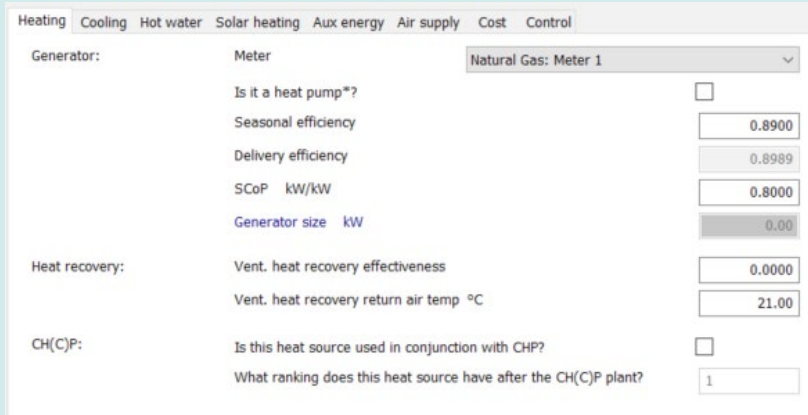
A list displays the Apache Systems in the model. You can add further systems using the **Add** button and remove them (if they are not in use) using the **Remove** button. The properties of the currently selected system are displayed in the main dialog area.

A tick in the 'Default?' column indicates that the system will be assigned by default to imported room templates.

You can change the default system by double clicking in the 'Default?' column. The system assignment may be overridden, like other template assignments, in Space Data.

More info available at [https://help.iesve.com/ve2019/apache\\_systems\\_2.htm#](https://help.iesve.com/ve2019/apache_systems_2.htm#)

The main inputs for the dialog are spread over eight tabs, as follows



More info available at [https://help.iesve.com/ve2019/heating\\_2.htm#](https://help.iesve.com/ve2019/heating_2.htm#)

**HEATING:**

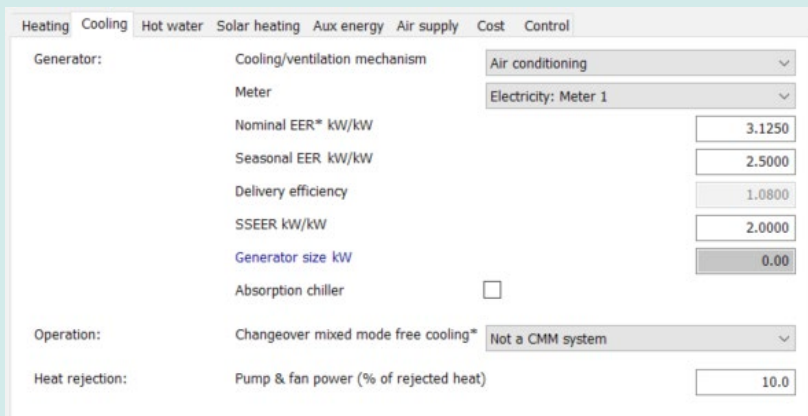
Select the appropriate meter that will be supplying the heating system.

Tick the box if it is a heat pump.

Update the Seasonal Efficiency and SCoP with manufacturer's data if this is available, or use generic data suitable for your project. The Delivery efficiency will then be calculated automatically.

Generator size is an autosized parameter that cannot be edited: it is the maximum load on the boiler or other heat source that occurred during the heating loads analysis.

Complete your project information for heat recovery and CH(C)P and this tab is complete.



More info available at [https://help.iesve.com/ve2019/cooling\\_2.htm#](https://help.iesve.com/ve2019/cooling_2.htm#)

**COOLING:**

Once again, select the appropriate meter that will be supplying the cooling system, and input the efficiency ratios.

Generator size remains an autosized parameter that cannot be edited.

Tick the box if the cooling source is an absorption chiller.

The changeover mixed mode free cooling mechanism parameter is only required for UK regulations compliance and certification.

Heat rejection pump and fan power, is expressed as a percentage of heat rejected by the chiller.

**HOT WATER:**

This tab allows you to describe the characteristics of the domestic hot water heating systems.

This approach is suitable for use in Building Regulations compliance tests, ApacheSim, ASHRAE Loads and CIBSE Loads.

Complete all the listed criteria as per your project hot water system.

A separate system can be created and assigned to control DHW, or it can be an aspect of the main system.

*Note that DHW demand is calculated from settings on the Space Conditions tab in the Building Template Manager or Space Data.*

More info available at [https://help.iesve.com/ve2019/hot\\_water\\_2.htm#](https://help.iesve.com/ve2019/hot_water_2.htm#)

**SOLAR WATER HEATING:**

This tab allows you to describe a solar water heating system feeding into the DHW system.

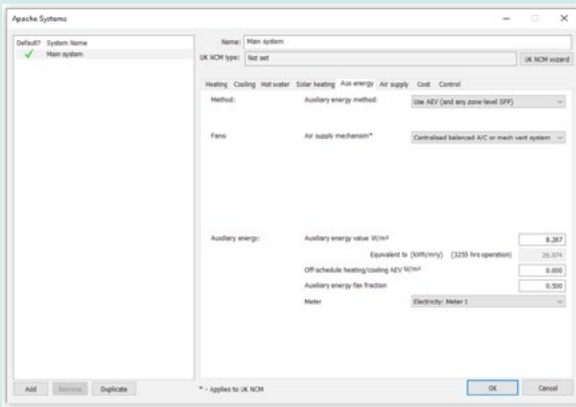
You can choose from:

- Flat Plate Collector
- None
- Parabolic Trough Collector

Then complete all information about the solar panel and its associated pumps and hot water storage.

The Flat plate collector system is assumed to consist of a solar panel using propylene glycol as the heat transfer medium, linked to a heat exchanger that transfers the collected solar heat to a storage cylinder. The mains cold water supply is preheated in this cylinder before being fed into the DHW storage tank.

More info available at [https://help.iesve.com/ve2019/solar\\_water\\_heating\\_2.htm#](https://help.iesve.com/ve2019/solar_water_heating_2.htm#)

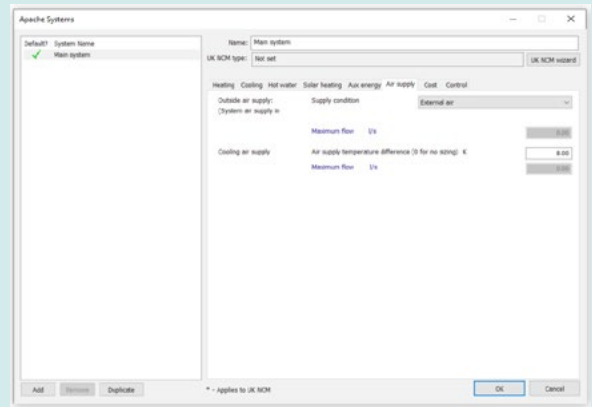


### AUXILIARY ENERGY

Auxiliary energy is energy consumed by fans, pumps and controls (excluding heat rejection).

Select the calculation methodology you would like, and then complete the data beneath for SFPs and AEV as required.

More information is available at [https://help.iesve.com/ve2019/auxiliary\\_energy\\_2.htm#](https://help.iesve.com/ve2019/auxiliary_energy_2.htm#)



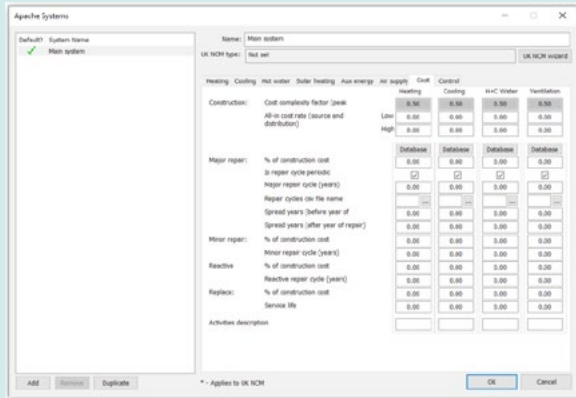
### AIR SUPPLY

This is where you set the outside air supply, which is listed as 'system air supply' in Vista.

Note that the Air supply temperature difference references the difference between the supply air and the room set point condition.

Set this value to 0 if no sizing is required.

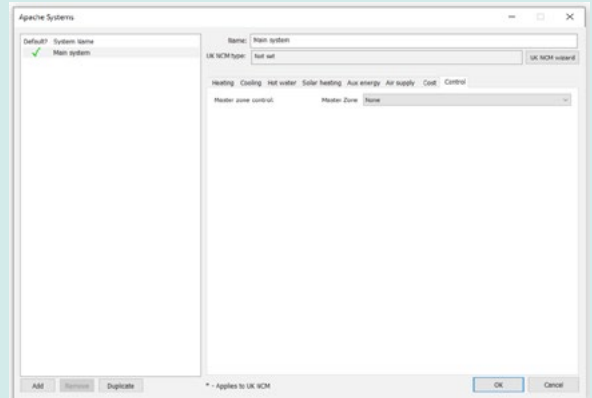
More information is available at [https://help.iesve.com/ve2019/air\\_supply\\_2.htm#](https://help.iesve.com/ve2019/air_supply_2.htm#)



### COST

This tab is only used for CostPlan and IMPACT applications

More information is available at <https://help.iesve.com/ve2019/cost.htm#>



### CONTROL

A room specified here, which must be one of the rooms served by the Apache System, will be treated as the master room for that system, dictating whether heating and cooling are available to other rooms served by the system (the 'slave rooms'). A room is said to be served by the system if the system is assigned to that room in the 'System' field on the Space Data System tab.

Master zone control only applies to rooms using the ApSys system methodology. It operates when the Master zone is assigned, and only during simulation, not during Loads analyses.

For rooms using the ApHVAC system methodology the role of Master zone is played by the Master room assigned to each HVAC zone.

More information is available at <https://help.iesve.com/ve2019/control.htm#>



## NCM Wizard

A system data wizard that applies the UK National Calculation Methodology system information can be used to set Apache System data, by clicking the button UK NCM Wizard at the top of the Apache Systems dialog.

This utility allows you to describe the characteristics of heating, ventilating and air conditioning systems using the method implemented in the BRE Simplified Building Energy Model (SBEM). It was developed for use in compliance testing for UK Building Regulations Part L2 (2006), but can also be applied more widely.

The system specifications entered here are interpreted into Apache Systems, where they are used for sizing central plant and calculating fuel consumption and carbon emissions. They are suitable for use in Building Regulations compliance tests, ApacheSim, ASHRAE Loads and CIBSE Loads.

The tabs of the UK NCM system data wizard define different aspects of system performance. Each tab is enabled only when relevant to the chosen system type.

More information is available at [https://help.iesve.com/ve2019/uk\\_ncm\\_system\\_data\\_wizard\\_1.htm#](https://help.iesve.com/ve2019/uk_ncm_system_data_wizard_1.htm#)

## Energy Sources and Meters

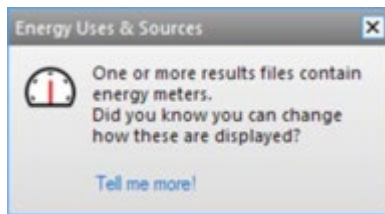


This facility lists the energy sources (fuels and electricity) used by the building and allows for the creation of meters attached to each energy source.

Default CO<sub>2</sub> emission factors are values specified by standards applying to the location specified in ApLocate, where such are available.

Find out more at [https://help.iesve.com/ve2019/energy\\_sources\\_and\\_meters#](https://help.iesve.com/ve2019/energy_sources_and_meters#)

By using **Energy Meters**, you can see a breakdown of your Building's Energy and Carbon usage in **VistaPro**. The Energy Breakdown tree allows you to view aggregated results for the Total Energy/Carbon used, each Energy Source and Energy Use, as well as individual Energy Meter results recorded during simulation.



When a project (old or new) is found to contain energy meter results you will get an alert, notifying you of the fact the energy breakdown feature is available. Dismissing the alert (by closing it or clicking on the link) will stop it from showing the next time you open the project in the VE. Once you have dismissed 5 alerts you will no longer be notified of the new energy breakdown feature for any project.

Energy Breakdown variables are not visible by default in VistaPro, and can be turned on using the Categories tree.

The options to view the Sources & Meters Breakdown and the Uses Breakdown are located under the Building Energy and Building Carbon categories.

If the project you have opened doesn't contain any meter results, these options will be disabled.

## Energy Sources and Meters



### Electricity Generators

Access the Electricity Generators from the **electricity** icon on the toolbar.

The effect of some common renewable technologies can be included in ApacheSim analysis for both dynamic thermal modelling and for VE Compliance analysis for Part L2.

In addition to the solar water heating option for DHW in Apache Systems, other Electricity Generators are:

- Photovoltaic (PV) panels  
This dialog allows you to describe a photovoltaic system supplying electrical power to the building. Specify the existence of such a system by adding one or more entries to the list of PV panels.
- Wind generators  
This dialog allows you to describe a wind generator supplying electrical power to the building.
- Combined heat and power (CHP)  
This dialog allows you to describe a combined heat and power plant supplying heat and electrical power to the building.

As it is currently configured, the CHP system operates a heat matching strategy, attempting to provide the heating needs of the building while generating electricity as a by-product. The operation of the CHP plant is dependent on:

- The enabling of the appropriate heating systems for CHP input.
- The minimum and maximum power output of the CHP system.
- The profile for heat matching.

Each heating system (Apache System, ApacheHVAC boiler or ApacheHVAC direct acting heater) must be enabled for CHP input if it is to receive heat from the CHP system. This is done by ticking the CHP box for the system in question. Next to the CHP box is a Boiler Ranking parameter which allows you to specify the order in which the boilers are switched on when the CHP system is either off or unable to meet the total heating load. Boilers with low Boiler Ranking will be switched on first. These will normally be the most efficient. Where two boilers have the same Boiler Ranking the CHP plant will contribute the same fraction of the heating load for both systems.

Find out more at [https://help.iesve.com/ve2019/renewable\\_\\_\\_electricity\\_generators\\_.htm#](https://help.iesve.com/ve2019/renewable___electricity_generators_.htm#)