iVN 2023.1.0 – Release Notes

July 2023

Contents

1 iVN 2023.1.0

Summer 2023 Release.

The list of updates in this version are as follows:

- General bug fixes: the IES development always endeavour to ensure the most seemless version of our software is available to our customers. This includes the identification and resolving of bugs as they are identified. If you find any bugs during your use of the software, please send the details to ICLfeedback@iesve.com

- The introduction of the single sign on (SSO) process and the use of the mylicensing portal. The addition of the mylicensing portal will allow the user to manage their iVN subscriptions and application requirements from one central hub, and the new SSO process will eventually allow the user to log in once across the suite of IES applications.

- The introduction of the 'Economics' tool package is designed for a user to be able to predict how long it will take to get a return on investment (ROI) for a designed network scenario. In order to make informed and economically concise decisions within the design and planning stages of a project, the cost and revenue of a project must be taken into consideration. Giving the user a valuable insight into the feasibility and profitability of their project from an early stage.

- A yearly total calculator has also been included to the analyse inspector. This allows the user to determine yearly totals for results variables with specified start and end dates.

1.1 SSO (Single Sign On)

On download of iVN 2023.1.0 a browser window will open directing the user to the new SSO log in page.

- On first login to this version, a new SSO account needs to be created. Select the "Sign Up Now" button and enter your email and new password.
  Note: The same email address as assigned to the original iVN licence must be re-used here. A new email address will not be accepted.

- Going forward, if the user is not logged in, a browser window will open directing the user to the log in page. Log in to SSO via browser by inputting account credentials. If user is already logged in then iVN will open and be ready to use.

- A notification will inform the user that the SSO log in has been successful and that the user can close the browser window.

- An update to any licence will be accompanied by a notification popup within iVN to inform the user of any new licence or any chances to previous licencing is available.

- An end-user license agreement (EULA) is required to be read and agreed to prior to the use/update of the iVN software.

- Information on current licensed packages will be available via the account tab.

1.2 'Economics' tool package

- **iVN Economics** is an add-on module containing IES 'economics calculation tab. Users can design and allocate economic parameters to their infrastructure of their existing or prospective network, determining costs and return projections at a scenario-based infrastructure level.

The 'Economics' tool package is designed for a user to be able to predict how long it will take to get a return on investment (ROI) for a designed network scenario. In order to make informed and economically concise decisions within the design and planning stages of a project, the cost and revenue of a project must be taken into consideration. Giving the user a valuable insight into the feasibility and profitability of their project from an early stage.
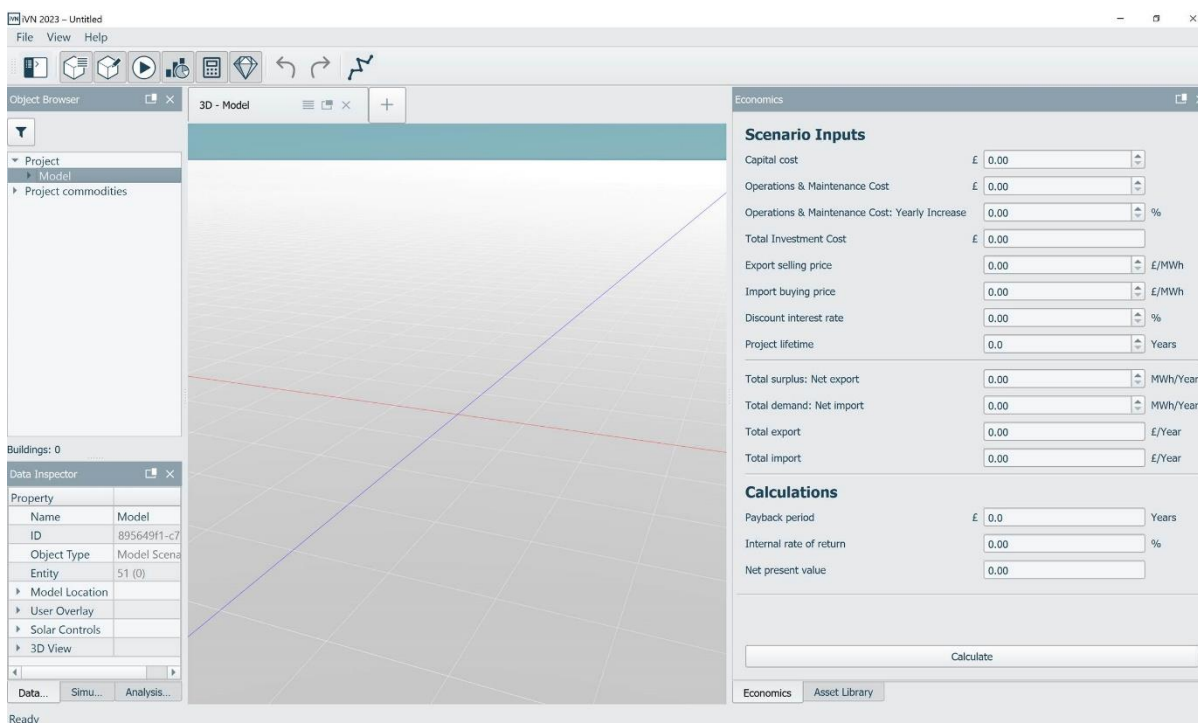
The economic panel can be accessed by the RHS docked panel viewer. It can be toggled via the economic ribbon icon, alternatively it can also be toggled on/off via the view settings and by right clicking the top panel.

Once the economic panel is visible the input variables will only be editable at and model scenario level.

To activate the panel the 'Model' must firstly be selected via the object browser.

Once the economic panel is active the input fields will become editable.

The 'Calculate' button will remain inactive until the required input criteria are met.

| Scenario inputs	Unit	Criteria
Capital cost	£	Positive rational number
Operations & Maintenance cost	£	Positive rational number
Operations & Maintenance cost: Yearly increase	%	Range of 0-100%
Export selling price	£/MWh	Positive rational number
Import buying price	£/MWh	Positive rational number
Discount interest rate	%	Range of 0-10%
Project lifetime	Years	Positive integer
Total surplus: Net export	MWh/Year	Positive rational number
Total demand: Net import	MWh/Year	Positive rational number

Calculated economic results:

- Payback period - The number of years required to recover the original investment.

- Internal rate of return - The expected compound annual rate of return that will be earned on a project or investment.

- Net present value – The current total value of the investment opportunity.

If the user updates/edits any of the defined input variables after a calculation has be completed the calculated results will become outdated/out of sync with the current set of inputs, this is highlighted by the calculations turning red.

1.3 Yearly totals

The yearly totals can be calculated for any simulated result that has data for at least one year.

The start date must be defined with at least 365 days of subsequent data in order for a yearly total to be calculated.
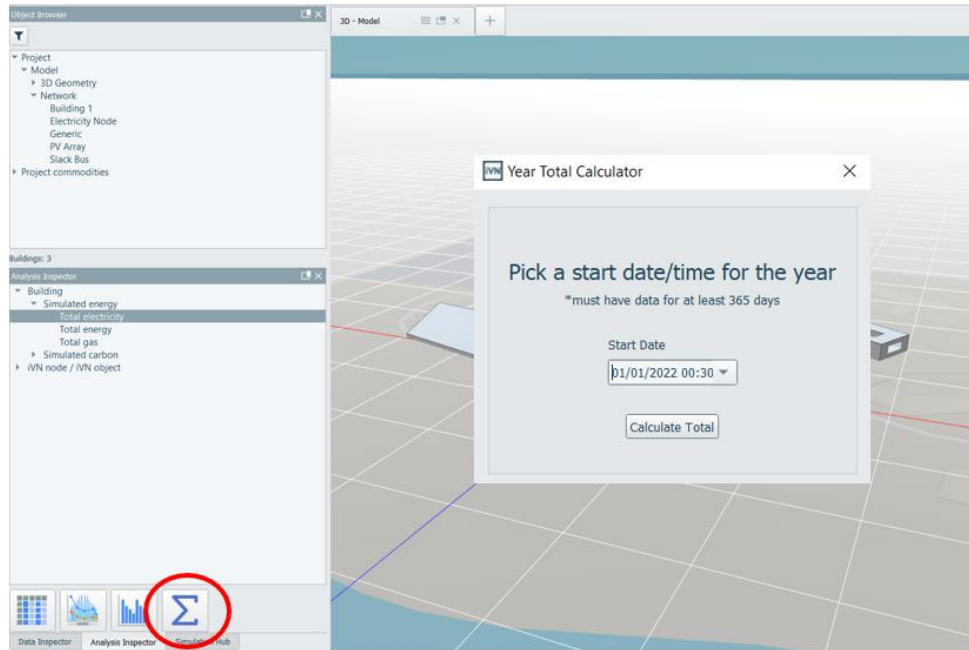
Once a yearly total is clouted a new tab will open displaying the specified yearly total variable, the specified start date, the end date (start date +365 days) and the resulting yearly total sum.

Variable name	Start Date/Time	End Date/Time	Total
Helix Building: Total electricity (Model) (kWh)	01/01/2022 00:30	01/01/2023 00:30	39605.85593

Each time a year total is calculated a new tab will be opened.

The chosen result variable must have at least 365 days of data in order to calculate a yearly total. If there is less than 365 days of data the user will be presented with a warning outlining insufficient data.

Insufficient data also occurs if the specified start date input does not have subsequently data for 365 days from the start date.

2   iVN 2023.0.0

A minor release, this latest version of the iVN contains minimal changes in functionality, with a larger release upcoming in Summer 2023. The list of updates in this version are as follows:

- General bug fixes: the IES development always endeavour to ensure the most seemless version of our software is available to our customers. This includes the identification and resolving of bugs as they are identified. If you find any bugs during your use of the software, please send the details to ICLfeedback@iesve.com

- Improvements to the CSV import feature: The first version of this feature only allowed the import of channels when the data was stored in rows. This version now allows for the more conventional import of row per column. Full details and explanation are available in the quick start guide on the website.

- User validation improvements: As with the general bug fixes, it is also important for a user to understand that if something has gone wrong in the simulation engine, the user should be able to figure out what has happened. This work improves the error messages in the iVN, allowing easier identification of the problem for the user.

3 iVN 2022.2.0

iVN 2022.2.0 will for the first time have a core software offering with the option for users to purchase add-on modules depending on their needs. This gives flexibility in the software offering and means that users will only have to purchase what they need.
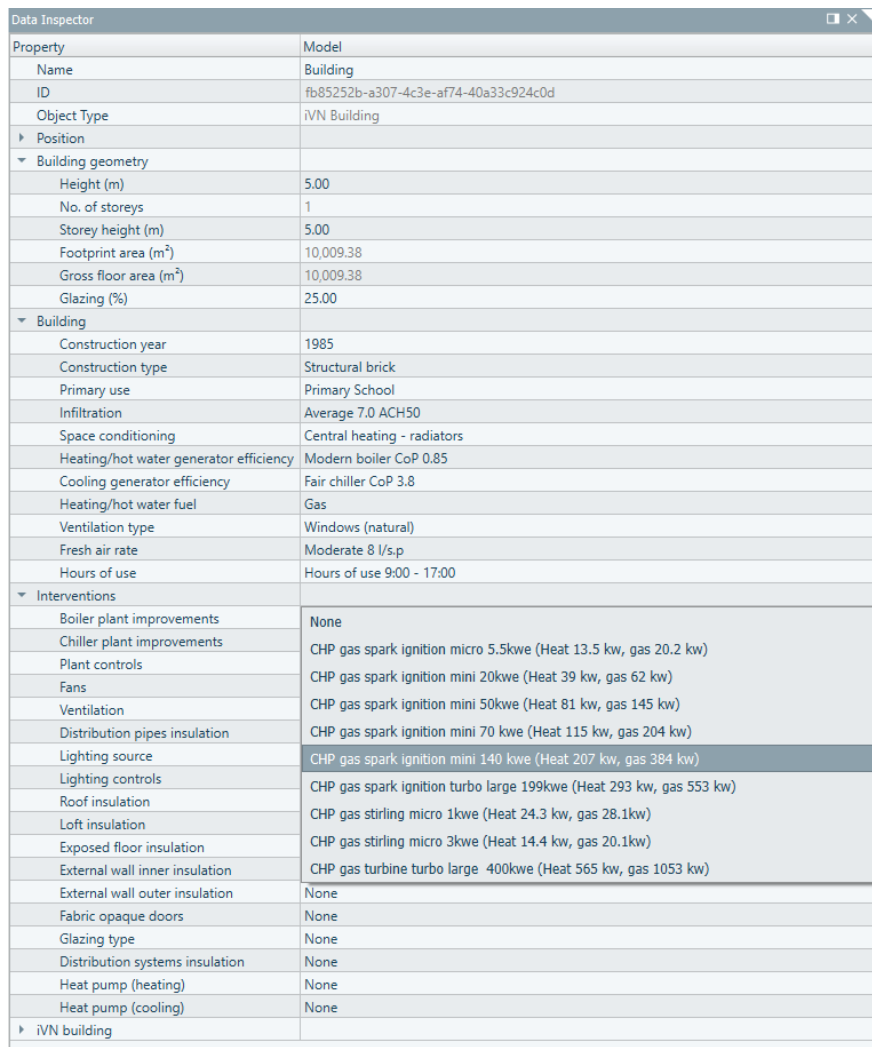
- **iVN Core** contains all of the central functionality of the product, including building energy simulation, renewable asset modelling, energy system/network aggregation, and ICL interoperability.

- **iVN Optimise** is an add-on module containing IES' optimisation engine which can be used to design renewable assets with the goal of minimising external energy supply which inherently reduces carbon emissions as a result.

- **iVN Heat** is an add-on module containing IES' district heat network modelling engine. Users can design and size the infrastructure of their existing or prospective heat network, modelling both the thermal and hydraulic behaviour of the same while taking account of heat losses, mass flow rates and supply/return temperatures.

Please note that iVN Core is required to access either of the add-on modules. When purchased, the add-on modules' functionality will work seamlessly within the iVN interface.

Core

3.1 Integrated Building Energy Simulation

In previous versions of the iVN, a copy of the VE had to be downloaded and linked to the software so that building energy simulations could be run. In this latest version, the building simulation capabilities are integrated into the software and so no link is required in the settings to a VE location, making for a more seemless installation process and faster simulation times.

Data Inspector	
Property	Model
Name	Building
ID	fb85252b-a307-4c3e-af74-40a33c924c0d
Object Type	iVN Building
▸ Position	
▾ Building geometry	
Height (m)	5.00
No. of storeys	1
Storey height (m)	5.00
Footprint area (m²)	10,009.38
Gross floor area (m²)	10,009.38
Glazing (%)	25.00
▾ Building	
Construction year	1985
Construction type	Structural brick
Primary use	Primary School
Infiltration	Average 7.0 ACH50
Space conditioning	Central heating - radiators
Heating/hot water generator efficiency	Modern boiler CoP 0.85
Cooling generator efficiency	Fair chiller CoP 3.8
Heating/hot water fuel	Gas
Ventilation type	Windows (natural)
Fresh air rate	Moderate 8 l/s.p
Hours of use	Hours of use 9:00 - 17:00
▾ Interventions	
Boiler plant improvements	None
Chiller plant improvements	CHP gas spark ignition micro 5.5kwe (Heat 13.5 kw, gas 20.2 kw)
Plant controls	
Fans	CHP gas spark ignition mini 20kwe (Heat 39 kw, gas 62 kw)
Ventilation	CHP gas spark ignition mini 50kwe (Heat 81 kw, gas 145 kw)
Distribution pipes insulation	CHP gas spark ignition mini 70 kwe (Heat 115 kw, gas 204 kw)
Lighting source	CHP gas spark ignition mini 140 kwe (Heat 207 kw, gas 384 kw)
Lighting controls	CHP gas spark ignition turbo large 199kwe (Heat 293 kw, gas 553 kw)
Roof insulation	CHP gas stirling micro 1kwe (Heat 24.3 kw, gas 28.1kw)
Loft insulation	CHP gas stirling micro 3kwe (Heat 14.4 kw, gas 20.1kw)
Exposed floor insulation	CHP gas turbine turbo large 400kwe (Heat 565 kw, gas 1053 kw)
External wall inner insulation	
External wall outer insulation	None
Fabric opaque doors	None
Glazing type	None
Distribution systems insulation	None
Heat pump (heating)	None
Heat pump (cooling)	None
▸ iVN building	

Building Attributes can be edited in the Data Inspector before running a building energy simulation

In terms of functionality and workflow within the software there is no change.

3.2 CSV Import – Time Series Profiles

There are a number of ways that a user can currently create time series demand profiles for buildings in the software: creating it by running a building energy simulation as described above, import an iCIM model with demand profiles already associated to it, or directly via iSCAN.
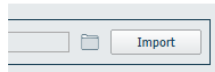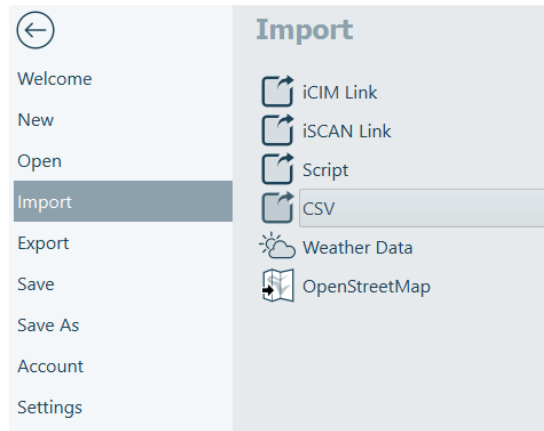
The CSV import feature is located in the same place in the user interface as the other import features

Now there is another way, which is directly from a CSV file on their desktop. This feature allows the user to import standalone time series profiles without the need for an iSCAN licence or any other interaction with the ICL, providing users with a standalone method of importing their data into the iVN

By clicking the folder button this opens Windows Explorer where the user can select their desired CSV file.
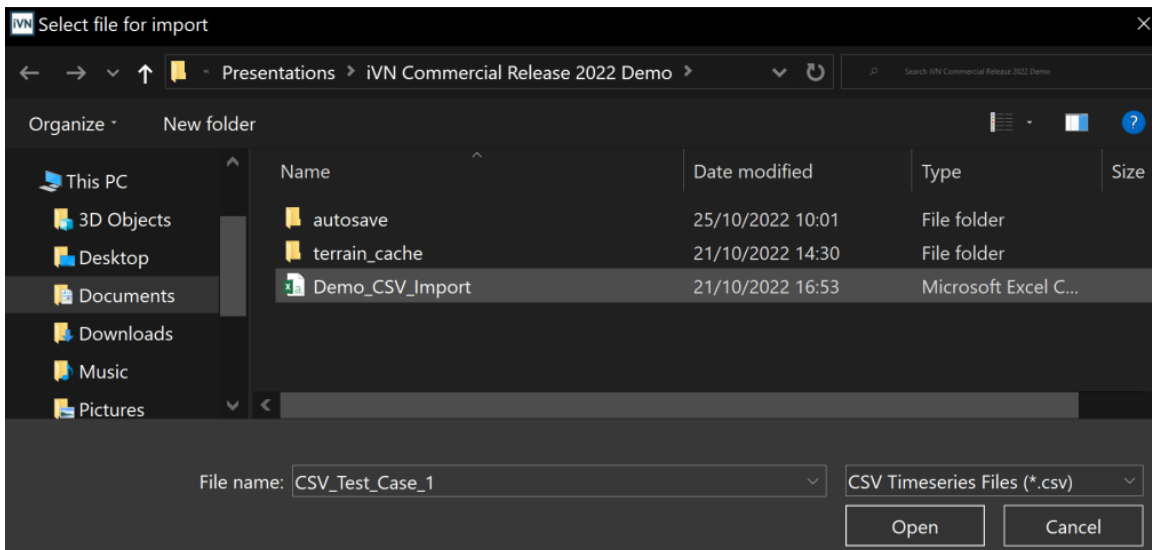

It is important to note that the CSV file must be in the following format to be imported correctly. More data formats will be available in future versions:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	name	start_year	start_month	start_day	end_year	end_month	end_day	timestep_minutes	values									
2	apples	2019	1	1	2019	12	31	5	53.07	94.44	19.80	53.59	25.01	25.29	95.66	26.28	62.90	67.99	78.44
3	bananas	2020	2	2	2020	7	20	60	162.33	834.23	566.25	500.05	52.67	999.98	367.98	702.59	701.74	931.47	338.13
4	oranges	2023	1	1	2023	12	31	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
5	pears	2023	1	1	2024	3	1	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
6	apples1	2019	2	1	2019	5	31	60	53.07	94.44	19.80	53.59	25.01	25.29	95.66	26.28	62.90	67.99	78.44
7	bananas1	2020	2	2	2020	7	20	60	162.33	834.23	566.25	500.05	52.67	999.98	367.98	702.59	701.74	931.47	338.13
8	oranges1	2023	1	1	2023	12	31	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
9	pears1	2023	1	1	2024	9	30	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
10	apples2	2019	2	1	2019	5	31	60	53.07	94.44	19.80	53.59	25.01	25.29	95.66	26.28	62.90	67.99	78.44
11	bananas2	2020	2	2	2020	7	20	60	162.33	834.23	566.25	500.05	52.67	999.98	367.98	702.59	701.74	931.47	338.13
12	oranges2	2023	1	1	2023	12	31	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
13	pears2	2023	1	1	2024	9	30	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
14	apples3	2019	2	1	2019	5	31	60	53.07	94.44	19.80	53.59	25.01	25.29	95.66	26.28	62.90	67.99	78.44
15	bananas3	2020	2	2	2020	7	20	60	162.33	834.23	566.25	500.05	52.67	999.98	367.98	702.59	701.74	931.47	338.13
16	oranges3	2023	1	1	2023	12	31	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
17	pears3	2023	1	1	2024	9	30	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
18	apples4	2019	2	1	2019	5	31	60	53.07	94.44	19.80	53.59	25.01	25.29	95.66	26.28	62.90	67.99	78.44
19	bananas4	2020	2	2	2020	7	20	60	162.33	834.23	566.25	500.05	52.67	999.98	367.98	702.59	701.74	931.47	338.13
20	oranges4	2023	1	1	2023	12	31	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08
21	pears4	2023	1	1	2024	9	30	60	224.27	307.65	118.03	231.60	313.23	146.92	288.09	154.56	160.89	226.03	262.08

CSV File Format: Time series values are held in individual rows, not columns as is typical

The time series profile must have its start date and end date defined as well as the timestep in minutes defined in its row after the name, with the subsequent cells in the row holding the profile values as shown above.

Once a time series profile is imported, this profile can be assigned to a building in the demand and generation editor of a building in the virtual network by right clicking the building and selecting the "Set Demand and generation" menu option, and then within the dialog assigning the profile via the drop down list:
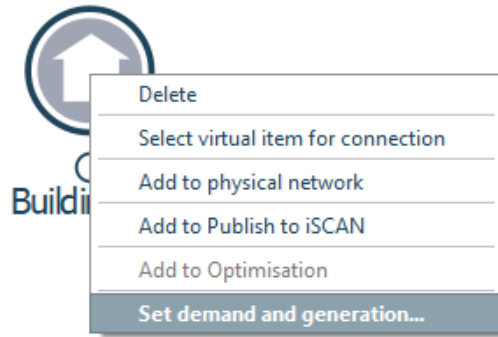

Selecting the "Set demand and generation" option of a building in the virtual network view

Within the demand and generation editor pop-up window then the time series profile can either be set as a demand profile (i.e. that it is energy being consumed) or a generation profile (i.e. that energy is being produced), and the commodity type can also be chosen. In the screengrab you can see this is set to Electricity, but heating, cooling and a number of other choices can be selected.
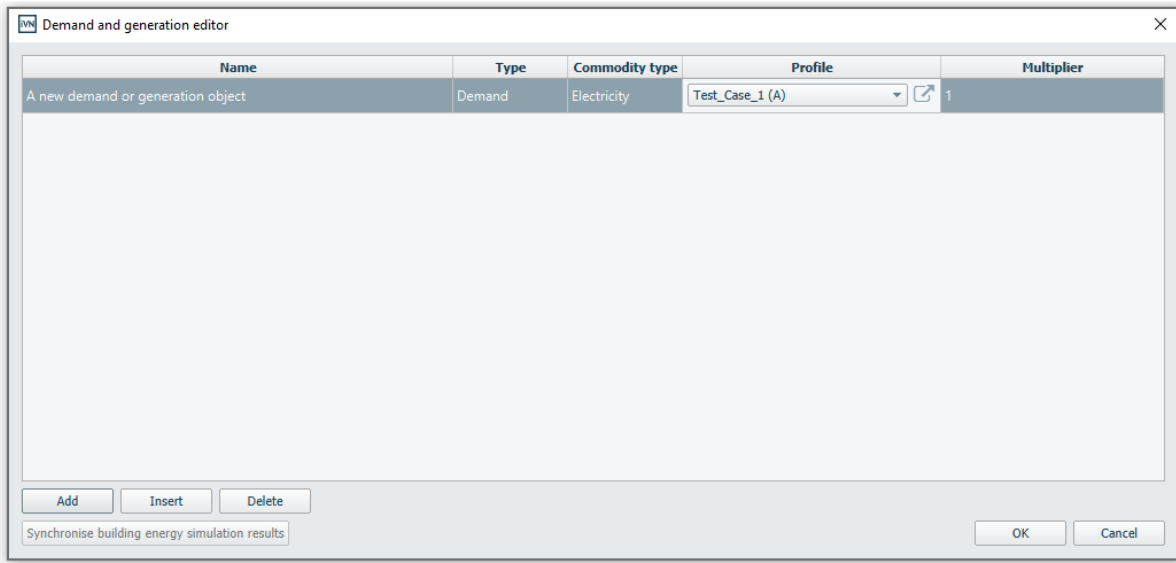
*The demand and generation editor pop-up window*
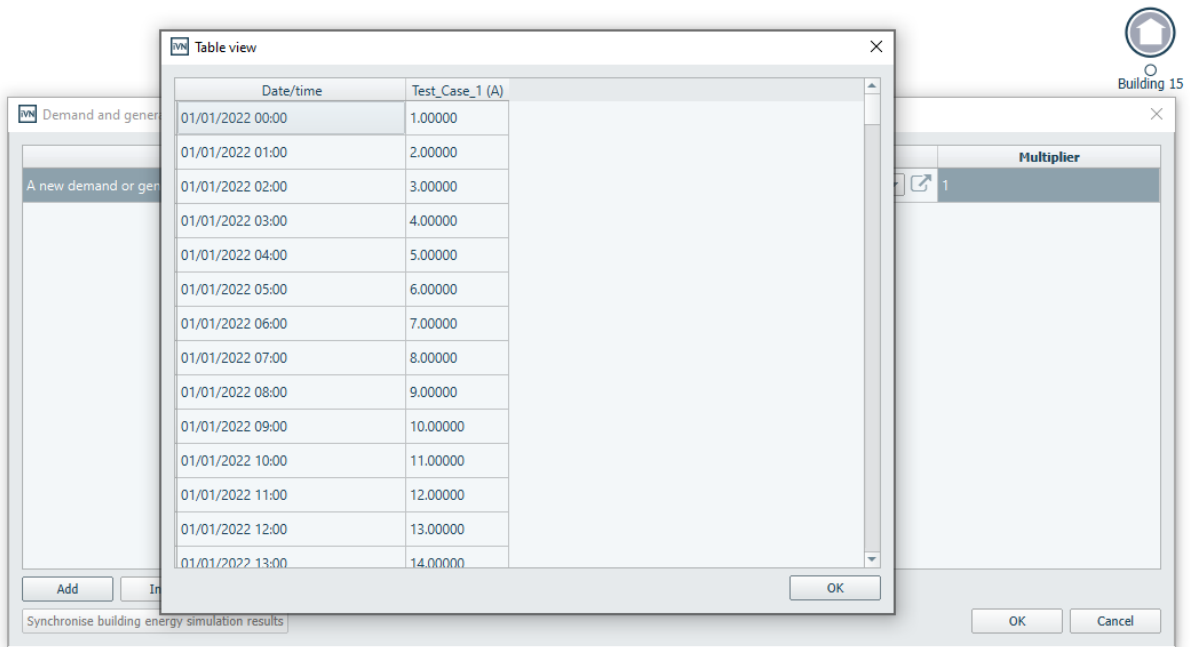
Showing the time series profile values by selecting the ⬈ button beside the profile name

Optimise

3.3 Optimisation for Virtual Network Assets

When using the iVN to design an energy system or network, the user is able to create different scenarios to analyse the impact of different combinations and sizes of renewable energy assets in terms of how much of the demand they are able to supply and carbon emissions they are able to remove. And while this is an effective way of designing the system, it does not guarantee the optimal design solution. This is where the optimisation engine comes in.

A user can select a number of assets in their model and the relevant asset attributes that can be changed by the optimisation engine. The engine will then determine the best values for each of those attributes with the goal of reducing the external energy supply (and associated carbon emissions) and save those to the model. The user can set constraints on these attributes as well so that the solution is still viable and realistic for their project. The first version of the optimisation engine works for the electricity, heating and cooling virtual networks.
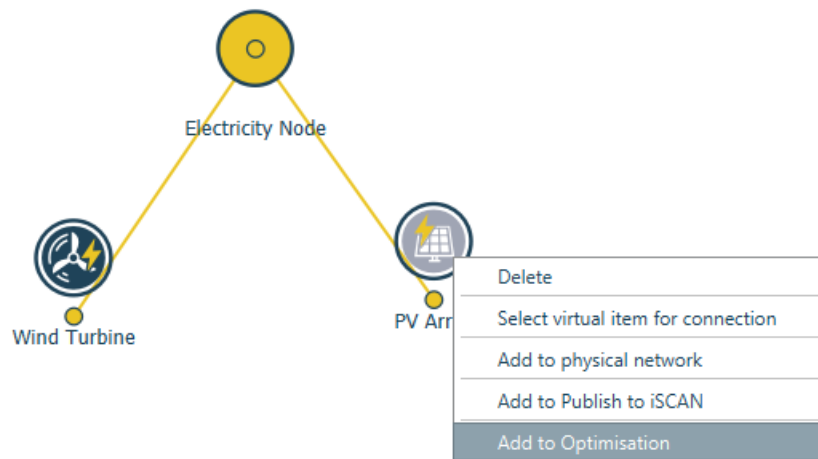
An asset is added to the optimisation problem by right clicking it in the virtual network and selecting "Add to Optimisation"

Once an asset is set up as "custom" in the data inspector, any of the asset attributes can be set as variables in the optimisation problem, with min and max values selected by the user depending on what the constraints are that they want to apply.

The optimisation problem can be set up via the Data Inspector. The "Set optimisation" pop up is clicked which shows the optimisation engine dialog box.
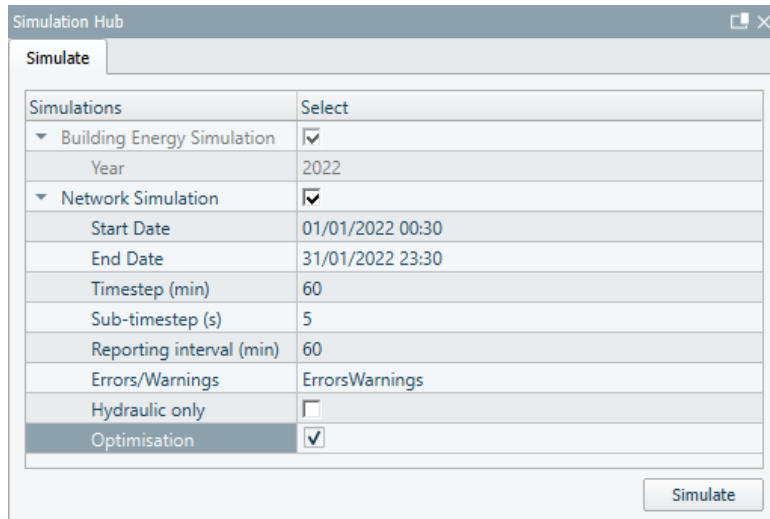
The optimisation option must be selected in the Simulation Hub before hitting simulate

Once the simulation is complete the user will be given the option to apply the optimsed values to the variables they have selected. These will then be applied to the model asset attributes.

Heat

3.4 District Heating Network – Decoupled Thermal and Hydraulic Calculations

The first version of the district heating network modelling engine in the iVN ran both thermal and hydraulic calculations in parallel. However, especially when designing new networks, it can be difficult to set the network parameters correctly for the engine to solve the problem and complete the simulation. So to give the user some flexibility in modelling and less stringent modelling requirements, the software now contains the ability to run a hydraulic only calculation. The requirements of the hydraulic calculations are less strict, and still gives useful outputs such as mass flow rate in the physical network and allows for high level design decisions to be made more easily.

Sample District Heating Network
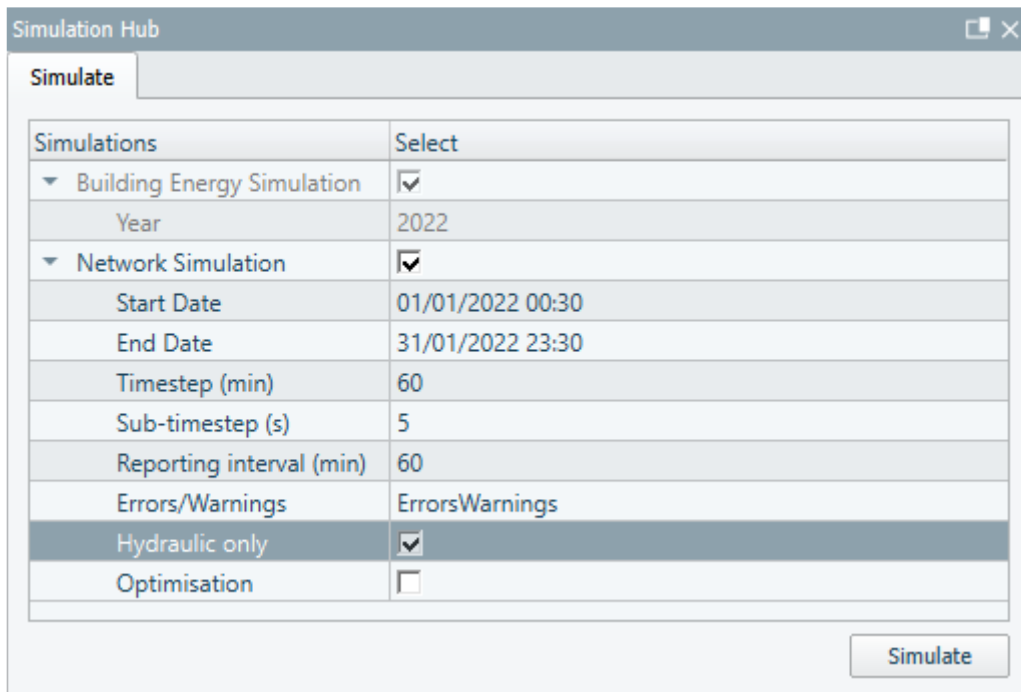
Running a Hydraulic only calculation can be selected in the Simulation Hub