



# N4 EnergyManager

powered by  energyvision

## User Guide

# Table of Contents

Changelog	5
Welcome	6
Installation	7
Licensing	8
Check license status	8
N4 ENERGY MANAGER Data	9
Aggregators	9
Using Aggregators	9
Manually adding histories to aggregators	9
Data Normalisation	10
Site Hierarchy	11
Discovering histories using Site Hierarchy	11
Adding Histories to Aggregators Using Site Hierarchy	12
Aggregator Facets	12
File Structure	14
Accessing N4 ENERGY MANAGER via a Web Browser	15
Recommended Browsers	15
Demo Station	16
N4 ENERGY MANAGER Reports	17
Instant Reports	17
Daily / Monthly / Yearly Profiles	18
Data Config	18
Meters	19
Schedules	20
Settings	20
Automated Reports	21
Enabling the automated reporting service	21
Adding an automated report (Workbench configuration)	21

Designing an automated report (Web Browser configuration)	23
Design Page Layout	24
Design Page Content	26
Preview Report	27
Exiting Report Builder	27
Engineering N4 ENERGY MANAGER	28
N4 ENERGY MANAGER Palette	28
User Interface Widgets	29
Widget Properties	30
Currency symbol	32
Line Chart	33
Bar Chart	35
Ranking Chart	35
Pie Chart	36
Degree Day Regression Chart	36
Degree Day Aggregator	37
How to Engineer the Degree Day Aggregator Component	38
How to Engineer Degree Day Regression Component	38
Stacked Bar Chart	40
Kiosk Mode	41
Heatmap	43
Gauges & Dials	44
Segments Dial	45
Bar Gauge	46
Needle Gauge	47
LED Dial	47
Navigation Menu	48
Vertical Menu	48
How to Engineer the Menu	49
Menu Builder	50
How to Engineer the Menu Builder	50
Using the Menu Builder	52

Data Quality	53
Data-Quality Popup	54
Energy Temperature Curve (ET Curve)	56
Adding an ET Curve chart	56
Energy Vision to N4 Energy Manager Migration Tool	58
Error Logging and Usage Analytics	61
Troubleshooting	63

# Changelog

Please refer to this section of the documentation for the N4 ENERGY MANAGER changelog.

Previous Version	Current Version	Changes / Updates
	3.0.1	Beta version
3.0.1	3.0.2	Niagara OEM statement

## Welcome

Welcome to N4 ENERGY MANAGER. The purpose of this document is to assist in engineering an N4 ENERGY MANAGER station, explaining the unique features and settings while advising on any tips and tricks to best utilise the software.



N4 ENERGY MANAGER has been developed and tested for Niagara version 4.4 or above. Please note that N4 ENERGY MANAGER has not been developed or tested for OEM versions of Niagara.

## Installation

To install N4 ENERGY MANAGER, follow the steps below. Prior to installation, ensure that the Niagara station and workbench are not running. Additionally, when N4 ENERGY MANAGER was purchased, download the modules and demo station from the partner web.

1. Open the module folder received which contains N4 ENERGY MANAGER.
2. Navigate to the module folder for Niagara > **C:\Niagara\Niagara-4.x.xx.xx\modules** [Version number may differ].
3. Copy and paste the N4 ENERGY MANAGER modules into the Niagara Module folder.
4. Start Platform Daemon.
5. Restart Station



To check that N4 ENERGY MANAGER has installed correctly, open the palette, search for N4 ENERGY MANAGER and the appropriate components should be listed.

Once these steps have been completed the N4 ENERGY MANAGER service needs to be added to your station. Once you start engineering your station using N4 ENERGY MANAGER components, when the station is restarted the N4 ENERGY MANAGER Service will automatically be added to your station. Alternatively, simply add the N4 ENERGY MANAGER Service from the Palette file.



N4 ENERGY MANAGER works best when used in conjunction with a 64-bit Niagara Installation. If you are using a 32-bit Niagara installation it may be worth considering installation the 64-bit version. If this is not possible, please read the notes in the troubleshooting



Due to the differences between EnergyVision AX and N4 ENERGY MANAGER, it is not possible to automatically migrate one to the other. The station would have to be re-engineered with the new version of N4 ENERGY MANAGER

## Licensing

N4 ENERGY MANAGER licensing limits the number of **unique histories** that can be used within the N4 ENERGY MANAGER station.



The number of Aggregators you used is not limited by N4 ENERGY MANAGER licensing.

## Check license status

It is possible to check how many **unique histories** are being used in the station, and how this corresponds to your licensed amount. Within workbench, load the **spy pages** view on the **N4 ENERGY MANAGER Service**. This will provide you with an overview of your licensing status.



# N4 ENERGY MANAGER Data

## Aggregators

The aggregator is at the core of N4 ENERGY MANAGER, connecting history data sources to the charts.

An aggregator is a virtual representation of a physical meter in the field. Aggregators also have the option to add external data from a file.

Aggregators normalise data of one or more meters into a 'virtual' meter. For example, 4 sub-meters in the field can be merged into 1 N4 ENERGY MANAGER aggregator representing a floor. Another example would be subtracting renewable from non-renewables.



Each Aggregator can be made up of up to 50 histories.



Removing histories **will permanently delete** the stored data in the N4 ENERGY MANAGER database.

## Using Aggregators

There are two main ways of configuring and using aggregators in N4 ENERGY MANAGER. Firstly, by manually adding histories to an aggregator, and secondly by using the Site Hierarchy.

### Manually adding histories to aggregators

This method is particularly useful when the user is adding a small number of meters to one page.

1. Open folder in which the aggregator needs to be added.
  - a. **Right Click** on the folder and select **Views > Wire Sheet**.
2. Open the **Palette** ensuring that the **N4 ENERGY MANAGER Palette** is opened.
3. **Expand** the folder **Aggregator**.
4. Drag & drop the **Aggregator** component onto the **Wire Sheet**.
5. Double click on the **Aggregator** component.
6. Right-click on the property sheet, select **Actions > Add Meters**.
7. Enter the number of **Meters** that need to be added.
8. Click **OK**.
9. Respective to the number of **Meters** added in step 7, **Meter** (1,2,3 etc....) will be added.
10. Expand **Meter**.
11. The **Ord** line will display **null**.
12. Click the drop-down icon next to the folder icon.
  - a. Select **History Ord Chooser**.
13. Using the pop-up, navigate through your histories selecting the appropriate file.
14. Once selected, click **Ok**.

To add further, repeat steps **10, 11, 12 (a), 13 & 14**.

## Data Normalisation

Data normalisation could be used to normalise aggregator output to calculate metrics such as “power consumption by area”, “power consumption per employee”. Data Normalisation is the process of applying a scalar operation (add, subtract, divide, multiply) to an aggregator's output. The normalisation is applied as the final stage in an aggregator's calculation. If more than one normaliser component is present the normalisation steps would be applied by their order in the slot sheet.

### Adding a normalisation step:

- Right-click on normaliser and choose the type of normalisation
- Set the operand value and the corresponding unit.

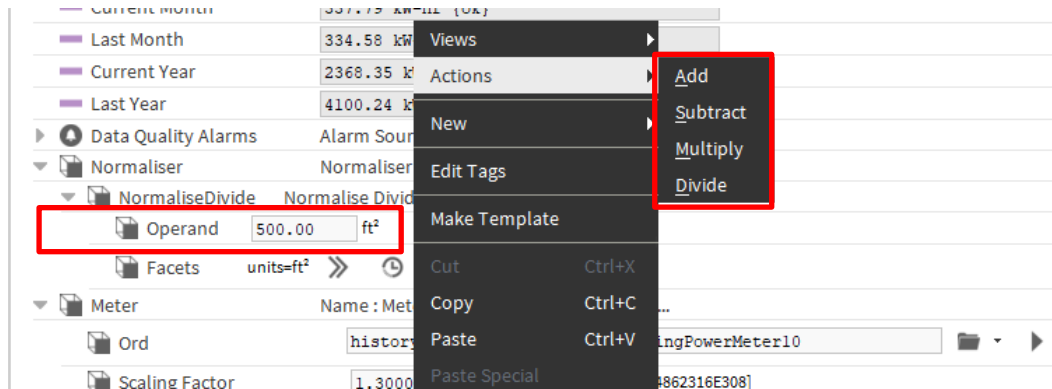


Figure 1 - EXAMPLE OF ADDING A NORMALISATION STEP

### Derived Unit:

The unit property on the aggregator is a derived unit based on the base history units and the normaliser units.

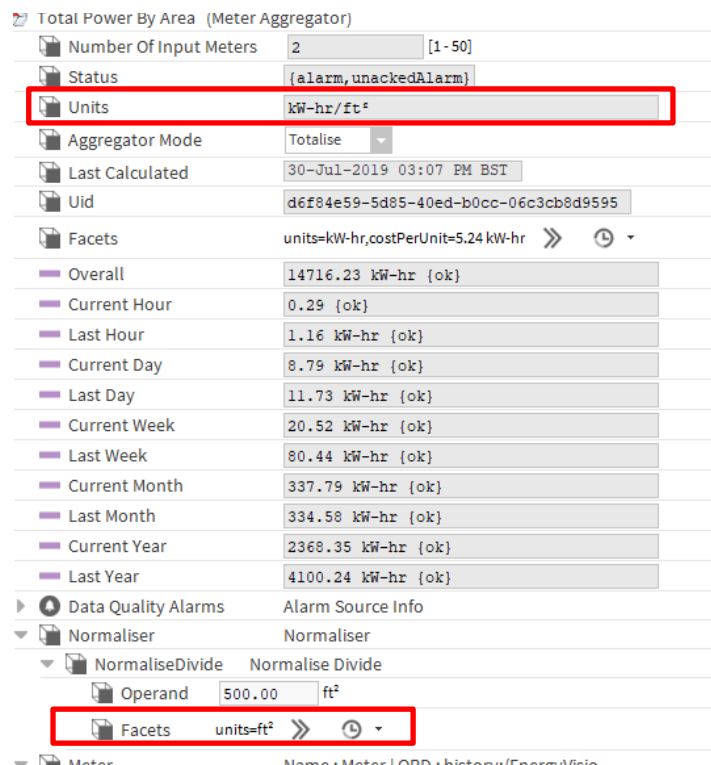


Figure 2 - EXAMPLE OF A DERIVED UNIT

## Site Hierarchy

The Task of “Site Hierarchy” is to simplify the creation of an aggregator and its assigned histories.



As a pre-requisite to using the Site Hierarchy function, it is assumed that the folder structure for the station has already been created. We would **STRONGLY recommend** that folders have already been created as this makes bringing in histories easier, allowing the engineer to see the hierarchy of the station.

## Discovering histories using Site Hierarchy

1. **Expand** the station in the **Navbar**
2. **Expand** Config → Services → N4 ENERGY MANAGER
3. **Double Click** on **Site Hierarchy**
4. Now, a new window will have appeared. (This may take a minute or 2 to open depending on the number of histories within the station).
  - a. **Station** – This window is the complete hierarchy of the station.
  - b. **Discovered** – Shows the history structure
    - i. If no histories have been discovered yet, at the bottom of the window click **Discover**. This will now search the network for any histories.
  - c. **Current Path: Slot:/** - This window is the folder structure of the station. This is where the aggregators will be added too.
  - d. **Site Meter Tree** – Once aggregators have been created, they will show in the site meter tree.
5. Using the **Discovered** window, navigate through the histories.

The screenshot displays the Site Hierarchy application interface. The main window is titled "Discovered" and shows a list of 8 objects. Below this, the "Current path: slot:/Aggregators" is selected, displaying a table of 14 objects. The table columns are Name, Type, Number Of Input Meters, Facets, and Exceeded Met. The table lists 10 "Total Power Meter" entries, each of type "Ev Meter Aggregator" with 1 input meter. Below the table, a list of folders is shown: Campus, Library, BuildingA, and Heatmap. On the right side, the "Site Meter Tree" is visible, showing a hierarchy of aggregators and folders.

Name	Type	Number Of Input Meters	Facets	Exceeded Met
Total Power Meter	Ev Meter Aggregator	2	units=kW-hr, costPerUnit=5.24	false
Total Power Meter2	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter3	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter4	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter5	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter6	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter7	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter8	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter9	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Total Power Meter10	Ev Meter Aggregator	1	units=kW-hr, costPerUnit=5.24	false
Campus	Folder			
Library	Folder			
BuildingA	Folder			
Heatmap	Folder			

Figure 3 - EXAMPLE OF SITE HIERARCHY

## Adding Histories to Aggregators Using Site Hierarchy

Now that histories have been discovered, it is now possible to assign histories to an aggregator

### Assign Single History to an Aggregator

1. To bring in a **single history**, ensure the folder that the meter will be added to is open in the **Current Path** window below. This is where the aggregator will be added too.
2. Select the **History**.
3. At the bottom of the window, click **Add**.
4. A pop-up window will now appear. Rename the aggregator if needed; if not, the aggregator will be named after the history it is being linked too.
5. The aggregator, with the history linked to it, will now be added to the folder opened in the **Current Path** window.
6. To add further single histories, repeat steps **1, 2, 3 & 4**.

### Assign Multiple Histories to an Aggregator

1. To bring in **multiple histories**, ensure the folder that the meter will be added to is open in the **Current Path** window below. This is where the aggregator will be added too.
2. Select the **Histories**.
3. At the bottom of the window, click **Add Group**.
4. A pop-up window will now appear. Rename the aggregator if needed; if not, the aggregator will be named after the history it is being linked too.
5. The aggregator, with the history linked to it, will now be added to the folder opened in the **Current Path** window.

To add further histories repeat steps **1, 2, 3 & 4**



It is paramount that the naming of your aggregators is kept relevant in the initial engineering stage. This is due to the fact the charts/graphs/dials/gauges all pull the name of the aggregator through and will be on display. For example, we would **STRONGLY recommend NOT** naming aggregators *Meter 1, Meter 2, etc...* rather call them something like, *Floor 1, Room 2, etc.* ensuring that they remain specific to data they are processing.

## Aggregator Facets

When adding multiple history files, the aggregator engineering unit must be added manually. This is achieved by configuring the facets of the Aggregator. In the same dialog, the cost per unit can be configured. This is used when displaying reports based on cost conversion (This is explained in the **Reporting** section of this manual).

### To manually add a facet

1. Open the Aggregator Property Sheet
2. Click the >> icon in the Facets Property
3. Configure the Units Property
4. Configure the costPerUnit Property

Property Sheet

Total Power Meter10 (Ev Meter Aggregator)

Number Of Input Meters: 1

Aggregator Mode: Totalise

Uid: d6f84e59-5d85-40ed-b0cc-06c3cb8d9595

Facets: units=kW-hr,costPerUnit=5.24 kW-hr

Overall: 14494591.00 {ok}

Current Hour: 280.54 kW-hr {ok}

Last Hour: 1240.42 kW-hr {ok}

Current Day: 3363.42 kW-hr {ok}

Last Day: 11541.40 kW-hr {ok}

Current Week: 3363.42 kW-hr {ok}

Last Week: 81375.98 kW-hr {ok}

Current Month: 61263.62 kW-hr {ok}

Last Month: 362510.34 kW-hr {ok}

Current Year: 3615377.75 kW-hr {ok}

Last Year: 1558297.75 kW-hr {ok}

EvMeter: Name : EvMeter | ORD : history:/EnergyVis...

Config Facets

Key	Type	Value
units	Unit	kW-hr
costPerUnit	Double	5.24

OK Cancel

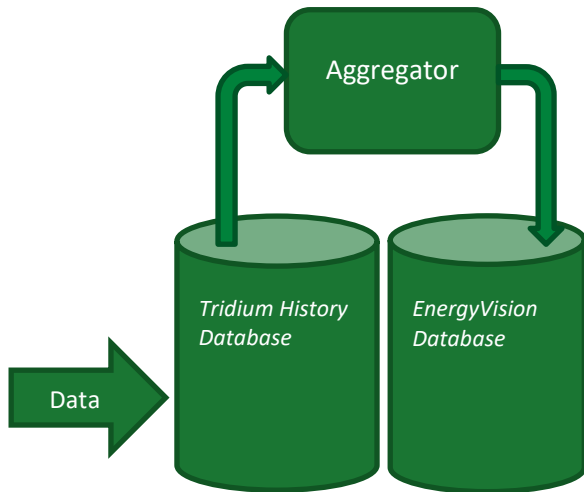
Figure 4 - EXAMPLE OF A FACET



Units for an Aggregator is taken automatically from the assigned history file.

## File Structure

Working alongside the in-built Tridium database, N4 ENERGY MANAGER's new proprietary format database is highly compressed and streamlined for optimum performance. Below is a graphical representation of the new database structure.



In the chart to the left is a representation of how the data is brought into N4 ENERGY MANAGER.

1. Data enters the Tridium history database.
2. Data is processed using aggregators.
3. The aggregator adds a copy of that history into N4 ENERGY MANAGER's database.
4. The chart will always access the history created by the aggregator in the N4 ENERGY MANAGER database.

## Accessing N4 ENERGY MANAGER via a Web Browser

As with all N4 Niagara Stations, it is possible to view your station via a web browser. Some features of N4 ENERGY MANAGER are only available when accessed in a web browser and are unavailable in workbench. (There will be a clear indication when this is the case). Below are some steps to ensure that your station will be accessible via a web browser.

1. Ensure the station is running in Niagara. (Platform > Application Director > [STATION NAME] running.
  - a. If it isn't running, click Start in the controls pane below.
2. Allow the station time to start running. Usually 2 minutes (depending on the size of the station).
3. Now, open the web browser.
4. Type: **localhost** – into the browser
  - a. If the port on which the station is running hasn't been changed the default port number is 80. If the port number has been changed manually, for example, to port 81, type: localhost:81.
5. A login window should now appear.
  - a. Enter the station's credentials.
6. The station should now be loaded within the web browser.

To change and/or check the port on which the station is running, follow the below instructions:

1. Ensure the station is connected.
2. Expand the **station** → Config → Services
3. Double click on **Web Service**.
4. Check HTTP(S) Port numbers. This will determine which port to access the station.



We recommend viewing N4 ENERGY MANAGER graphical components in the latest version of Google Chrome for the best experience.



Ensure the latest version of Chrome is installed on the Server (where the N4 ENERGY MANAGER station is running). **This is critical to report generation.**

## Recommended Browser

- Google Chrome

## Demo Station

If you are using the provided demo station as a starting point for your own station, the login details are as follows.

**Username:** "admin"

**Password:** "n4EnergyManager"



Default Username and Password should be changed in your own station for security.



# N4 ENERGY MANAGER Reports

There are two types of reports which N4 ENERGY MANAGER can generate: Instant Reports and Automated Reports.

## Instant Reports

N4 ENERGY MANAGER charts can produce an instant report as a PNG, PDF or CSV file. The diagram below shows the chart controls and their functionality.

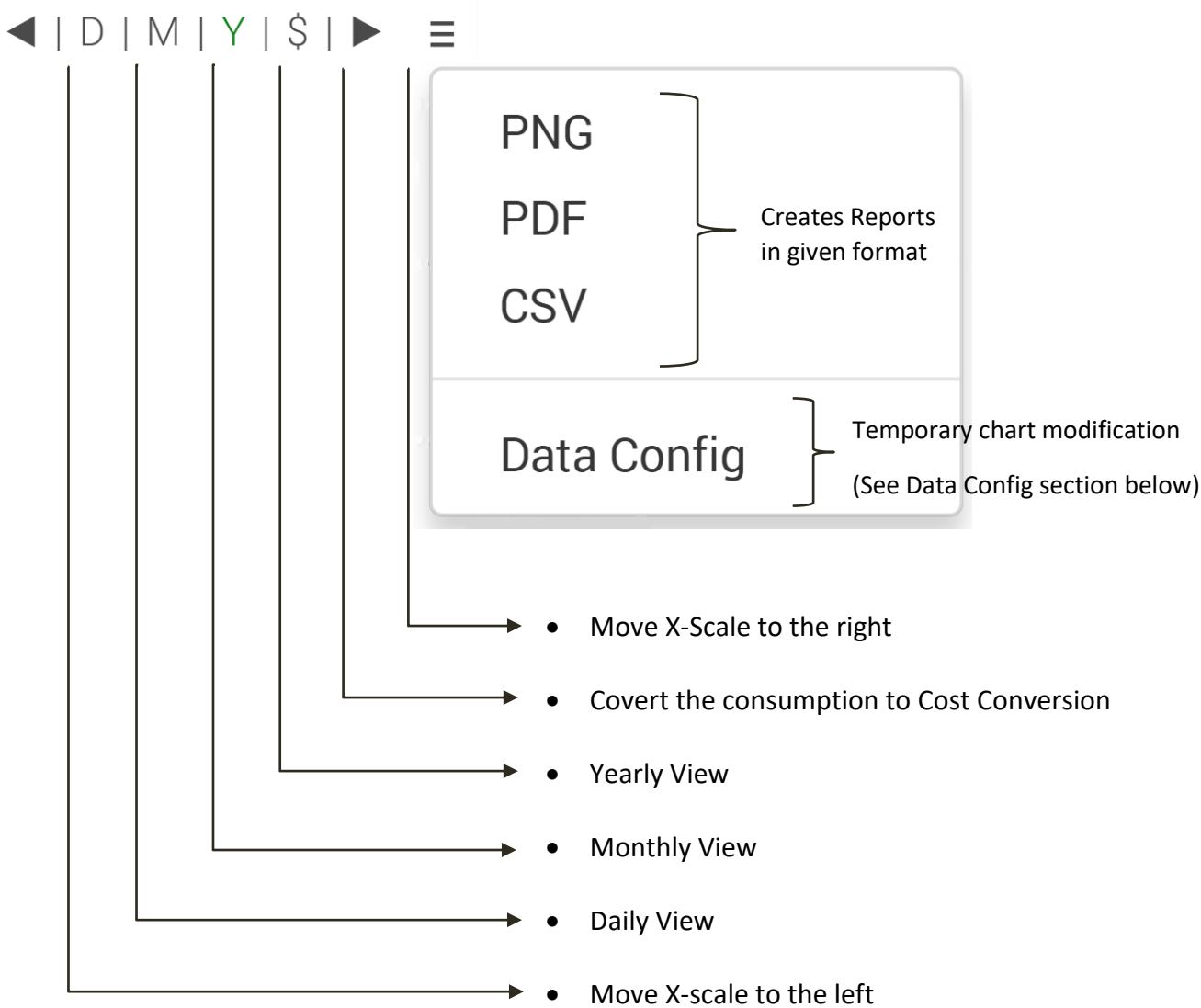


Figure 5 - CHART CONTROLS AND FUNCTIONALITY

## Daily / Monthly / Yearly Profiles

The D|M|Y profiles that feature in each of the charting components are interactive buttons allowing the user the view data from a different time period.

For example, if the user is viewing the line chart in 'Daily' mode, they would see the most recent data from that day. Using the arrows ◀▶ the user can navigate forwards and back through the data.

When comparing data, the days are aligned. For example, if the user wants to compare yesterday's data (e.g. 2<sup>nd</sup> January 2017) then the chart would compare data from the same day last year (2<sup>nd</sup> January 2016) regardless of whether the actual days (e.g. Monday to Monday) align.

## Data Config

The Data Config window can be accessed from the instant report menu.



The chart configuration menu needs to be operated through web browser access. Some of the configuration menu will not work correctly in workbench



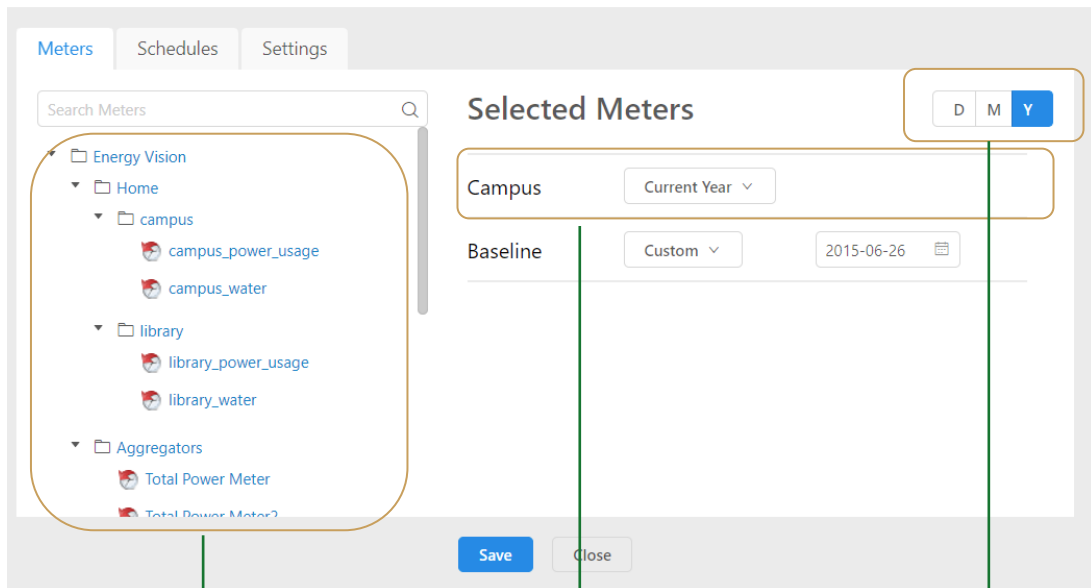
Any changes which are made in the Data Config window are not saved and are only visible until the chart is reloaded. (Unless you are using the Data Config menu in the Report Builder – this is explained in the following section.

The Data Config window contains three main tabs:

- Meters,
- Schedules
- Settings.

## Meters

The **Meters** tab allows configuration of which Aggregators (See section on N4 ENERGY MANAGER Aggregators) are being displayed on the current chart, along with the selection of custom time periods and time ranges depending on the selected time period (e.g. Day, Month, Year).



One instance of a meter added to the chart. Depending on the selected time period, the drop down enables time range selection.

This is a list of all Aggregators in the station, selecting one of these will add it to the **Selected Meters** list on the right.

Selects the time period the chart will show.

Figure 6 – EXAMPLE METER CONFIGURATION

## Schedules

The **Schedules** tab will only be available within graphical widgets which support the Schedule functionality. The Line Chart supports the Schedule functionality. The **Schedule** function allows the addition of a schedule to the bottom of the chart (e.g. to show occupancy information).

Using the drop-down box, select the Schedule you wish to be displayed on the chart.



In case a new created Schedule will not be visible please restart the station or run "Rebuild Site Tree" under N4 ENERGY MANAGER Service  
→ Site Hierarchy

## Settings

The **Settings** tab will contain settings relevant to the chart you are editing.

**Show Minimap** – If enabled, the slider on the bottom of the chart will be displayed allowing the user to navigate the chart using either a mouse or their finger on a tablet/smartphone.

**Show Schedules** – If enabled, this will display any added schedules.

## Automated Reports

Automated Reports give a powerful way to generate customised reports and automatically generate them on a schedule of your choosing. These reports can then be 'pushed' elsewhere by using standard forwarding options from the Reporting Palette (e.g. Email Recipient or File Recipient).

### Enabling the automated reporting service

To enable the functionality of automated reporting in your station a few steps must first be carried out to setup the feature.

1. Within Workbench, open the N4 ENERGY MANAGER Service and expand the **Report Manager**.
  - a. Default is disabled. The service needs to be **Enabled**.
  - b. Server Port default is 9000. If no other servers/services are running on that port, leave as default. If not, you can change this to a port of your choice.



Ensure the latest version of Chrome is installed on the Server (where the N4 ENERGY MANAGER station is running). **This is critical to report generation.**

### Adding an automated report (Workbench configuration)

Before starting to design the report, the initial setup of the automated must be done in Workbench. You must add a **PDF Report Generator** onto your station and configure the generation period and any forwarding options you want. The following example created an Automated Report and sends the generated report to a File Recipient.

1. Create a new folder under the Station.
  - a. Name it something relevant (e.g. energyReport).
  - b. Open the wiresheet of the folder.
2. Ensure the N4 ENERGY MANAGER Palette is open in the Palette window.
  - a. Expand **Aggregator**
3. **Drag & Drop** the **PDF Report Generator** onto the wiresheet of the **energyReport** folder.
  - a. Give the component a name (e.g. energyReport)
4. Open the Property Sheet of the **PDF Report Generator**
  - a. Here you can set the trigger mode, frequency and intervals between automatic report generation. (**Figure 9**)
5. In the Palette window, open the **report** Palette.
  - a. Expand **Reporting**.
  - b. **Drag & Drop** the **FileReceipient** component onto the wiresheet.
  - c. **Link** the out slot of the **energyReport** to the **route** slot of the **FileReceipient**.

- d. Double-click on the component to open the properties. By default, it will save the report in the root of the station. Create a new folder if required and save the report to the desired location (engineers discretion).
- e. Enable **Append Timestamp**.

Figure 8 shows the wiresheet of this configuration



You could also use the Email Recipient in the same way as the File Recipient to forward the report to an email address.



Other custom logic could be used to trigger the component using the 'Generate Report' action on the PDF Report Generator component.



Reports can be generated manually by right clicking on the component and selecting actions > generate.



Reports will continuously be generated on the schedule configured. Whether automatic or manual, reports take around 30 seconds to be generated.

Property Sheet	
energyReport (Ev Pdf Report)	
Schedule	2:00 AM {Sun Mon Tue Wed Thu Fri Sat }
Trigger Mode	Daily
Time Of Day	02:00:00 AM GMT
Randomization	+000000h 00m 00s
Days Of Week	<input checked="" type="checkbox"/> Sun <input checked="" type="checkbox"/> Mon <input checked="" type="checkbox"/> Tue <input checked="" type="checkbox"/> Wed <input checked="" type="checkbox"/> Thu <input checked="" type="checkbox"/> Fri <input checked="" type="checkbox"/> Sat
Last Trigger	null
Next Trigger	04-Nov-2017 02:00 AM GMT
Data	

Figure 7 - AUTOMATED REPORTING PROPERTY SHEET

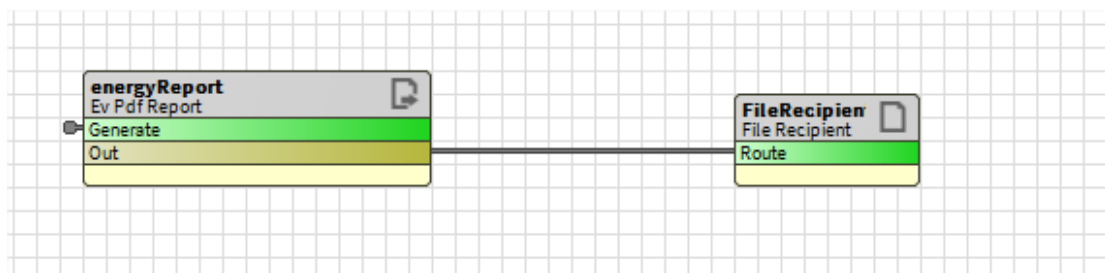


Figure 8 - WIRE SHEET

## Designing an automated report (Web Browser configuration)

Once the automated report component has been set up in Workbench, the design phase of the report needs to be done via a web browser. The same automated report component which was added previously, when viewed in a web browser, will present the tools needed to design the report.

1. Open the web. Login to the station. Use an engineer's login so that the structure of the station can be seen, rather than loading into a graphical PX.
2. Under the folder structure of the station, navigate to the **energyReport** folder.

- a. Right-click on the **energyReport** component and select **views**.

**Report Builder** – Responsible for building the reports.

**Report Viewer** – Responsible for viewing the reports.

- b. Select **Report Builder**.
- c. The report designer page will now open.

Figure 9 shows the layout of the report designer and how each section is referred to in the following guide.

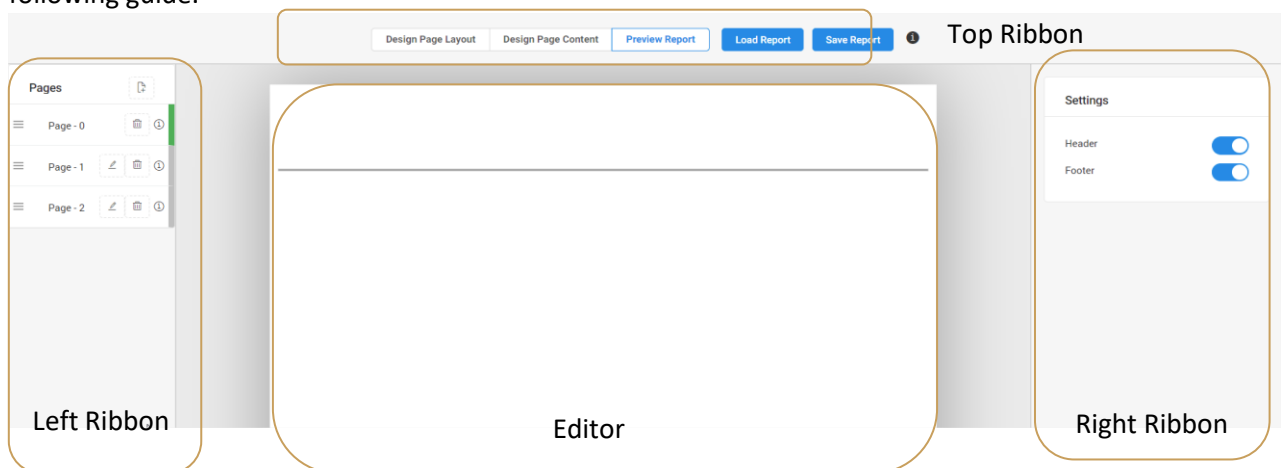


Figure 9 REPORT DESIGNER

The report designer has three modes: Design Page Layout, Design Page Content and Preview Report. These can be selected using the top ribbon of the report designer. (Figure 12)

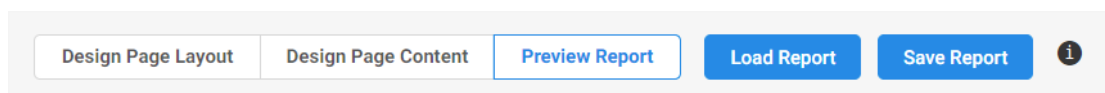


Figure 10 - MODE SELECTION

- **Design Page Layout**
  - Allows the header and footer to be resized and edited.
  - When this is selected, the **Add Header Widget & Add Footer Widget** options will appear.
- **Design Page Content**
  - Allows the content of the page to be resized and edited.
  - When this is selected the **Add Widget** option will appear.
- **Preview Report**
  - Allows the report to be previewed as it would appear exported.
- **Load Report**
  - This will send the report to the report generator.
- **Save Report**
  - This will save the report.



It is recommended to periodically save your report using the Save Report button to prevent unintended loss of report configuration.

## Design Page Layout

When in **Design Page Layout** mode, it is possible to resize and edit the header and footer of the report. Initially, this is applied to all pages in the report (and any subsequently added pages). This can be overridden per page by using the **Settings** options on the right ribbon (Figure 9).

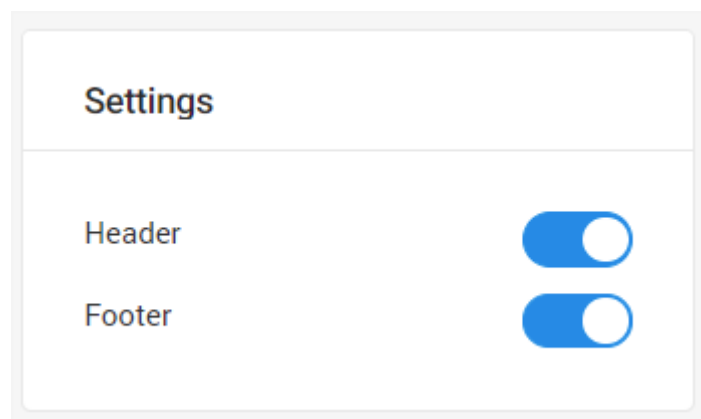


Figure 11 - SETTINGS

In **Design Page Mode** you can use the resize handle on the report page to resize the header and footer.



Using the **Add Header Widget** or **Add Footer Widget** buttons in the top ribbon, you can add text widgets to the respective locations. Once these have been added, the **Text Settings** options appear in the right ribbon. Use these to alter text appearance, and to insert images into the text box. (Figure 10).

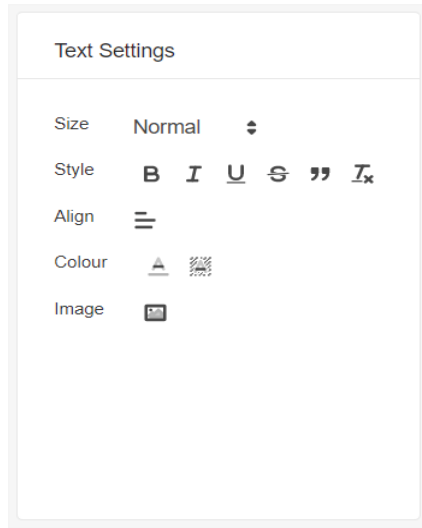


Figure 12 - TEXT SETTINGS

Pages can be configured when in any of the three operating modes by using the Pages options in the right ribbon. This is also the method to navigate to different pages of the report (Figure 11)

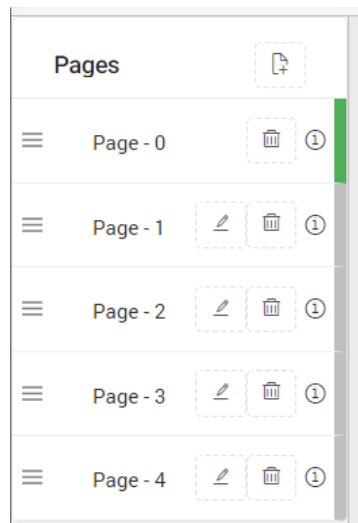


Figure 13 - PAGES

At the top of the Pages tab, the **Add Pages** button will add a blank page to the end of the report.

Each page will have a **Pencil icon**. Clicking this will enable editing of that page.

Each page will have a **Trash Can Icon**. Clicking this will delete the page.

Each page will have an **I (information) icon**. Hovering over this will display the name of the page.



When adding or navigating to a page, there will be a prompt to save any changes made on the current page.

## Design Page Content

When in **Design Page Content** mode, a variety of widgets can be added to the body of your report by clicking the **Add Widget** button and selecting the desired widget (Figure 12).

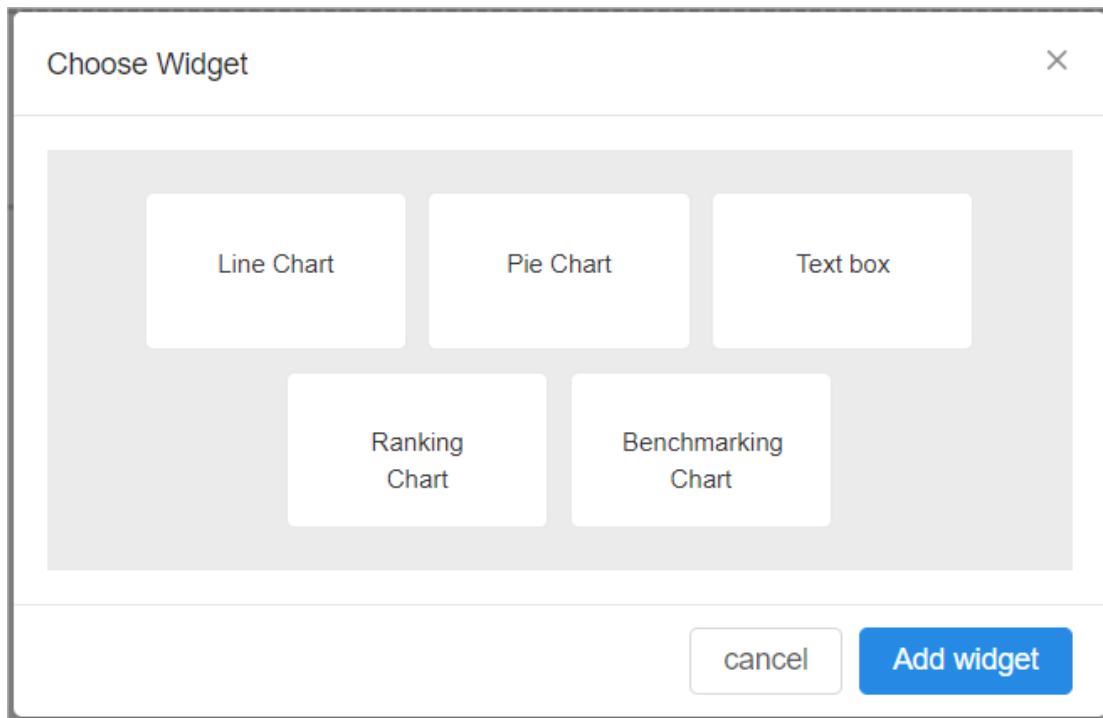


Figure 14 - ADD WIDGET

Once a widget is added to the report, it is configured using the **Data Config** menu, which is explained in the **Instant Reports** section of this manual.



New widgets are always initially added to the bottom of the current page. Using the drag handles you can resize and re-arrange the widgets on the page.

## Preview Report

When in **Preview Report** mode, the current page of your report is displayed to check the layout prior to saving.

## Viewing the completed Report

Go back to the folder structure of the station within the browser. Navigate to the folder energyReport, right-click on the energyReport component > views > Report Viewer.

## Printing the report

Following the 'viewing the report' steps. Use Chrome's Print to .pdf / print function by pressing Control P or right-click, print.



We recommend using Google Chrome for printing these reports.

## Exiting Report Builder

To exit the report designer SAVE your report and navigate back to the root of your station, by changing the path entering your local IP address 127.0.0.1.



If you type the original station address into the browsers address bar (this may be localhost/domain name or other IP Address), this will take you back to the root of the station.

# Engineering N4 ENERGY MANAGER

Sites can be engineered from scratch or by customizing the demo station.



Prerequisite is that histories have already been brought into Niagara.

## N4 ENERGY MANAGER Palette

The N4 ENERGY MANAGER palette is where all the N4 ENERGY MANAGER components can be accessed from. This includes the Services that provide the N4 ENERGY MANAGER processing functionality, but also the

To expose the Palette, follow these steps:

1. Click **Window** the top bar.
2. Select **Side Bars**.
3. Select **Palette**.

Now the Palette sidebar is opened, the N4 ENERGY MANAGER Palette can be accessed.

1. In the Palette window, click the **folder** icon.
2. The **Open Palette** window will now open.
3. In the filter search box, search **N4 ENERGY MANAGER**.
4. **Select** N4 ENERGY MANAGER, click **Ok**.
5. The N4 ENERGY MANAGER Palette will now be open in the Palette window.

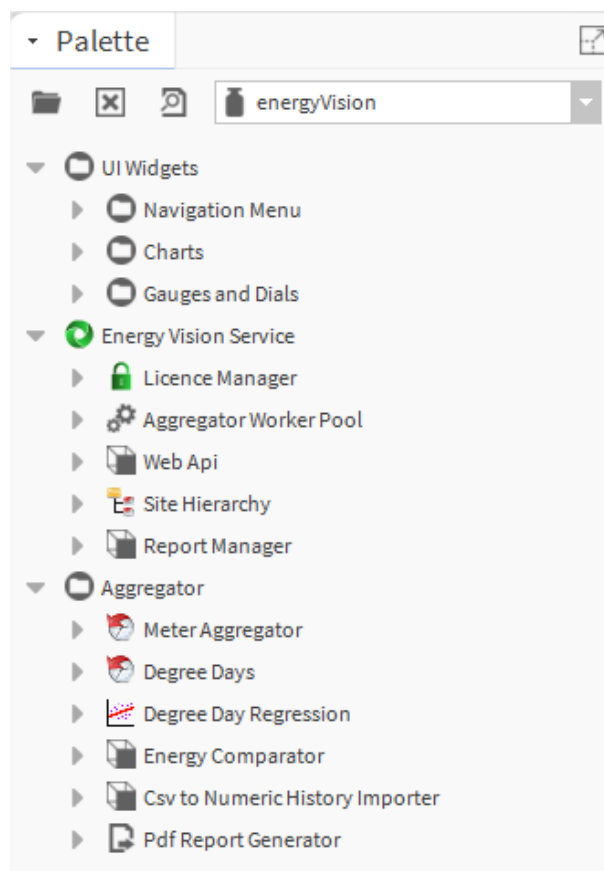


Figure 15 - EXAMPLE PALETTE


- **UI Widgets** – Houses all of the widgets which can be added to a PX Page
  - **Navigation Menu** – The components for the navigation menu.
  - **Charts** – The folder in which all the charts are stored.
  - **Gauges and Dials** – The folder in which all the gauges and dials are stored.
- **N4 ENERGY MANAGER Service** – Houses the services on which N4 ENERGY MANAGER runs.
  - **Licence Manager** – The service that is responsible for managing the licences for N4 ENERGY MANAGER.
  - **Aggregator Worker Pool** – The service that allows the user the modify the amount of the threads the aggregator can use simultaneously.
  - **Web API** – Allows the user the check, disable & enable the Web API service
  - **Site Hierarchy** – This component allows the histories to be brought into the station as aggregators.
  - **Report Manager** – This component allows the report manager to be enabled/disabled and the port on which it operated to be changed.
- **Aggregator** – Houses the services which allow the user to add the Meter Aggregator & Energy Comparator
  - **Meter Aggregator** – Allows the user to access the aggregator component
  - **Degree Days** – The aggregator designed specifically for calculating Degree Day data.
  - **Degree Day Regression** – The component that combines 3 aggregators, Kwhr, Heating Degree Days & Cooling Degrees Days.
  - **Energy Comparator** – The service in which users can input their energy consumption and cost per unit, and the component will output how much the energy consumed has cost.
  - **CSV to Numeric History Importer** – A tool to import CSV files into a numeric history.
  - **Pdf Report Generator** – Used to create an instance of an Automated Report.

## User Interface Widgets

Contained in the **UI Widgets** folder of the N4 ENERGY MANAGER Palette file are the graphical widgets which can be used to display data within your station. You can combine these with standard Niagara widgets to create a wide range of displays.

Each widget has its own set of properties which can be set in workbench. Some of these are duplicated in some or all the widgets and some are unique to individual widgets.

Selected charts (Ranking / Pie / Benchmarking / Line) can be converted to a tabular CSV view whilst being viewed.

1. Ensure the chart has been configured with the appropriate aggregator.
2. Hover over the chart.
3. A table icon will appear. 
  - a. The table icon is a toggle button. Click once to initiate, click again to deactivate.
4. Click on the table icon to convert the graph to a table view.

5. The chart will now convert to a table.
6. Click on the button again to toggle back to the graphical chart.

## Widget Properties

This section will look at the various widgets available in N4 ENERGY MANAGER, their purpose and information on how to engineer them.



Where Widget Properties are duplicated, they will be described in the first Widget they appear in. Please refer to other previous Widget Property descriptions if one appears to be missing.

When a widget is added from the N4 ENERGY MANAGER palette to the PX Page in Workbench, the widget properties can be accessed by using the **Properties Tab**.



It is possible to access widget properties by double clicking on the widget. However, we recommend using the Properties Tab to add meters as some properties do not display as expected when using the double click method.

Properties	
backgroundColour	...
chartSubTitle	
chartTitle	Library Power Benchmarking
enabled	true
foregroundColour	...
js	view:energyVision:BarChartWidget
layer	...
layout	270.0,0.0,1090.0,410.0
timeRange	Month
visible	true
xAxisTitle	
yAxisTitle	

Ev Chart Data Binding	
data	CLICK_HERE_TO_CHOOSE_ORD

Figure 16 - EXAMPLE WIDGET

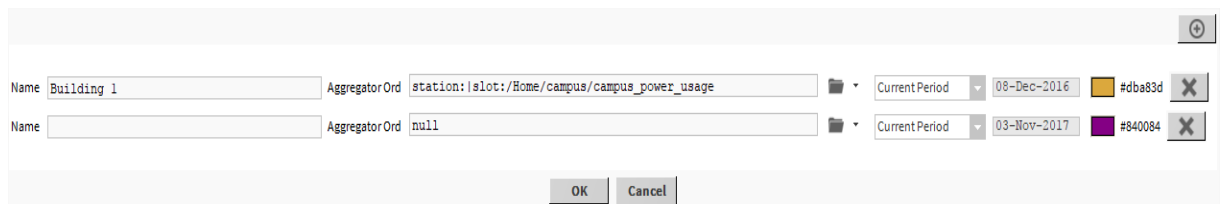
## Properties

The Widget Properties section is divided into two columns: the property name and its value. Depending on the type of property, the value column will allow different types of input – this could be, for example, a colour from a colour picker, an ORD, or a Boolean value

## Data Config

Most N4 ENERGY MANAGER charts will use the **Chart Data Binding** property to set the data to be displayed. When you click on the value column, you will be presented with the data configuration popup.

Using this popup, you can add Aggregators to the chart. You can further configure the name which will appear in the chart, the time period and an associated colour.



The screenshot shows a 'Data Configuration' popup window. It contains a table with two rows of aggregator configurations. The first row has 'Building 1' as the Name, 'station:/slot:/Home/campus/campus\_power\_usage' as the AggregatorOrd, '08-Dec-2016' as the Current Period, and a yellow color swatch with code '#dba83d'. The second row has an empty Name field, 'null' as the AggregatorOrd, '03-Nov-2017' as the Current Period, and a purple color swatch with code '#840084'. At the bottom are 'OK' and 'Cancel' buttons. A '+' icon is in the top right corner.

Name	AggregatorOrd	Current Period	Color
Building 1	station:/slot:/Home/campus/campus_power_usage	08-Dec-2016	#dba83d
	null	03-Nov-2017	#840084

Figure 17 - EXAMPLE CHART CONFIGURATION

1. Click the **drop-down arrow** on the right of the folder icon, **select Component Chooser**.
2. Navigate to the desired **Meter** that needs binding. **Select & Click Ok**.
  - a. To add an additional aggregator to the Line Chart, click the '+' sign in the top right-hand corner of the **data** pop-up. **Repeat steps 5 & 6**.
  - b. Use the **X** button and the end of each entry to remove that aggregator from the current configuration.



Aggregators must be individually named.

### Currency symbol

The currency symbol on the chart headers can be configured using the currency option under services in the station.

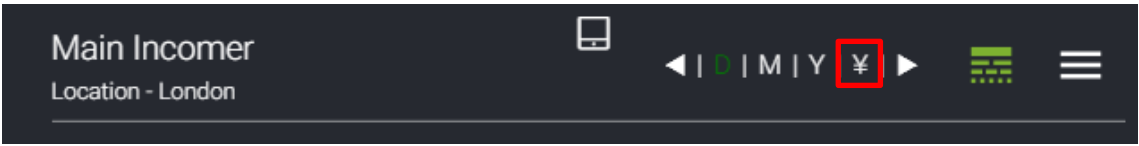


Figure 18 - EXAMPLE OF YEN CURRENCY ON A CHART

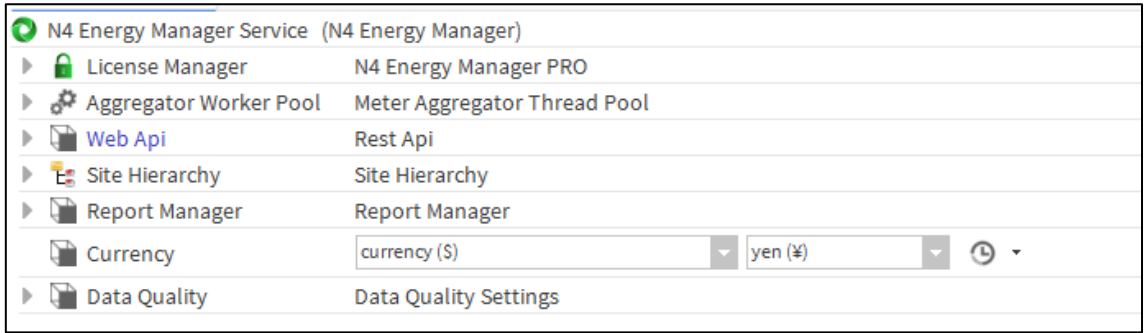


Figure 19 - EXAMPLE CURRENCY SELECTOR IN ENERGY MANAGER



## Line Chart

The Line Chart displays aggregator values as a series of points connected by straight lines. A line chart is normally used to show the trend of data over time.



By enabling **Multiple Y Axis** in the Line Chart Property tab, multiple Y Axis will be drawn for each unique facet found in the Aggregators assigned to the chart.

## Properties

WebWidget		
Web Widget		
backgroundCo		...
chartSubTitle	Location - London	
chartTitle	Library Water Benchmarking	
enabled	true	▼
foregroundCo		...
js	view:energy/Vision:BarChartWidget	...
layer		▼
layout	270.0,420.0,1090.0,350.0	...
timeRange	Month	▼
visible	true	▼
xAxisTitle		
yAxisTitle		
Ev Chart Data Binding		×
degradeBehav	None	▼
data	CLICK_HERE_TO_CHOOSE_ORD	...

Figure 20 - EXAMPLE PROPERTY TABLE

- **BackgroundColour** – The background of the chart.
- **ChartSubTitle** – The subtitle of the chart.
- **ChartTitle** – The title of the chart.
- **Enabled** – This setting allows the user to enable and disable the chart.
- **ForegroundColor** – This setting sets the foreground colour of the chart (ie. Lines, text)
- **Js** – Internal use only (Does not need to be configured).
- **Layer** – Unused feature, hardcoded into Niagara.
- **Layout** – The size and position of the chart
- **TimeRange** – Default setting when calling up the chart via a web browser. Supported time ranges are Day, Month & Year
- **Visible** – Is the chart visible on the page, or not.
- **Data** – Assignment of the aggregator. Click on the field to open the **Add Ord** property sheet
- **XAxisTitle** – the X-Axis title
- **YAxisTitle** – the Y-Axis title
- **MultipleYAxis** – enabled the display of multiple YAxis

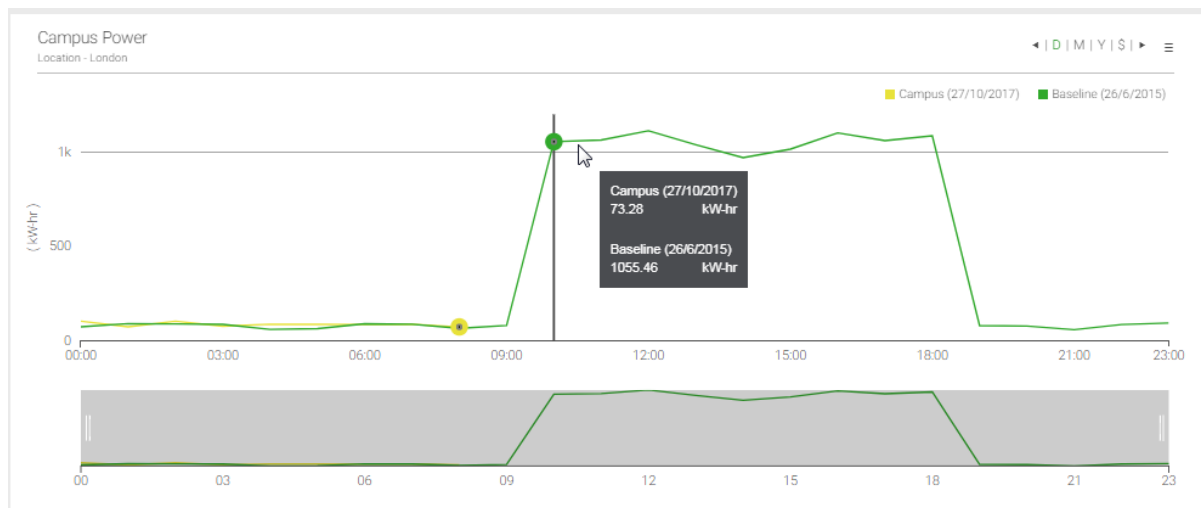


Figure 21 - EXAMPLE LINE CHART

## Bar Chart

The bar chart represents the value of the aggregators assigned to it, by the height of bars. This chart is commonly used to show comparisons between different categories of data.

### Properties

The bar chart does not have any further unique properties. See Line Chart.

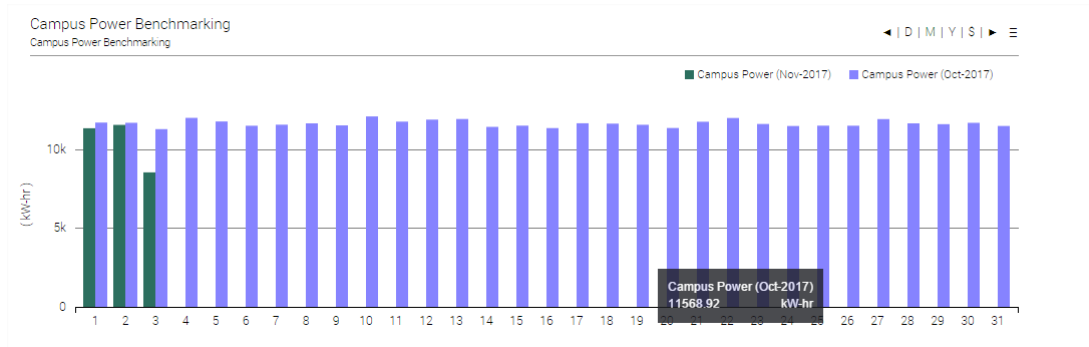


Figure 22 - EXAMPLE BAR CHART

## Ranking Chart

The Ranking Chart displays the value of each aggregator assigned to it as a horizontal bar chart. These values are then ranked into order from highest to lowest. This could be used to rank energy usage across multiple sites, ranked to show the most efficient/inefficient.



There is no limit on the number of aggregators that can be added to a Ranking Chart. However, large numbers may reduce performance.

### Properties

The ranking chart does not have any further unique properties. See Line Chart.

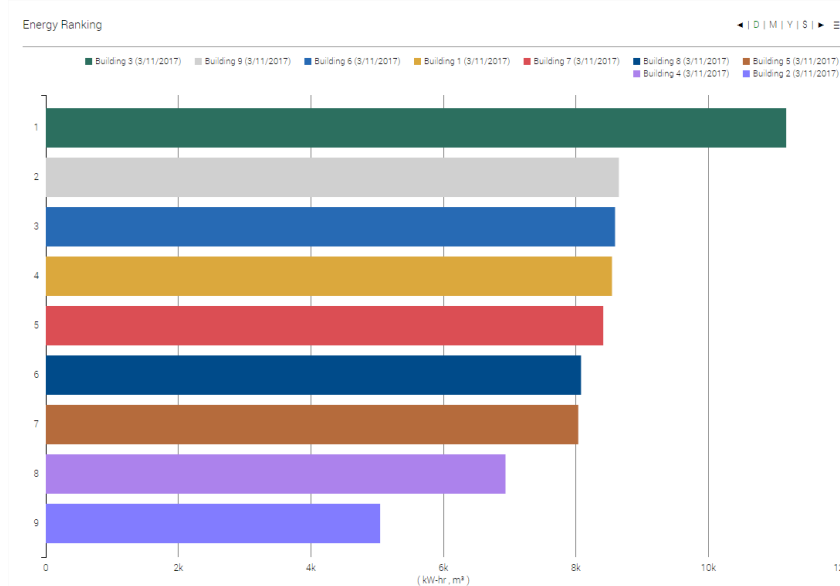


Figure 23 - EXAMPLE RANKING CHART

## Pie Chart

The pie chart displays the total value of all aggregators assigned to it, split into sectors of a circle.

### Properties

The pie chart does not have any further unique properties. See Line Chart.

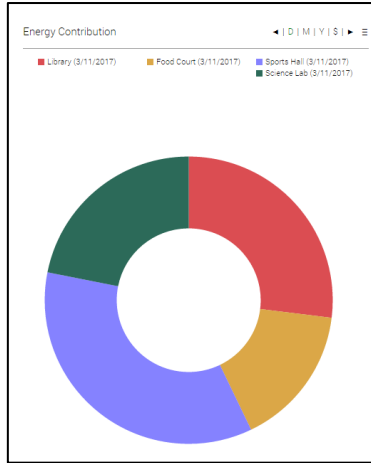
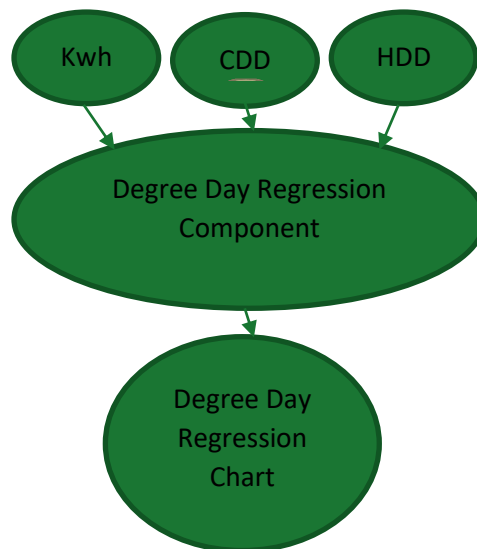


Figure 24 - EXAMPLE PIE CHART

## Degree Day Regression Chart

The Degree Day Regression Analysis chart is a representation of degree days (Heating Degree Days and Cooling Degree Days) and energy consumption.

The diagram below represents the data flow that allows the Degree Days Regression Component to calculate its data.



The Degree Day Regression chart has three steps to engineer. Firstly, **Degree Days Aggregators** must be present in the station – these differ from standard Aggregators. Secondly, the **Degree Day Regression** component must be added to a station. This is where the Aggregators are configured. Finally, the **Degree Day Regression Chart** needs to be added to a PX Page. When the data property is configured, the component previously configured will be used as the data ORD.

## Degree Day Aggregator

The Degree Day component inputs temperature and baseline temperature with the output of Degree Days. Although the Degree Day Component isn't a chart, it can still be linked to a chart allowing the processed data to be presented on a chart.

The component would need to be bound to an OAT (Outside Air Temperature).

### Property Sheet of the Degree Day Aggregator

Property Sheet

DegreeDay (Degree Day)

Uid 6019cfad-1ddb-4917-ba1e-6f9df891da40

Facets units=null, costPerUnit=1.00 >> ⌚

Overall - {null}

Current Hour - {null}

Last Hour - {null}

Current Day - {null}

Last Day - {null}

Current Week - {null}

Last Week - {null}

Current Month - {null}

Last Month - {null}

Current Year - {null}

Last Year - {null}

Degree Day Type Heating Degree Day

Base Temperature 15.50

EvMeter Exception in Ord: null

Ord null

Figure 25 - DEGREE DAY COMPONENT PROPERTY SHEET (NOT CONFIGURED)

- **Facets** – The unit of the data.
- **Degree Day Type** – Switch between Heating and Cooling Degree Days.
- **Base Temperature** – Enter the base temperature of the building.
- **Meter**
  - **Ord** – Link to the OAT (Outside Air Temperature) aggregator.

## How to Engineer the Degree Day Aggregator Component

1. **Drag and drop** the Degree Day Component from the Palette into the wiresheet on which the chart will be displayed.
2. **Double click** on the component.
3. The first setting to change is **Ord**.
  - a. **Click** the drop-down arrow next to the **Folder Icon**.
  - b. **Select** Component Chooser.
  - c. **Navigate** to the OAT (Outside Air Temperature) aggregator.
  - d. **Select** it.
  - e. **Click OK**.
4. Enter the **Base Temperature** for the building.  
Ensure the correct **Degree Day Type** has been selected.

## How to Engineer Degree Day Regression Component

1. **Drag & drop** the component in the page folder.
2. **Double click** on the component to open the property sheet. (Figure 20)
3. The **Ord** link fields will appear **null**.
  - a. **Heating Degree Day** – Use the drop-down icon next to the folder icon
    - i. select **Component Chooser**
    - ii. Navigate to the **Heating Degree Day** aggregator
    - iii. Click **OK**.
  - b. **Cooling Degree Day** – Use the drop-down icon next to the folder icon
    - i. select **Component Chooser**
    - ii. Navigate to the **Cooling Degree Day** aggregator
    - iii. Click **OK**.
  - c. **Energy** – Use the drop-down icon next to the folder icon
    - i. select **Component Chooser**
    - ii. Navigate to the **Total Energy** aggregator
    - iii. Click **OK**.
4. Using the drop-down menu, select the **Time Range**.
5. Click **Save**.
6. Open the Px Page the **Degree Day Regression Chart** will appear on.
7. Select **Edit Mode**.
8. **Drag & Drop** the **Degree Day Regression Chart** onto the **Px Page**.
9. **Double Click** on the chart.

Property Sheet	
Degree Day Regression (Degree Day Regression)	
Heating Degree Day	station: slot:/Degree\$20Days/Heating\$20Degree\$20Days
Heating Energy	station: slot:/Degree\$20Days/Heating\$20Kwhr
Cooling Degree Day	station: slot:/Degree\$20Days/Cooling\$20Degree\$20Days
Cooling Energy	station: slot:/Degree\$20Days/Cooling\$20\$20kwhr
Time Range	Last Year

Figure 26 - DEGREE DAY PROPERTY SHEET

1. **Heating Degree Day** – A link to the Aggregator for Heating Degree Day.
2. **Cooling Degree Day** – A link to the Aggregator for Cooling Degree Day.
3. **Energy** – A link to the Aggregator for energy consumption.
4. **Time Range** – Use this setting to define the range of time.



The **Degree Day Regression** components Property Sheet can be accessed via the Workbench or a web browser. If you wish to use a web browser, you will need to have access to the Property Sheet and the File Structure.

## Properties

The Degree Day Regression chart does not have any further unique properties. See Line Chart.



The Data Config of this chart works by setting the ORD to a **Degree Day Regression** component as described in the **How to Engineer Degree Day Regression Component** above.

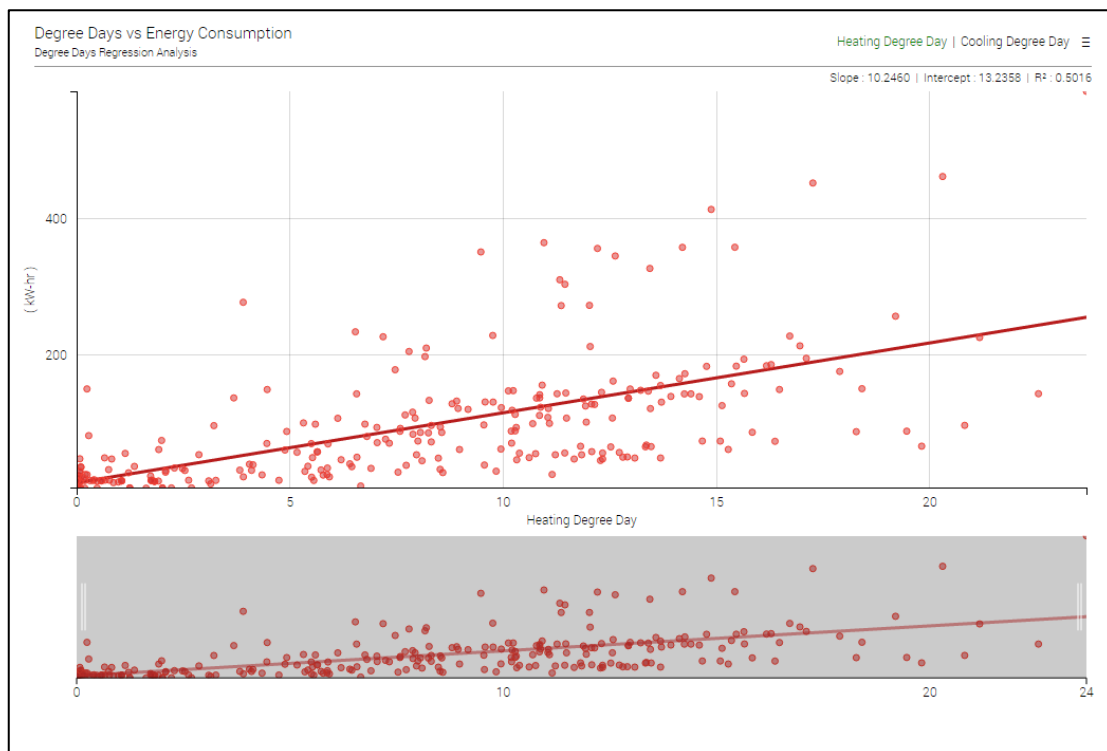


Figure 27 - EXAMPLE DEGREE DAY REGRESSION CHART

### Stacked Bar Chart

The Stacked Bar Chart offers an alternative view to the Bar Chart. Where the Bar Chart offers the user the view of seeing data represented in bars organised side-by-side, the Stacked Bar Chart will group and stack the data on top of each other. For example, if 2 individual meters represent a room, the engineer could group the 2 meters on top of each other. This would indicate the individual meter values whilst showing the combined total of the 2 meters on a bar chart.

The Stacked Bar Chart is engineered in the same way as the Bar Chart.

### Properties

The Stacked Bar Chart does not have any further display properties (See Line Chart). However, the data configuration is slightly different.

The screenshot shows a configuration window for a Stacked Bar Chart. It includes input fields for 'Name', 'Aggregator Ord' (set to 'null'), 'Category' (highlighted with a red rectangle), 'Current Period' (set to '03-Nov-2017'), and a color selection (set to '#840084'). 'OK' and 'Cancel' buttons are at the bottom.

Figure 28 - STACKED BAR CHART DATA CONFIGURATION

In the data configuration – there is an extra option: **Category**. All Aggregators with the same Category will be placed on the same stacked bar. Each category will have its own stacked bar.

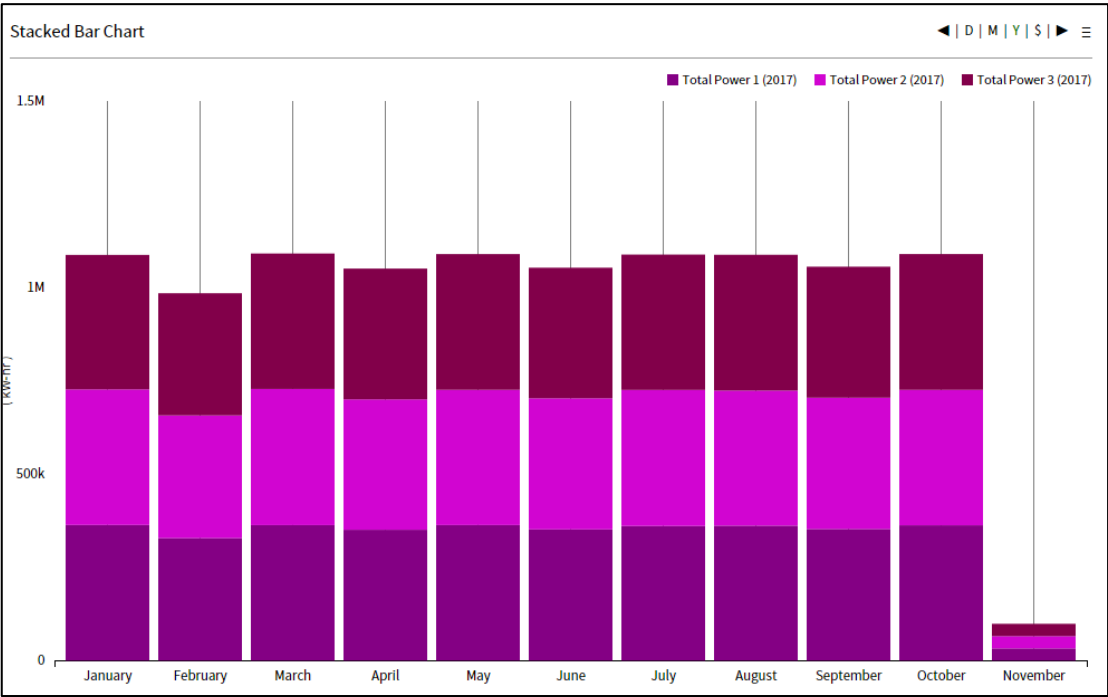


Figure 29 - EXAMPLE STACKED BAR CHART



## Kiosk Mode

The Kiosk Mode is a full-page widget that allows predefined pages to carousel with a predefined timer. The widget needs to be engineered on its own full page, with the width & height of the widget slightly larger than the PX pages to avoid scroll bars.

### Engineering the Kiosk Mode

1. In the station, create a new folder for the Kiosk Mode.
2. On the Kiosk Mode folder, create a new view.
3. Ensure edit mode is enabled, double click on the PX page and make the width and height of the page 15 pixels higher and wider than the other PX pages in the station.
4. Open the N4 ENERGY MANAGER palette.
5. Drag & drop the Kiosk widget onto the page.
6. Resize the widget to the full width & height of the page.
7. Double click on the component to access the property sheet.
8. Starting from kioskPage01, begin selecting the ord of the pages to be displayed.
  - a. Use the '...' button next to the field – select the folder with a view already assigned.
9. In the property sheet, ensure other settings are accurately set up. For example, ensure that the timer field (measured in seconds) correct.
10. Click Ok.

### Properties

WebWidget	
backgroundCo	<input type="color"/>
enabled	true
foregroundCo	<input type="color"/>
js	view:energyVision:KioskWidget
kioskPage01	station: slot:/LightTheme/Home
kioskPage02	station: slot:/LightTheme/Home/Energy\$20Benchmarking/Library
kioskPage03	station: slot:/LightTheme/Home/Energy\$20Stacked\$20Bar\$20Chart
kioskPage04	station: slot:/LightTheme/Home/Energy\$20Contribution
kioskPage05	station: slot:/LightTheme/Home/Dials
kioskPage06	
kioskPage07	
kioskPage08	
kioskPage09	

Figure 30 - EXAMPLE PROPERTY SHEET

- **KioskPage01-20** – select the ORD of the view you wish to be displayed on each Kiosk Page
- **ShowArrows** – show the arrows to manually move between kiosk pages
- **Timer** – the duration of each kiosk page

## Properties






WebWidget				
Web Widget				
backgroundCo		...		
enabled	true	▼		
foregroundCo		...		
js	view:energyVision:KioskWidget	...		
kioskPage01	station: slot:/LightTheme/Home	...		
kioskPage02	station: slot:/LightTheme/Home/Energy\$20Benchmarking/Library	...		
kioskPage03	station: slot:/LightTheme/Home/Energy\$20Stacked\$20Bar\$20Chart	...		
kioskPage04	station: slot:/LightTheme/Home/Energy\$20Contribution	...		
kioskPage05	station: slot:/LightTheme/Home/Dials	...		
kioskPage06		...		
kioskPage07		...		
kioskPage08		...		
kioskPage09		...		
kioskPage10		...		

Figure 31 - EXAMPLE PROPERTY SHEET



A Kiosk Page is not designed to be interacted with or navigated from. We recommend loading the Kiosk Page and once it is no longer needed closing that browser page or tab.

## Heatmap

The Heatmap is a widget that allows the yearly data for an aggregator to be represented on a Heatmap chart. The chart will display the value represented by the applicable colour on each day, for each month for the year (if data is available). The Heatmap chart is engineered similarly to the other charts, in that it is directly connected to an aggregator.

### How are the Colours Automatically Applied?

The widget will examine the data being added to it for the entire year. It will then apply a Range based on the minimum & maximum value. The minimum value will be assigned the deepest green and the maximum value will be assigned the deepest red.

Using the example below, the chart is representing the OAT (Outside Air Temperature) for a building. It is clear to see when the temperature rises and lowers. The cooler days/month represented in Green are clearly displayed throughout December & January, with the temperature steadily rising until it peaks between June & August, which are represented with deeper Red.

### How to Engineer the Heatmap

1. **Drag & Drop** the Heatmap widget onto the desired PX Page.
2. **Select** widget (single click on the widget – the green box should appear surrounding the widget).
3. Using the **Properties** window on the bottom right-hand side of the Workbench window, apply the preferred background and foreground colour.
4. In the same **Properties** sheet, select **CLICK HERE TO CHOOSE AN ORD**.
  - a. The **data** window will now appear
5. Using the **Drop-Down** arrow next **folder** icon, select **Component Chooser**.
  - a. The **Choose Ord** window will now appear.
6. Using the **Choose Ord** window, navigate to the appropriate aggregator.
  - a. Once the aggregator has been selected, **click OK**.
7. Using the **Name** field, give the aggregator an appropriate name.
8. Ensure that the date range (options above the **Name** field) have been adjusted to accurately reflect the date range that will be displayed on the chart.
9. **Click OK** to save the settings.



As the chart is rendering a whole year's data set (amount of data being analysed depends on history linked to the aggregator), the chart may pause for a moment on first launch, depending on the spec of the PC/Server. This is so the widget can cache all the data to be presented.

### Properties

The heatmap does not contain a property for setting the time period. Instead, the period is set in the data configuration popup. This is because the graph is designed to show yearly data only, so the data configuration popup lets you define that year period.

Current Period: 03-Nov-2017

Custom

Last Period

Current Period

AggregatorOrd: null

OK Cancel

Figure 32 - EXAMPLE DATA CONFIGURATION POP UP

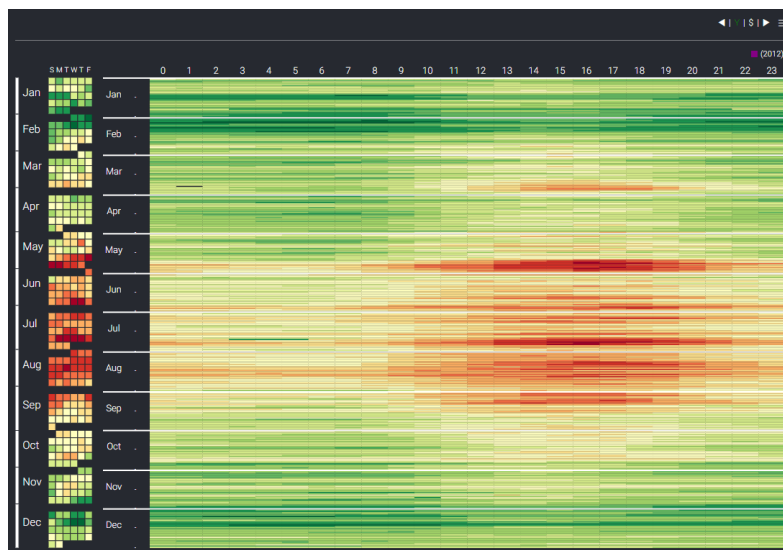


Figure 33 - EXAMPLE HEAT MAP

## Gauges & Dials

Gauges & Dials differ from the previous Charts in a fundamental way: they are **not** linked directly to aggregators. Instead, they are linked to a **numeric writeable**. That, in turn, is linked to an aggregator and placed on the **wiresheet** of the **Px Page** it resides on.

In the property sheet, as with the Chart Widgets, the gauge or dial display properties will be displayed first, with the values in the left column and the configurable value in the column on the right. In the **Wb View Binding** section below, the ORD value needs to be set to the **numeric writeable** discussed above.

## How to Engineer the Gauges & Dials

1. On the **Px Page wiresheet** where the Gauge / Dial is being placed, place a **Numeric Writeable**.
2. **Link** the **Numeric Writeable** to the desired output of the aggregator.
3. The **Numeric Writeable** should now be displaying data from the aggregator.
4. Go back to the **Px Page** where the Gauge / Dial is placed.
5. **Double Click** on the Gauge / Dial to open the **Property Sheet**.
6. Populate the customisable fields (as explained above).
7. In the **ord** field, click **Null**.
8. An **ord** selection box will now appear.
9. Click the **drop-down arrow** next to the folder.
10. Select **Component Chooser**.
11. Navigate to the **Numeric Writeable** that has just been to the aggregator. **Select it**.
12. Click 3x **Ok** prompts.
13. The Gauge / Dial will now be displaying the data being pulled through from the aggregator via the numeric writeable.

## Segments Dial

The Segments dial displays a numeric value on a circular gauge split into a calculated number of segments. The segments are coloured by assignment of a low, medium and high colours. The thresholds at which these colours start are also configurable. The result is a dial where it possible to see when a value is reaching pre-defined limits.

### Properties

WebWidget	
Web Widget	
backgroundCo	<span style="background-color: black; color: black;">[Color Picker]</span>
enabled	true
foregroundCo	<span style="background-color: white; border: 1px solid black; color: black;">[Color Picker]</span>
js	view:energyVision:GaugeWidget
layer	
layout	295.0,430.0,203.0,230.0
maxValue	15000.00
minValue	1.00
thresholdColo	<span style="background-color: red; color: black;">[Color Picker]</span>
thresholdColo	<span style="background-color: green; color: black;">[Color Picker]</span>
thresholdColo	<span style="background-color: yellow; color: black;">[Color Picker]</span>
thresholdHigh	80.00
thresholdMed	50.00
units	kWh
visible	true
Wb View Binding	
ord	station: slot:/Aggregators/Campus/campus_power_usage/lastDay

Figure 34 - EXAMPLE PROPERTY PAGE

- **MaxValue** – The maximum value the dial will show, allows the dial to scale correctly.
- **MinValue** – The minimum value the dial will show, allows the dial to scale correctly.
- **ThresholdColourHigh** – The colour of the high threshold value segments
- **ThresholdColourLow** – The colour of the low threshold value segments
- **ThresholdColourMedium** – The colour of the medium threshold value segments
- **ThresholdHighPercentage** – Percentage of the maximum value at which the high threshold will start
- **ThesholdMediumPercentage** - Percentage of the maximum value at which the medium threshold will start
- **Units** – Alters the Si Unit type measured on the dial.
- **Ord** – Link to the numeric writeable.

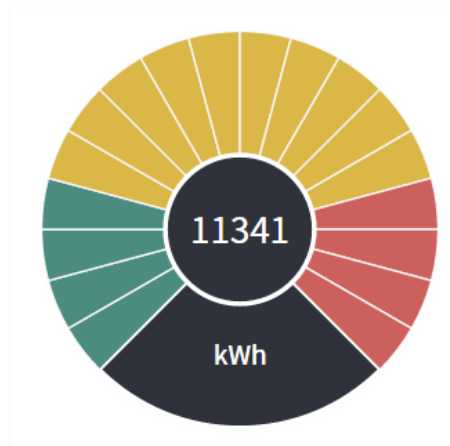


Figure 35 - EXAMPLE SEGMENT DIAL

## Bar Gauge

The Bar Gauge displays a numeric value on a horizontal bar. The minimum and maximum value are configurable, along with the number of segments in the bar. The threshold colouring and limits can also be set the same as the segments dial.

### Properties

- **NumberOfSegments** – the number of segments in the dial
- **Text** – the text to show under the gauge

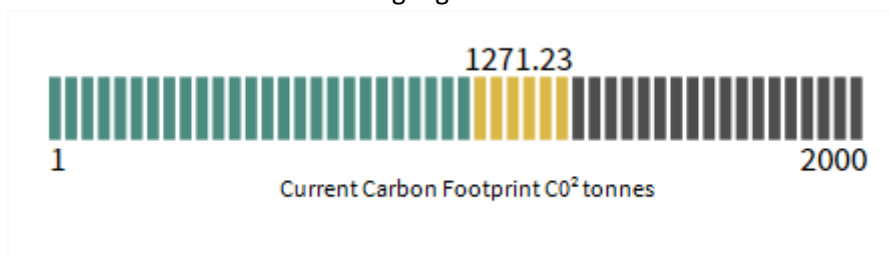


Figure 36 - EXAMPLE BAR GAUGE

## Needle Gauge

The needle gauge displays a numeric value on a circular gauge with the value shown in its numeric form within the gauge. The minimum and maximum value are configurable, along with the unit type – which is displayed within the dial.

There are three Needle Gauge's available in the N4 ENERGY MANAGER palette file: Needle Gauge Green, Needle Gauge Yellow and Needle Gauge Red. These offer the same functionality, but the background coloured the dial are the respective colour contained within the widget name (i.e. Green, Yellow and Red).

### Properties

- **DialColour** – The colour of the dial part of the widget

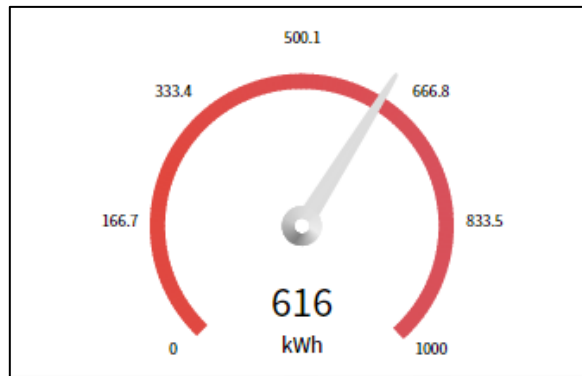


Figure 37 - EXAMPLE NEEDLE GAUGE

## LED Dial

The LED Dial displays a numeric value in a circular gauge. The gauge is split into small segments and each one is 'lit' up to give an LED effect when the value is passed.

There are three LED Dials available in the N4 ENERGY MANAGER palette file: LED Dial Green, LED Dial Yellow and LED Dial Red. These offer the same functionality but the LED segments of the dial are the respective colour contained within the widget name (i.e. Green, Yellow and Red).

### Properties

The LED Dial does not have any further unique display properties (See Segments Dial and Line Chart for those).

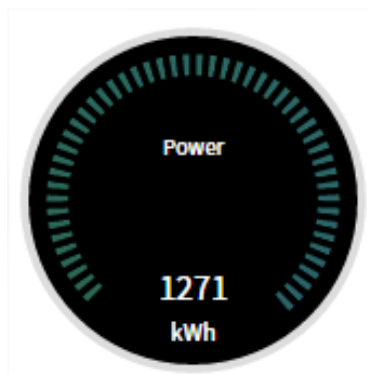


Figure 38 - EXAMPLE LED DIAL

## Navigation Menu

The Navigation Menu folder in the N4 ENERGY MANAGER Palette contains two widgets: the **Vertical Menu** and the **Menu Builder**.

### Vertical Menu

The Vertical Menu can be used for navigation within your station, between defined PxPages.



The Vertical Menu widget should be added to a single PxPage and configured. You can then use this as a PxInclude page on any page you wish to see the Navigation Menu.

### Properties

- **IconDefaultColour** – The default colour for icons.
- **IconSelectedColour** – The colour of the icon once selected.
- **MenuItemHeight** – The individual height of each menu item.
- **MenuStyle** – Choose display from both **Icon and Text**, just **Icon** or just **Text**.

The data configuration is different from the other Chart Widgets. Instead of being presented with the data configuration popup, you need only select a .menu file.



**.menu** file contains the definition for your menu hierarchy, naming, icons and link destinations. It is an JSON format which you could create yourself using the demo stations menu as a starting point. Alternatively, the Menu Builder will create this file for you through a graphical interface.



When copying the demo stations menu, the editor profile must be in **Ax Text Editor**. To achieve this, in the top right-hand corner the default editor would be **Text Editor**, click this and select **Ax Text Editor**.



## How to Engineer the Menu

1. Create a folder in the **Files** folder called **Menu**.
2. Open the **Menu** folder, right-click & select **New -> TextFile.txt**.
3. Name that **TextFile.txt** -> (InsertName).menu.
4. Below is an example of the demonstration's menu structure.
5. **Edit** the menu & menu structure depending on project requirements.
6. **Save** the newly edited menu structure.
7. Open up the **Px Page** on which the menu will be placed.
8. **Drag & drop** the menu widget from the **N4 ENERGY MANAGER Palette** onto the **Px Page**.
9. **Double-click** the **menu widget** on the **Px Page**.
10. **Click** on the **ord** field.
11. A pop-up will appear. **Click** on the **folder**.
12. **Navigate & select** the **.menu** file.
13. **Click Open**.
14. **Click Ok**.
15. **Click Ok**.

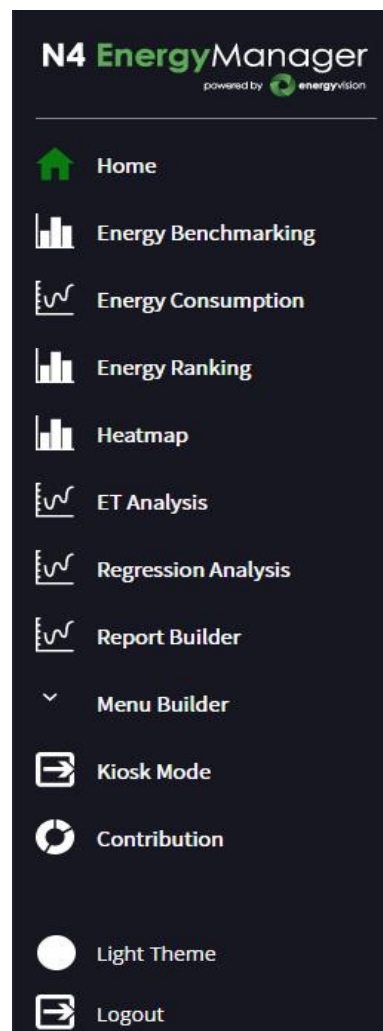


Figure 39 - EXAMPLE MENU

## Menu Builder

The Menu Builder has been designed to allow engineers to build a menu structure, without the need for any coding experience. The Menu Builder is a widget, the same as the other widgets of N4 ENERGY MANAGER and resides in the N4 ENERGY MANAGER Palette.



Although the widget can be used in a browser, Centraline recommend creating a Px Page within Workbench, engineering the Menu using the Menu Builder, saving the file, then deleting the Px Page. We recommend this because, although the Menu Builder can be used to reorganise the Menu structure in a browser, individual end users could change the hierarchy of the menu which could complicate the setup of a finished station.



The Menu Builder will create the necessary code to enable the Vertical Menu widget to work and a Menu hierarchy to be built, however, the .menu file still needs to be manually created. Once the blank .menu file has been created, the Menu Builder can start to implement the code as the engineer starts to build the Menu.

## How to Engineer the Menu Builder

1. Create a temporary Px Page in your Px folder. Ensure that the width of the Px Page matches the width of the Px Include as the Menu Builder is a large widget.
2. In the **Menu** folder (created in the previous Menu Section) ensure there is either a blank .menu file in there or an existing .menu file is in there (if using an existing .menu file, ensure the .menu file is complete and valid, if the code isn't correctly engineered, the Menu Builder will not work).
3. With the Px Page in edit mode, **drag & drop** the Menu Builder widget onto the Px Page.
4. The Widget will now display **Please add an ord to the menu file.**
5. **Double Click** on the widget to open the property sheet.
6. At the bottom of the Property Sheet, **find the Ord** field.
  - a. **Click** either the **null** field or the ... at the end of the **Ord** row.
  - b. The **Ord Chooser** will open.
7. Using the **drop-down** arrow located next to the **folder icon**, select **File Ord Chooser**.
8. In the **File Ord Chooser** pop-up, navigate to your .menu file.
  - a. Select the file & open.
9. Click **Ok**. Click **Ok**.
10. The Menu Builder will now appear.
  - a. **If an empty .menu file was used:** The Menu Builder will appear with 3 items in the menu structure.
  - b. **If a pre-coded .menu file was used:** The Menu Builder will open with the structure of the .menu file.
  - c. **If an incorrectly coded pre-coded .menu file was used:** The Menu Builder would not load.

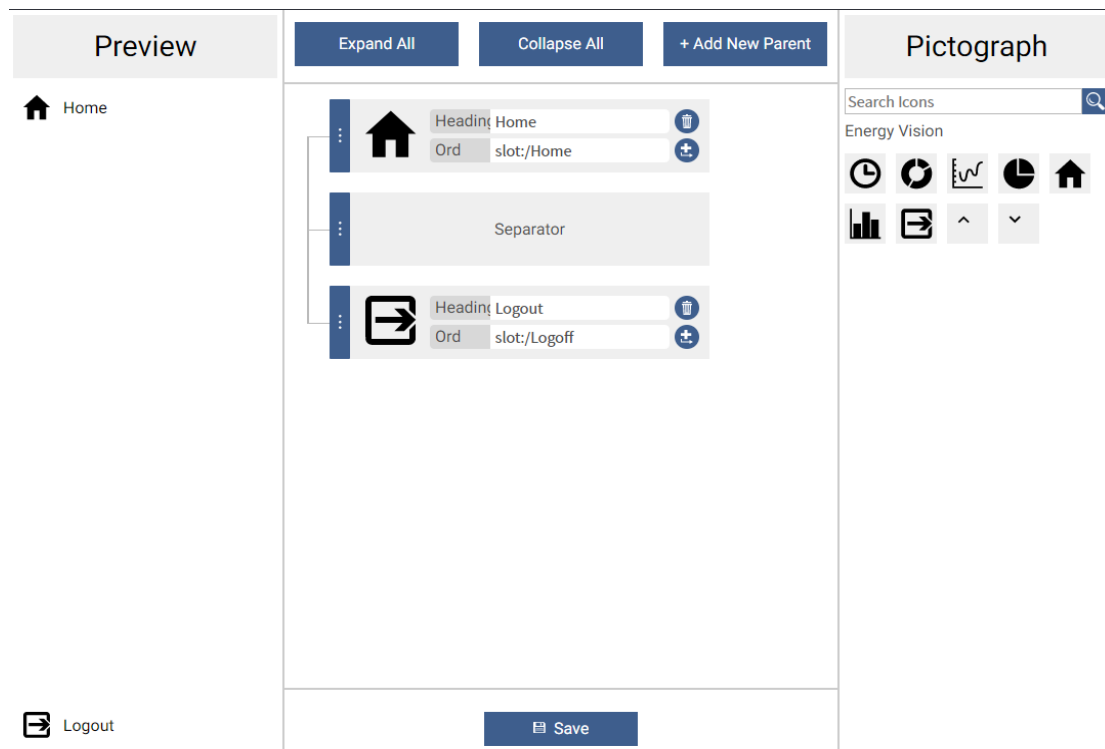


Figure 40 - Menu Builder with a blank .menu file

**Preview:** The Preview window gives the engineer a live preview of what the menu will look like when in a station. The preview window will react immediately to any changes made to the menu. The hyperlinks in the preview window have been disabled so users do not accidentally move away from page prior to saving. However, the engineer can still explore child menu items when clicking on the parent menu item.

**Expand All:** The Expand All button will expand all the menu items.

**Collapse All:** The Collapse All button will collapse all the menu items.

**+ Add New Parent:** The + Add New Parent button will add a new parent menu item to the menu.

**Trash Icon:** The Trash Icon will delete the menu item.

**+> (Below Trash Icon):** This button will add a new child menu item to that menu item.

**Separator:** The separator will split the menu items above and below it, placing the item below it to the bottom of the menu. For example, the Log Out button.

**Pictograph:** The library of icons available to use within the menu.

**Save:** Save the changes to the .menu file.

## Using the Menu Builder

The Menu Builder has been engineered around the Drag & Drop principle. To reorganise the Menu structure, drag & drop the menu item to the desired location in the menu and the Preview window will update accordingly.

### Adding an Icon

To add an image, choose an image from the Pictograph and drag & drop it onto the square to the left of the **Heading & Ord** field.

### Creating a Child Menu Item

Drag & Drop the Parent Menu Item (the Menu Item to become a Child) under the Parent Menu Item.

Or, click the +-> (under the Trash Icon) and a Child Menu Item will be added.

### Adding a Heading & Ord

In the Workbench view, ensure the folder structure is visible in the navigation window. Now, drag & drop the Folder into the box to the left of the **Heading & Ord** field. Both fields will now be automatically populated.

If only the **Heading**, or **Ord**, names/link need to be added, drag & drop the folder onto the respective field.

# Data Quality

Users can now view the integrity of the data displayed within charts via a ‘Data Quality’ icon placed to the top right of most charts (not applicable to Regression and the HeatMap charts). The button's colour changes based on the minimum integrity value returned from the data set being displayed on the chart.

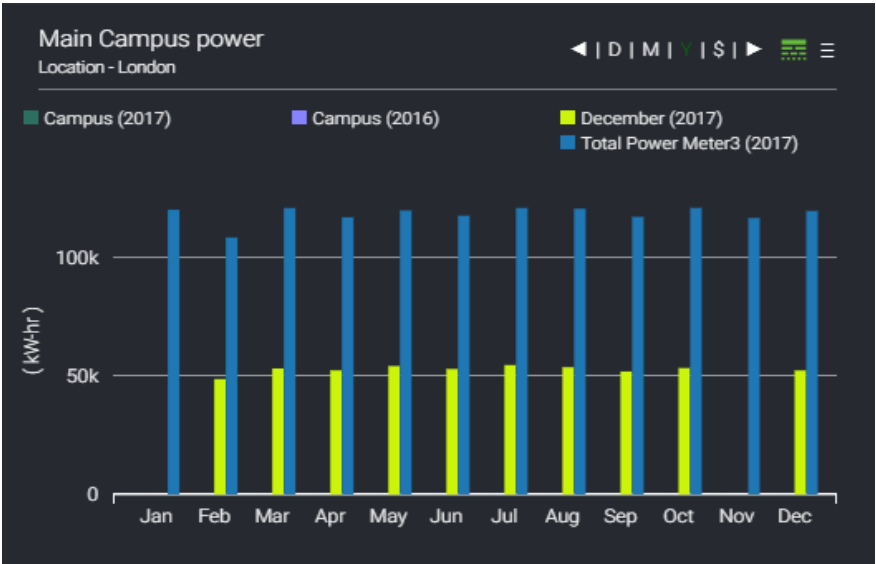


Figure 41 - EXAMPLE DATA QUALITY ICON

A simple colour code system [red, amber, green] is used to show the integrity of the data between 80-100% scale. An integrity level below 80% remains red

Colour scale example:



Figure 42 - EXAMPLE DATA QUALITY COLOUR SCALE

Hovering over the Data Quality button will display a tooltip. This contains the following information:

- The minimum integrity from the series currently displayed
- The number of Offline Meters
- The number of Inactive Meters

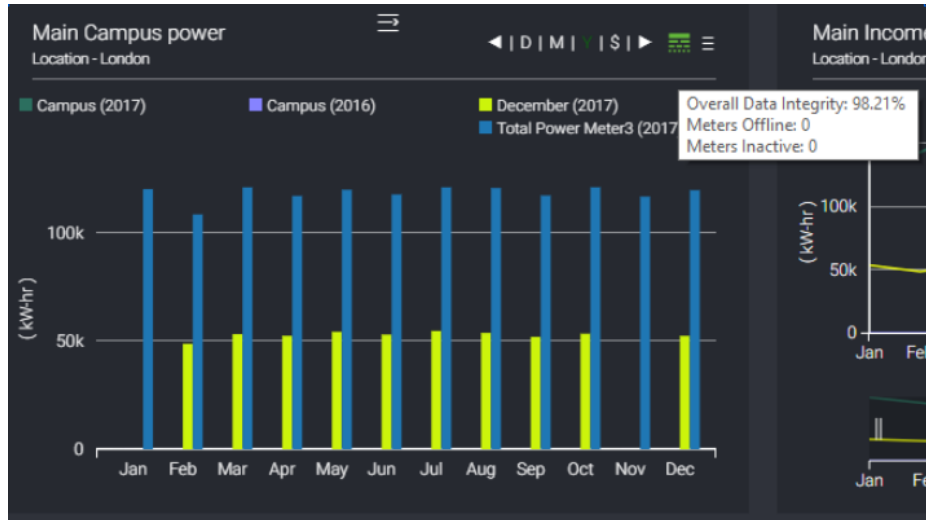


Figure 43 - EXAMPLE DATA QUALITY HOVER OVER

## Data-Quality Popup

Clicking on the Data Quality button will bring up another window containing more in-depth information regarding the integrity of the data. Users will see a tab for each series in the chart, with each tab displaying a graph of the integrity, broken up over a more detailed time period. For example, if the main chart is set to 'year', the integrity chart will show the data broken down by month, if the main chart is set to 'month' data will be shown in days and if the main chart is set to 'day' mode then the integrity chart will show the integrity broken down into hours.

Yearly integrity popup Year example:

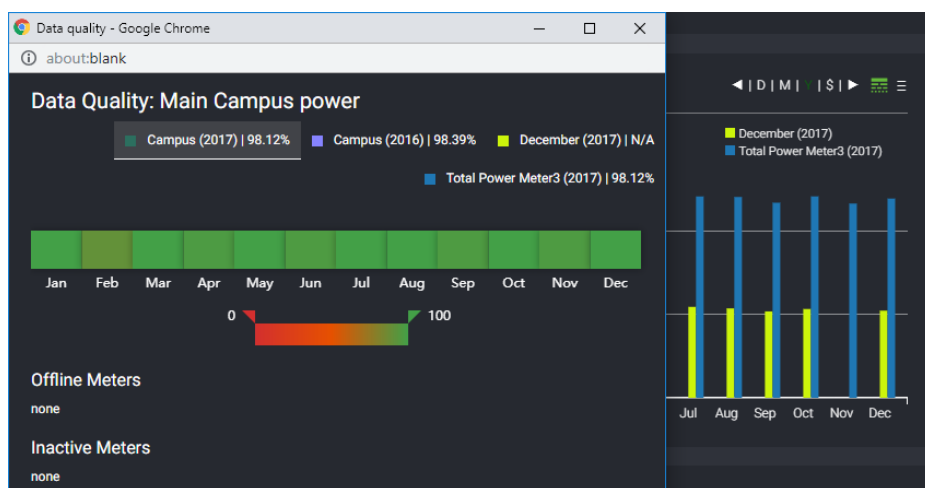


Figure 44 – EXAMPLE DATA INTEGRITY POP UP

Data quality popups include an adjustable slider that can be used to show or hide the data entry on the chart. It can be set between 0 and 100 to analyse the daily, monthly or yearly data integrity on the selected data-set.

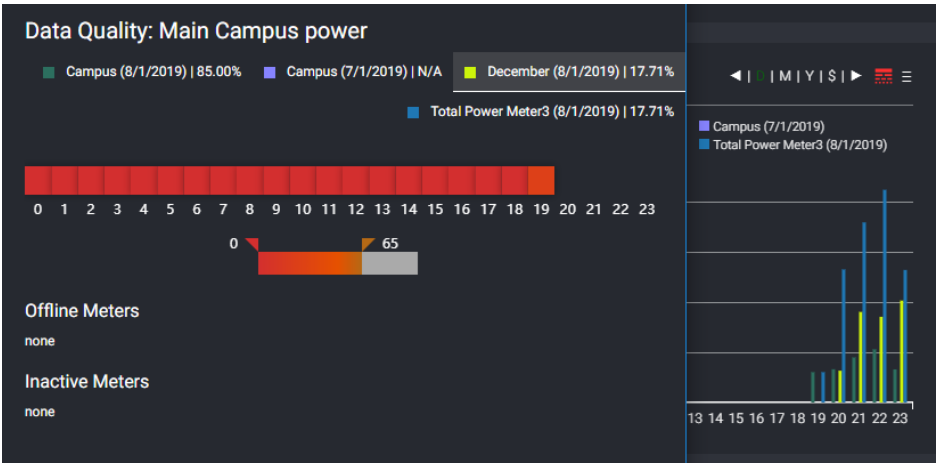


Figure 45 - ADJUSTABLE SLIDER BAR

In addition to this, inactive or offline meters are also displayed.



Figure 46 - DISPLAY OF INACTIVE / OFFLINE METERS

# Energy Temperature Curve (ET Curve)

ET Analysis helps determine how the energy consumption of a site varies with temperature. For a given time period, the kWh/m<sup>2</sup> of a site and temperature can be superimposed onto a graph showing the ideal consumption for the period.

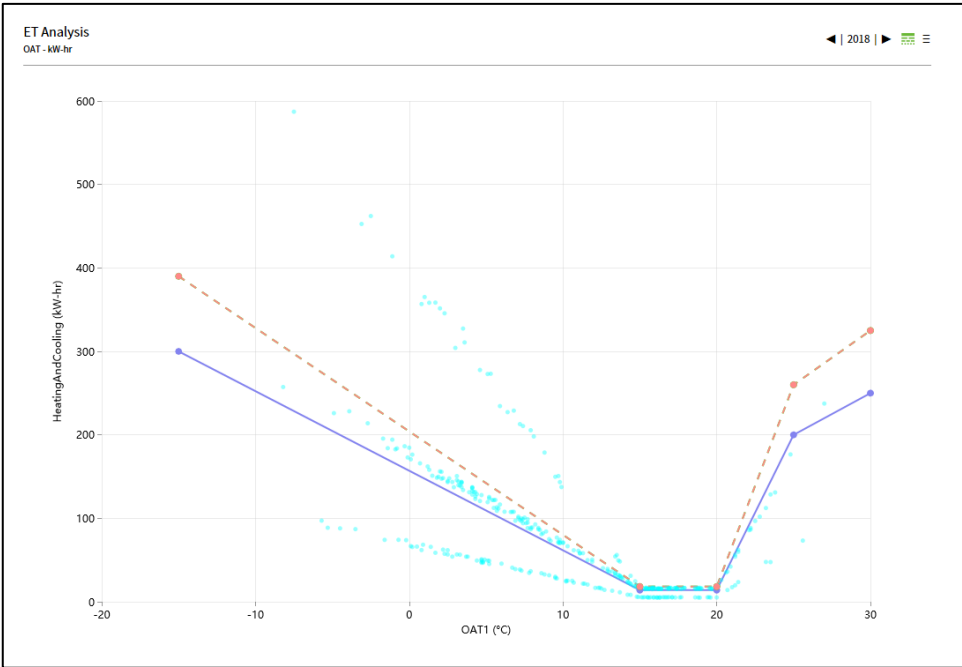


Figure 47 - EXAMPLE ET CURVE CHART

## Adding an ET Curve chart

Drag and drop an **Energy Temperature Analysis** component from the Palette into the station and configure the properties.

Energy Temperature Analysis (E T Analysis)	
Status	OK {ok}
X Axis Aggregator	station:/slot:/Aggregators/OAT1
Y Axis Aggregator	station:/slot:/Aggregators/HeatingAndCooling
Energy Start	300.00
Energy1	14.00
Energy2	14.00
Energy3	200.00
Energy End	250.00
Temperature Start	-15.00
Temperature1	15.00
Temperature2	20.00
Temperature3	25.00
Temperature End	30.00
Upper Bound	30.00 % [0.00 - 100.00]
Lower Bound	30.00 % [-100.00 - 0.00]

Figure 48 - EXAMPLE ET CURVE COMPONENT PROPERTY SHEET



Important, temperatures 1, 2 & 3 must increase in value (Example, Temperature 1 < Temperature 2 etc)



### Property description:

- **X Axis Aggregator:** Ord to an Aggregator with temperature data
- **Y Axis Aggregator:** Ord to an Aggregator with energy consumption data
- **Ideal ET profile:** The ideal curve is generated from user-configured temperate, energy and tolerance values.
  - **Temperature:** [Temperature Start, Temperature1, Temperature2, Temperature3, Temperature End] – Temperature range and bands are defined in an increasing order. E.g., [-15,15,20,25,30]
  - **Energy:** [Energy Start, Energy1, Energy2, Energy3, Energy End] – E.g., [300,14,14,200,250]

Drag and Drop the ET analysis chart to the canvas from the palette once the properties have been configured.

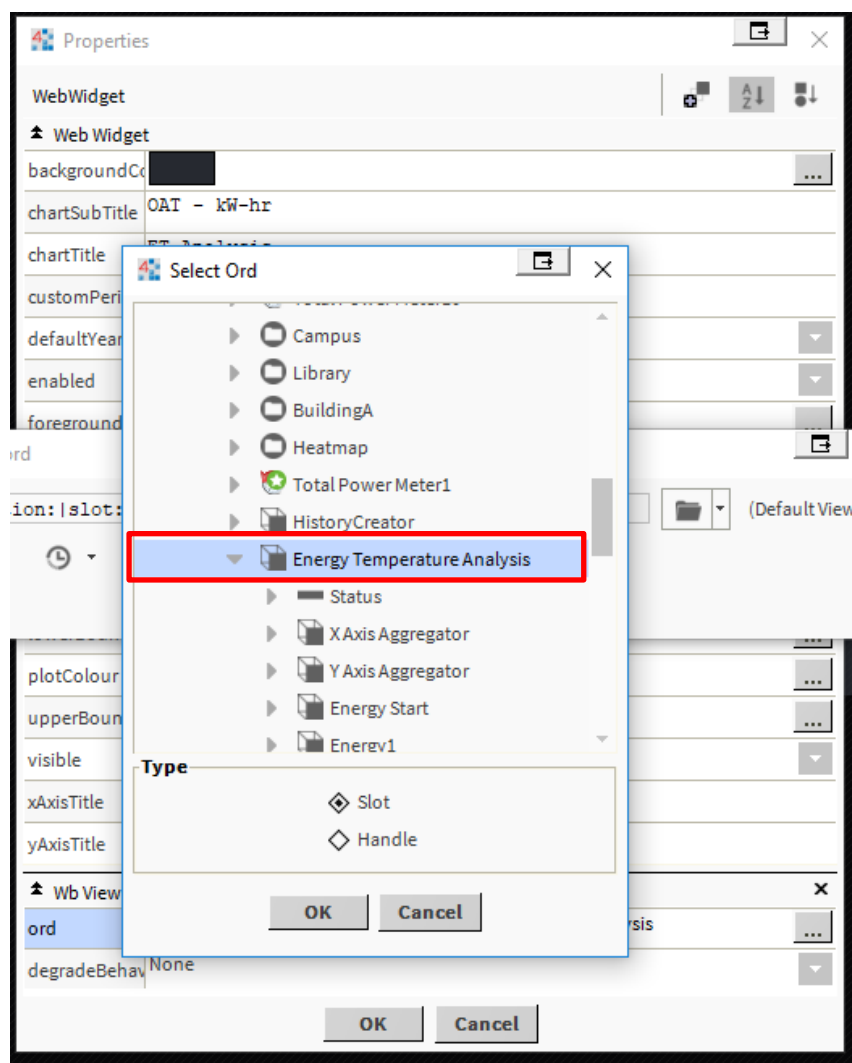


Figure 49 - EXAMPLE OF BINDING TO AN ET COMPONENT

Once the binding is complete the ET curve chart as shown in figure 40 is created.

## Energy Vision to N4 Energy Manager Migration Tool

The migration tool converts stations using energyVision modules to use N4 Energy Manager. The tool will convert all energy vision components to their N4 Energy Manager counterparts, retaining all user configuration and product features.

### Prerequisites:

- Install **energyVisionN4EnergyManagerMigrator.jar** module
- The station folder and the workbench used for migration are required to be present on the same machine.
- Create a backup of the station to be migrated.
  - If the station is present on a JACE, transfer the station to a supervisor machine.

### Migration Steps:

Open the migration tool available under the workbench Tools option.

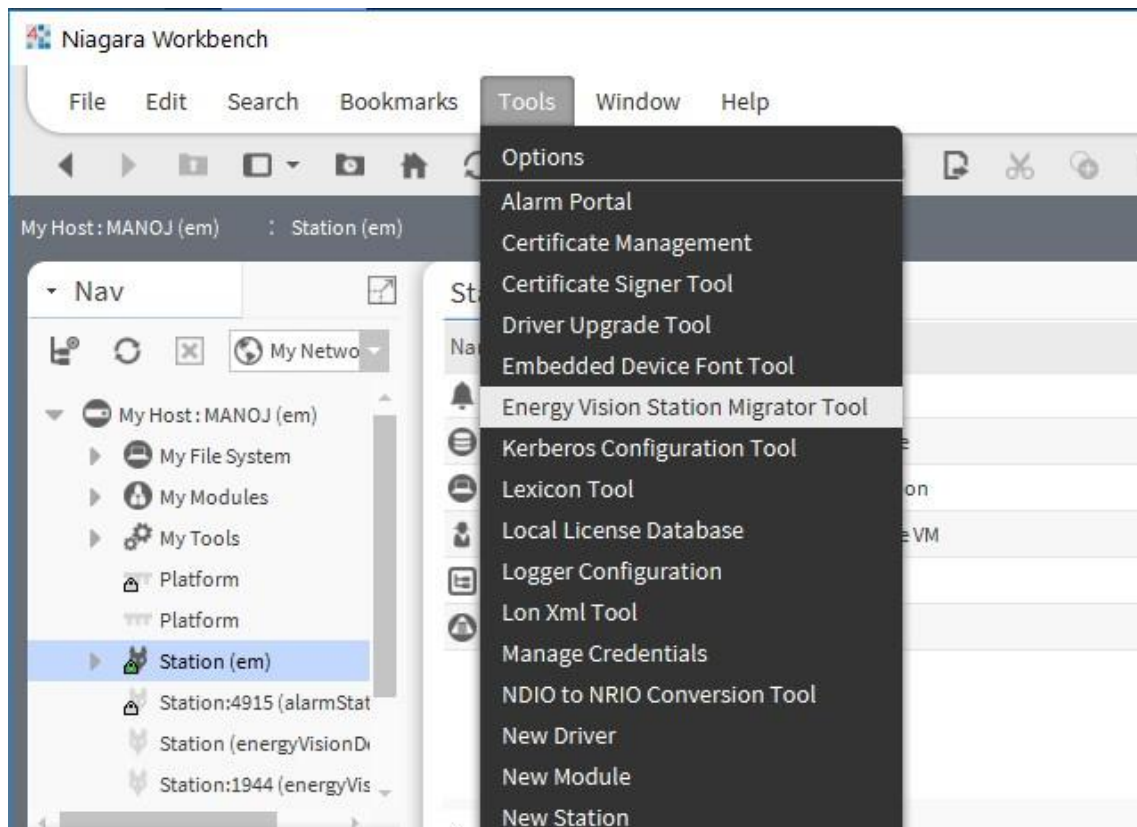


Figure 50 EXAMPLE OF OPENING MIGRATION TOOL

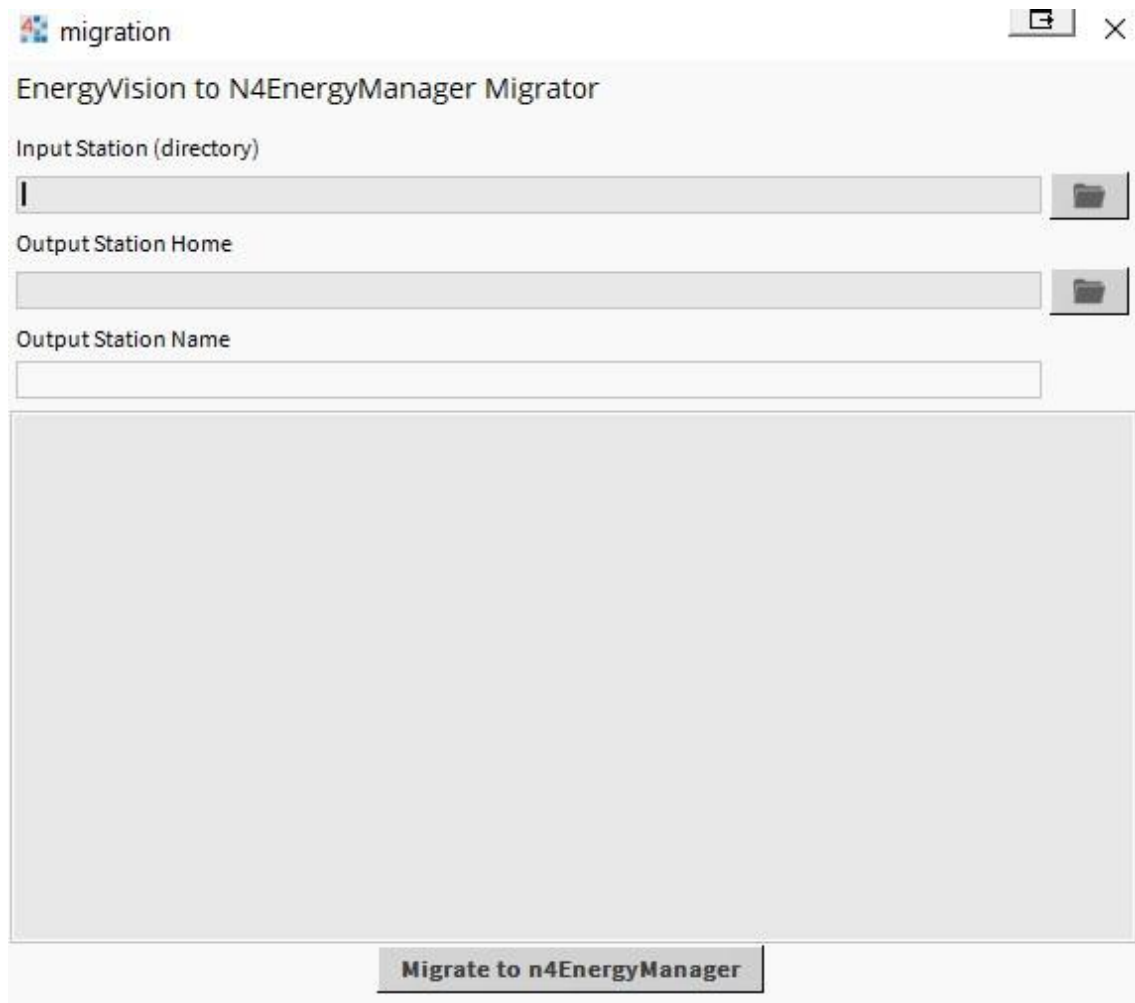


Figure 51 MIGRATION TOOL



The migration is performed on a copy of the input station, The source station files would remain untouched once the migration is complete.

#### Properties:

- **Input Station (directory):** Path to the input station directory - The station to be migrated
- **Output Station Home:** Path to the directory where a new migrated station folder would be created.
- **Output Station Name:** Name of the new migrated station.

Click **Migrate to n4EnergyManager** to run the migration. On successful migration, a new station with user-specified **Output Station Name** would be created under **Output Station Home** folder.

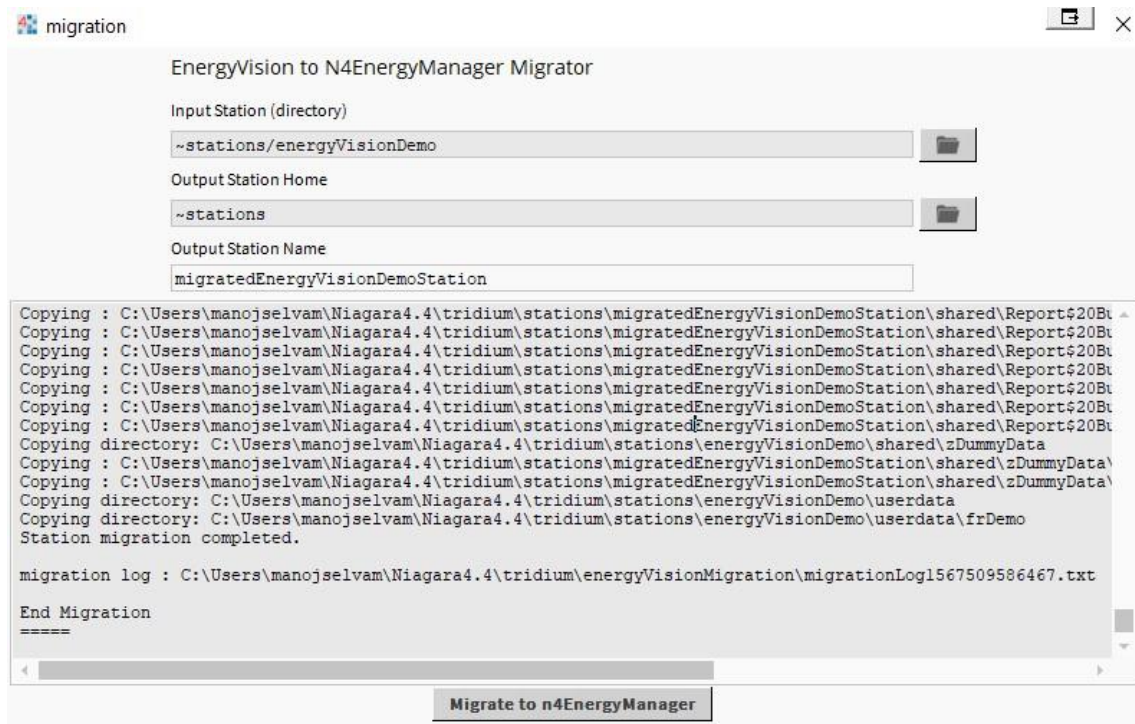


Figure 52EXAMPLE OF A SUCCESSFUL MIGRATION

On successful migration, a log detailing the migrated components is created in the **Niagara User Home**.

#### Running the migrated station:

- Rename the migrated station to the to match the source station name if needed.
  - This step could be performed during the station transfer process if using station copier.
- Uninstall all energyVision related modules.
  - energyVision-[rt,ux,wb].jar
  - enregyVisionResources-[rt-ux].jar
  - energyVisionReports.jar
- Ensure N4EnergyManager modules are installed.
- Start the station using the application director.
- Perform tests on the station to ensure its normal operation.
  - Test if histories have been migrated over
  - Tests if \*.px have been migrated and accessible

## Error Logging and Usage Analytics

We collect anonymised error logs and usage analytics to improve the quality of the product and fix issues proactively. The feature is disabled by default for all users and enabled only when the user has provided consent. The users will be presented with an option to provide consent when they visit a px page with an N4 Energy Manager widget.

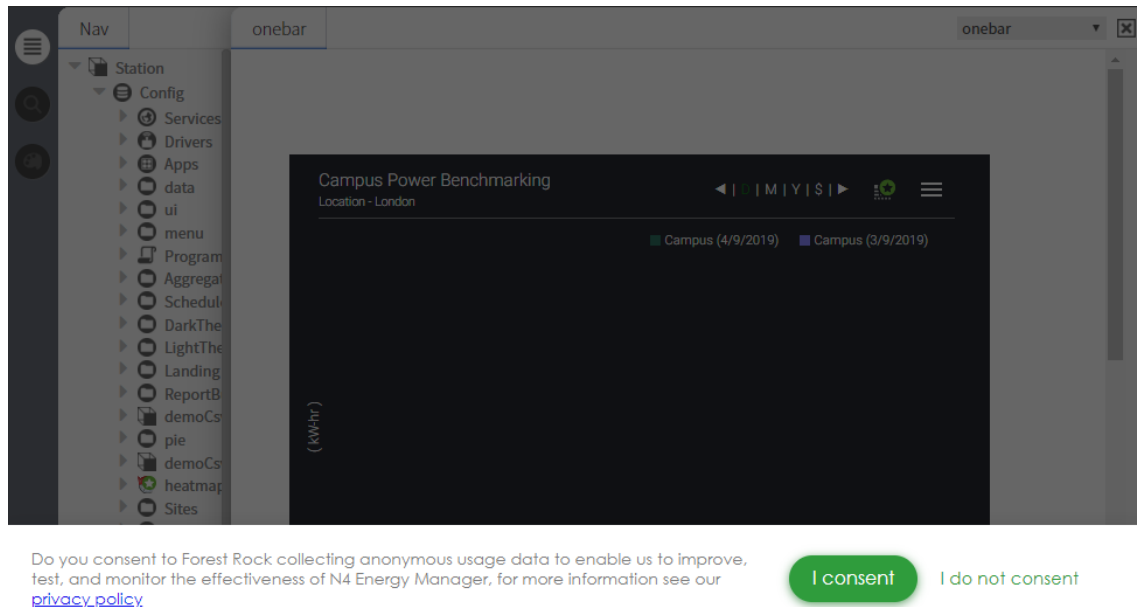


Figure 53 DIALOG REQUESTING USER CONSENT

User preferences could be changed on station, through the N4EnergyManagerPrivacy options available under every user in user services.

**Properties:**

**Accepted:** Has the user accepted the privacy consent

**Request Consent:** If set to True the user will be presented with the consent dialog in the browser.

**Last Updated At:** Last Time the settings were updated.

The screenshot shows a web interface with a breadcrumb trail: Station (em) > Config > Services > UserService > admin. Below this is a 'Property Sheet' for 'N4EnergyMangerPrivacy' with the title 'Privacy Consent'. It contains three properties: 'Accepted' with a green circle icon and a dropdown set to 'true'; 'Request Consent' with a red circle icon and a dropdown set to 'false'; and 'Last Updated At' with a text field showing '03-Sep-2019 03:36 PM BST' and a calendar icon.

Figure 54 EXAMPLE OF A USER WHO HAS ACCEPTED THE PRIVACY CONSENT

The privacy consent can be reset for a user using the Reset Action.

This screenshot shows the same 'Property Sheet' as Figure 54, but with a context menu open over the 'Accepted' property. The menu has four tabs: 'Views', 'Actions', 'New', and 'Edit Tags'. The 'Actions' tab is selected, and a 'Reset' button is visible next to it. At the bottom right of the menu, there is a 'Make Template' option and a 'Refresh' button with a circular arrow icon.

Figure 55 OPTION TO RESET USER CONSENT

## Troubleshooting

**I am using a 32-bit Installation of Niagara and N4 ENERGY MANAGER does not load as expected. What can I do other than installing the 64-bit version of Niagara?**

These issues are ultimately caused by 32-bit applications having access to less memory than their 64-bit counterpart. The best option would be to install the 64-bit version of Niagara wherever possible. However, following these steps will help alleviate issues caused by a 32-bit installation.

1. Locate the '**nre.properties**' file in your Niagara installation directory. It will be inside the **defaults** folder in the root of the installation directory. This will typically be **C:\Niagara\Niagara-4.x.xx.xx\defaults**.
2. Locate the property identified by '**wb.java.options=**' and, if not already present' append **-Xms512M** to the end. It will look like this:

```
#####  
#  
# File: nre.properties  
#  
# This file contains properties which used  
# the NRE launch executable  
#  
# Revision History  
# 17 Feb 04 Brian Original  
#  
#####  
# The list of options separated by spaces to pass thru to the VM  
station.java.options=-Dfile.encoding=UTF-8 -Xss512K -Xmx6000M -Xms7000M -agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=6789  
wb.java.options=-Dfile.encoding=UTF-8 -Xss512K -Xmx1024M -Xms512M
```

3. Locate the '**system.properties**' file. This will be in the same folder as the file from step 1. Add the following text to the end of this file: **niagara.jxbrowser.disable=false**
4. Restart the station and workbench.



These actions require editing Niagara properties files. We recommend backing up these property files before editing them so that they can be reverted if any errors occur.

**I am not seeing the same popups in Workbench as I am when viewing my station in a web browser. Why is this?**

Some of the features will not work as fluently within Niagara as they do in an actual browser. The Niagara web browser is limited in its functionality. It is expected some of the UI elements behaviours are slightly degraded within the workbench for the above reason. Eg:- The popup menus are disabled within the workbench. Previewing in Google Chrome will allow the pop-up to work correctly.

**When connecting to my station running N4 ENERGY MANAGER via localhost, I am getting unexpected behaviour. Is there anything else I can try?**

If your N4 ENERGY MANAGER widgets are not rendering as expected when accessing the station via localhost, try alternatively connecting via **127.0.0.1** or the actual IP Address of the station.

