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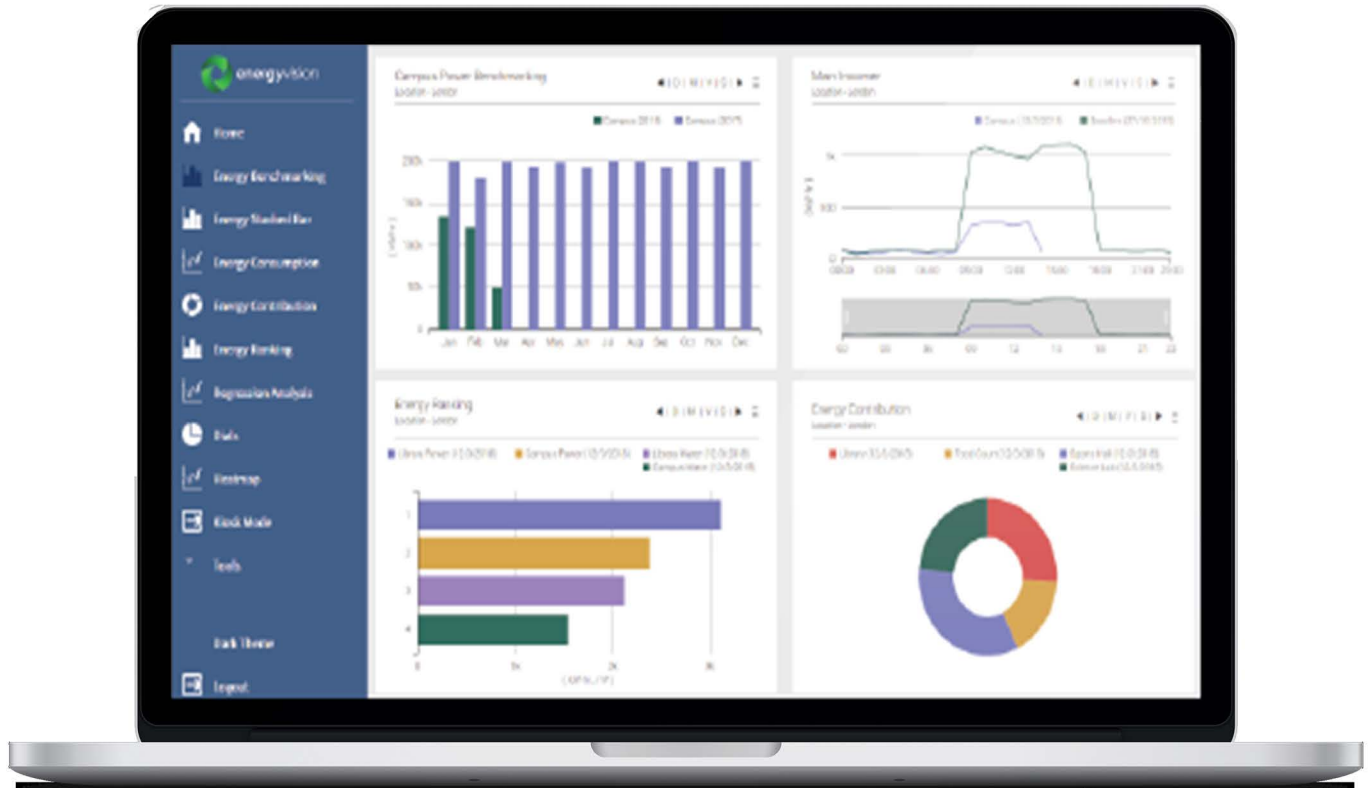
N4 Energy Manager

User Guide

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Release History

Please refer to this section of the documentation for the **N4 Energy Manager** change log.

Version Control	Changes
2.4.1	Last Energy Vision release.
3.1.7	License change to introduce Core/Pro Tier. Product name change to **N4 Energy Manager.**
3.2	Excel Reports, Maintenance licensing for selected features.
3.3	Burger Menu saved settings. Weekly comparison for charts. Lock Ideal time range for chart comparison.
3.3.1	Security enhancements License management enhancements. Bound table widget for reporting.
3.4.0	Updated documentation for Energy Temperature Chart Analysis. Addition of FAQ Tariff Scheduling White-labeling capabilities Report printing in Landscape mode. Addition of Energy Comparator section. Updated Demo Station.
3.4.1	Bug fix to avoid PX migrations losing layer information.
3.4.2	Security Update in response to Log4j2 vulnerability CVE-2021-44228.
3.4.2	Security Update in response to Log4j2 vulnerability CVE-2021-44228.
3.4.3	Bug fix to support PDF Reporting on Niagara 4.10.
3.4.4	Bug fix release to support Niagara 4.11.

Version Control	Changes
3.4.5	Updated documentation for: • Degree Days • Custom Time Periods (Aggregator) • Excel Reporting • Batch Reporting. Bug fix to support Data Quality alarming. Bug fixes related to Charts. Chart refresh for Kiosk mode. Stability improvements to Batch Reporting.
3.4.6	Bug fix to add the missing regression chart line. Bug fix to support ET analysis CSV export.
3.5.0	Bug fixes related to Charts: • Line chart is not updated correctly for January for weekly/yearly view • Offline option in a meter inside an aggregator should return true for history with null reading • Formulas disabled in N4EnergyManager invoice spreadsheet • Chart Data Binding: Ord popup window cannot load • Stacked Bar chart: aggregators are not shown under meters tab of data-config popup • Stacked Bar chart: rendering issue when not all bars are toggled on and user selects different time periods • Tooltips: correct timestamp formats, they should not be shown for future timestamps • Niagara 4.12 compatibility issues New features: • Background transparency support for vertical menu and charts • Ability to have first/last accumulative meter readings for Excel reports • Ability to show symbols on top of lines in line charts • Ability for aggregators to be in the root of the station • Tooltips: colour keys to differentiate values on tooltips • Threshold colours for dial gauges, arbitrary colours for LED dial and needle gauges Updated documentation: • Meter replacement • Addition of external database histories • Csv Import scheduling • Saving data configuration locally

Version Control	Changes
3.6.0	Bug fixes: • Vertical Menu component crashes with named color properties in Niagara 4.8 • Issues with multiple Y axes on the line chart • History extension throws duplicate history extension after csv import • Heatmap chart's unit is °C when aggregator's unit is missing • Relativized Bar/Heatmap charts do not work in pop-up views • Bar chart is not printed in PDF from Report/Export Source component • Charts do not work in presence of third-party modules • Infinite and NaN values are used in aggregator calculations • Vertical Menu component's Home button does not work • Inactive and Offline meter count are not shown on the line/pie charts • Energy Comparator component bugs • Gauges/Dials do not support transparent background colour • 5Y period with currency toggled on chart taking longer than expected to load the data. • PDF Report save/load bugs: popup window is removed • Currency sign is not respected in PNG/PDF instant reports • n4EnergyManagerReports module forces Niagara to rebuild • the registry at the station start • Niagara 4.13 compatibility issues Improvements: • Total value is displayed in pie chart's tooltip • Custom Period's "Event" and "Period" properties are writable • Aggregator can have up to 150 meters • Line charts display fractional numbers on the y-axis • Energy Comparator has cost-related properties New features: • Weather service (see Weather Service) • Anomaly Detection (see Anomaly Model) • Site component (see Grouping of Aggregators) • Service- and meter-level inactive and offline thresholds (see Data-Quality Alarms) Updated documentation: • Energy Comparator (see Energy Comparator) • PDF Report Builder configuration (see Batch Reporting) • Aggregator modes clarification (see Aggregator Mode) • A note on what kind of values is used in aggregator calculations (see Calculated Values)

Version Control	Changes
3.7.0	Bug fixes: • Negative delta not respected in aggregator calculations • Including an aggregator with zero meters in a widget would cause other valid aggregators to not display any data • N4EM logo image not loading • Filter not working on Anomaly Console • Vertical Menu fails to sync the menu with navigation if there is nested menu Improvements: • Aggregator can have a colour to use in charts. • User can customize colour of the data shown in charts using Data Config • Variable Tariff Export Along with Aggregator Data into the Excel Reports New features: • Estate View (see Estate View) • Tree Menu (see Tree Menu) Updated documentation: • Cost View Mode • Aggregator History Export (see Aggregator Facets)
3.8.0	Bug fixes: • Pie chart styling issue in popup view. • Heatmap legend clipped in a smaller view. • Heatmap Csv popup crashing when scrolling down. • Report Builder crashing. • Renamed brushActive property in the Line Chart properties to showMiniMap. • Menu Builder icons not aligning properly. • Could not invoke command in "Add Group" in site hierarchy component. • Time Zone missing in the Data Quality Popup in Charts. • Made the meter offline/inactive data persistent in Meter Component. • Energy Billing calculation in Excel Template generated bill. • Niagara 4.14 compatibility issues Improvements: • User can choose the interval of the data shown on Line chart view. New features: • Leaderboard Chart (see Leaderboard Chart) Updated documentation: • Aggregator calculated Values

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 utilize the software.

Note: *N4 Energy Manager has been developed and tested for Niagara version 4.8, 4.9, 4.10, 4.10u1 - 4.10u6, 4.11, 4.12, 4.12u1, 4.12u2, 4.13u2, 4.13u3, and 4.14.*

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 from the partner web. Open the module folder received which contains **N4 Energy Manager**.

Step 1.   Navigate to the module folder for Niagara > **C:\Niagara\Niagara-4.x.xx.xx\modules** [Version number may differ].

Step 2.   Copy and paste the **N4 Energy Manager** modules into the Niagara Module folder.

Step 3.   Start platform daemon.

Step 4.   Restart station.

Step 5.   If CSV reporting is to be used, copy the templates into the station file space.

Note: *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 **N4 Energy Manager** service needs to be added to your station from the Palette.

Note: *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 guide.*

Note: *Due to the differences between EnergyVision AX and N4 Energy Manager, it is not possible to automatically migrate one to the other. An AX station will need to be re-engineered using N4 Energy Manager.*

Checking Your 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 the workbench, load the **spy page's** view on the **N4 Energy Manager Service**. This will provide you with an overview of your licensing status.

Meter ORD's	Used
Remote Station | nav | localhost | station | Services | EnergyVision	
Meter Metrics	
Meter limit :	none
Number of unique meters :	17
history:/EnergyVisionDemo/CampusPower	4
history:/EnergyVisionDemo/TeachingPowerMeter03	1
history:/EnergyVisionDemo/TeachingPowerMeter02	2
history:/History/CoolMeter	2
history:/EnergyVisionDemo/TeachingPowerMeter10	1
history:/EnergyVisionDemo/LibraryPowerMeter	2
history:/EnergyVisionDemo/TeachingPowerMeter	2
history:/EnergyVisionDemo/TeachingPowerMeter09	1
history:/EnergyVisionDemo/TeachingPowerMeter08	1
history:/EnergyVisionDemo/TeachingPowerMeter07	1
history:/EnergyVisionDemo/TeachingPowerMeter06	1
history:/H_W_CP132A/OustsideAirTemperature	1
history:/History/OAT1	4
history:/History/HeatMeter	2
history:/H_W_CP14a/LTHWHeatMeter	2
history:/EnergyVisionDemo/TeachingPowerMeter05	1
history:/EnergyVisionDemo/TeachingPowerMeter04	1

Fig. 1 Example Overview of License Status

N4 ENERGY MANAGER 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.

Note: *Each Aggregator can be made up of up to 50 histories.*

Note: *Removing histories or values in histories **will permanently delete** the stored data in the N4 Energy Manager database.*
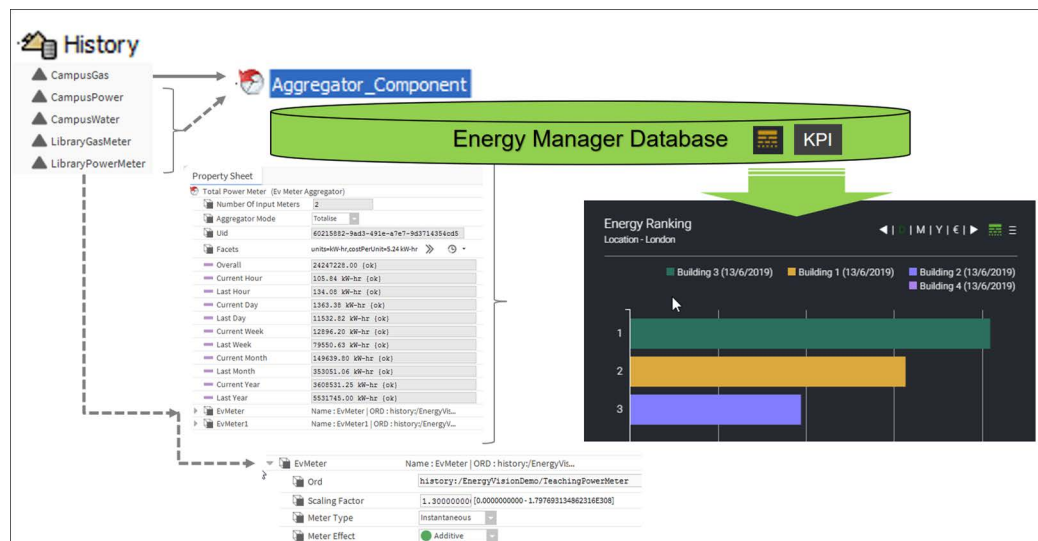

Fig. 1 Meter Aggregator Overview

Creating Aggregators

There are two main ways of configuring and creating aggregators in **N4 Energy Manager**.

1. Manually adding histories to an aggregator.
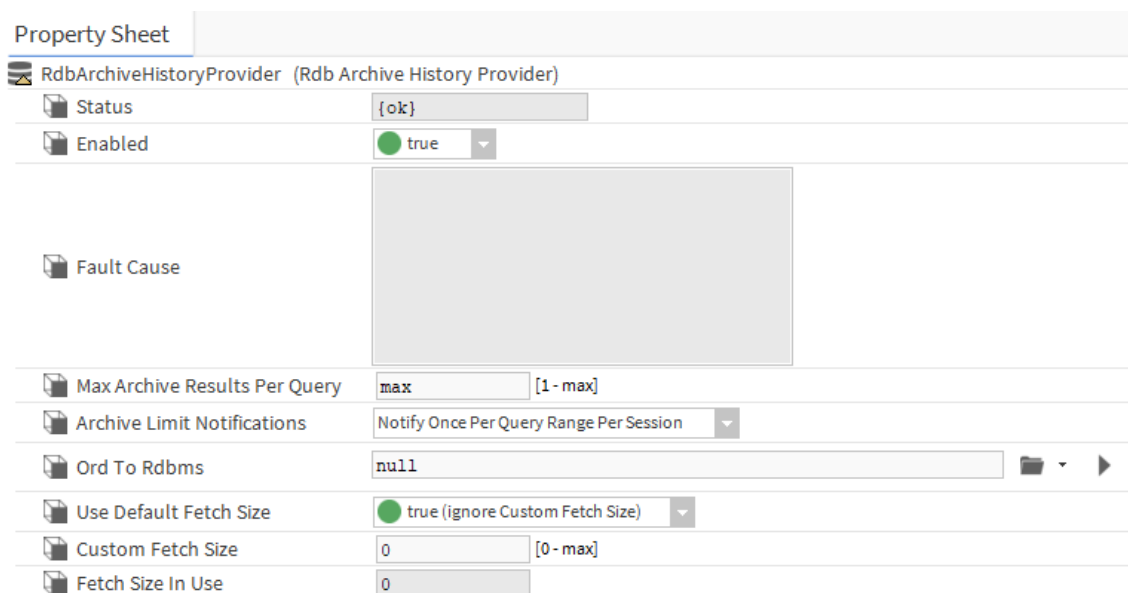2. By creating the aggregators using the Site Hierarchy.

Manually Adding Histories to Aggregators

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

Step 1.   Open folder in which the aggregator needs to be added:

  a. Right Click on the folder and select **Views > Wire Sheet**.

Step 2.   Open the **Palette** ensuring that the **N4 Energy Manager Palette** is opened.

Step 3.   Expand the folder **Aggregator**.

Step 4.   Drag & drop the **Aggregator** component onto the **Wire Sheet**.

Step 5.   Double click on the **Aggregator** component.

Step 6.   Right-click on the property sheet, select **Actions > Add Meters**.

Step 7.   Enter the number of **Meters** that need to be added.

Step 8.   Click **OK**.

Step 9.   Respective to the number of **Meters** added in step 7, **Meter** (1,2,3, etc....) will be added.

Step 10.   Expand **Meter**.

Step 11.   The **Ord** line will display **null**.

Step 12.   Click the drop-down icon next to the folder icon:

  a. Select **History Ord Chooser**.

Step 13.   Using the pop-up, navigate through your histories selecting the appropriate file.

Step 14.   Once selected, click **Ok**.

Step 15.   To add further, repeat steps **10, 11, 12 (a), 13 & 14**.

Adding Histories from Remote Databases

If a history of a meter is being fetched from SQL or any other external database via a "RdbArchiveHistoryProvider", one must set the "Max Archive Results Per Query" property to "max" to ensure the proper work of the aggregator.

Fig. 2 RDB Archive History Provider Property Sheet

Data Normalisation

Data normalisation can be used to normalise aggregator output to calculate metrics such as "power consumption by area" and "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.

To add a Normalisation:

Step 1.   Right-click **Normaliser**, and choose the type of **Normalisation**.

Step 2.   Set the **Operand** value and the corresponding unit.
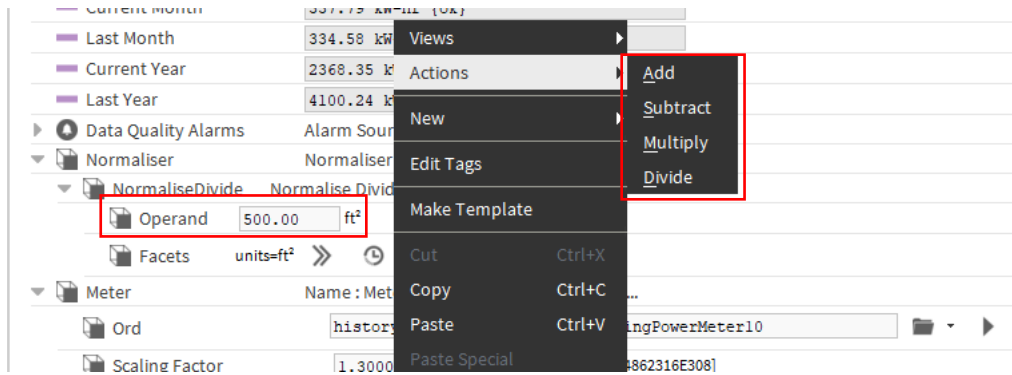
Fig. 3 Example of Adding a Normalisation Step

Derived Unit

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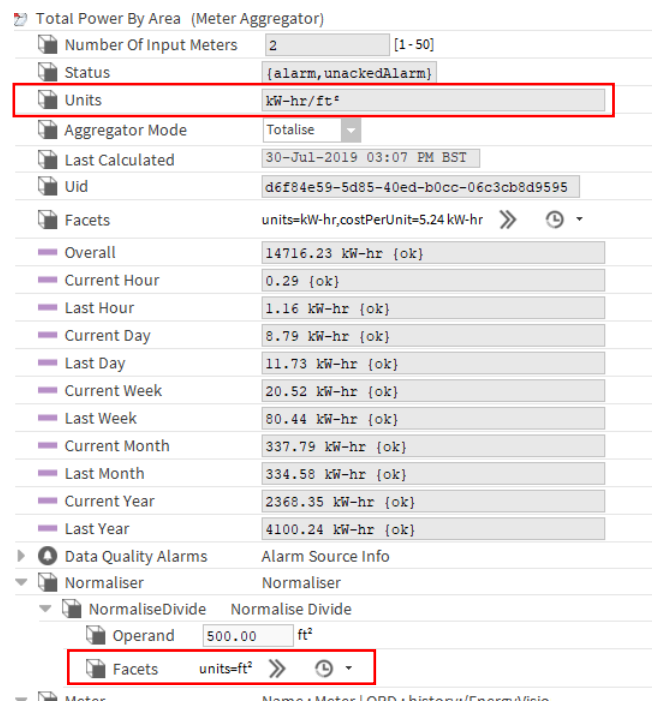

Fig. 4 Example of a Derived Unit

Aggregator Mode

Aggregation mode determines how two meters of vales can be combined. The available modes are:

- **Totalise** – Meter readings will be added across time intervals and across all the meters linked to that aggregator.
  E.g. – An aggregator with two meters with history interval of 15 minutes. The last hour reading on aggregator is the sum of all four readings from meter1 taken at 15-minute intervals and four readings from meter2 taken at 15-minute intervals for the last hour.

- **Average** – Meter readings will be averaged across time intervals and across all the meters.
  E.g. – An aggregator with two meters with history interval of 15 minutes. The last hour reading of the aggregator will be equal to the average of averages from all the meters connected. Four readings from the Meter1 and Meter2 will be averaged and then the final reading on aggregator is the average of outputs from two meters.

Aggregator Colour

User can choose colour for each aggregator for better visualisation on charts. This colour will be the default colour for the aggregator on any charts except for estate view and anomaly console charts. Users can override this colour in the widget settings or in the data config menu if available.
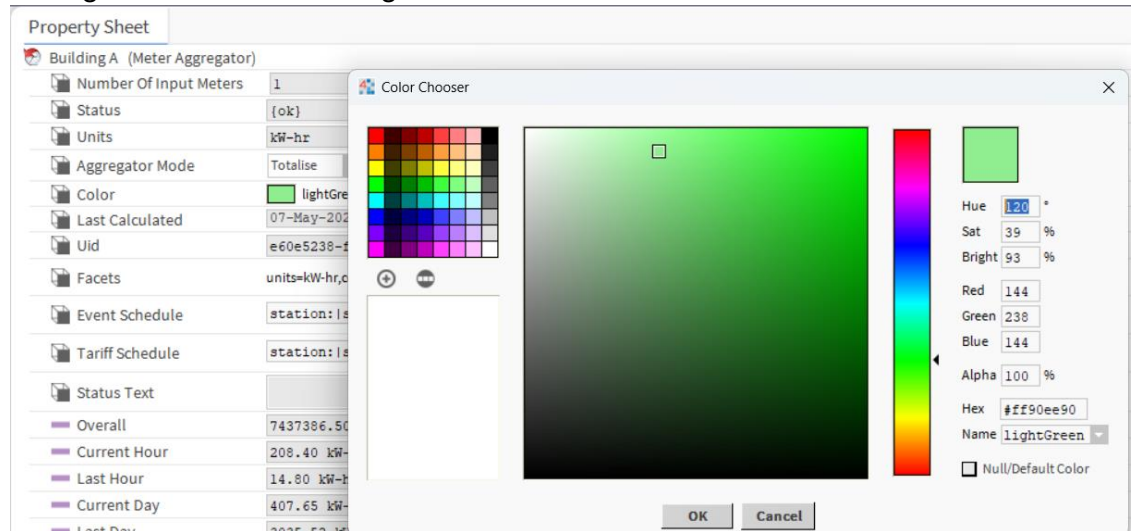

Fig. 5 Colour slot of an aggregator

Aggregator Facets

The 'Aggregator Facet' is the facet that is used on the aggregator output value and will be displayed in the charts. When adding multiple history files, the aggregator engineering unit must be modified 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 (for more details, please see Instant Reports section of this manual).

To manually add a facet:

Step 1.   Open the Aggregator Property sheet.

Step 2.   Click the >> icon in the **Facets** property.

Step 3.   Configure the Units property.

Step 4.   Configure the **costPerUnit** Property.
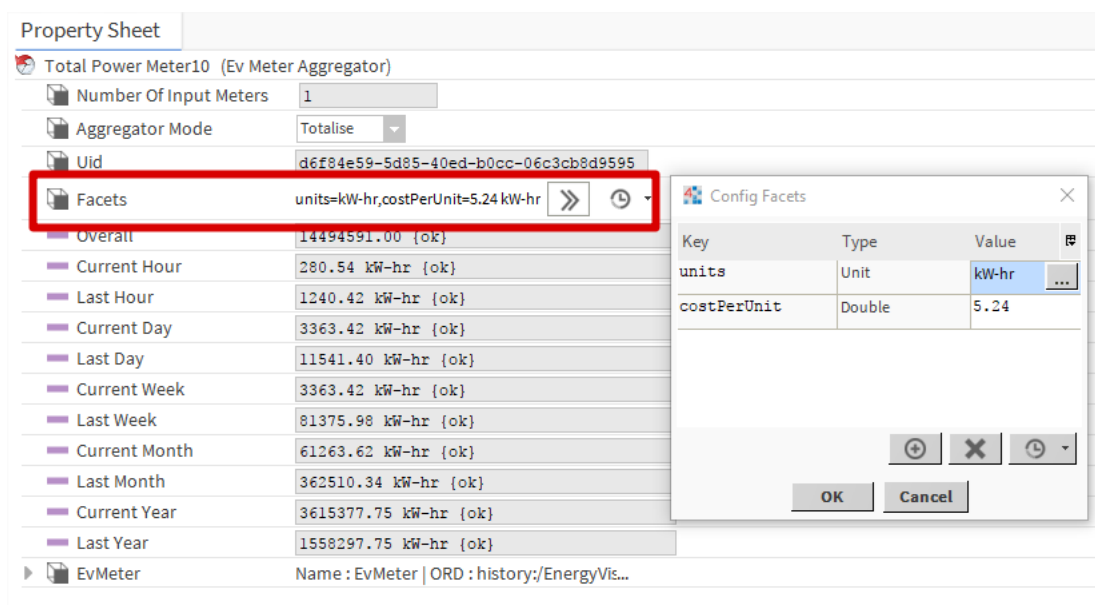
Fig. 6 Example of a Facet

Note: *Units for an Aggregator are taken automatically from the assigned history file.*

Exporting Aggregator Values as History

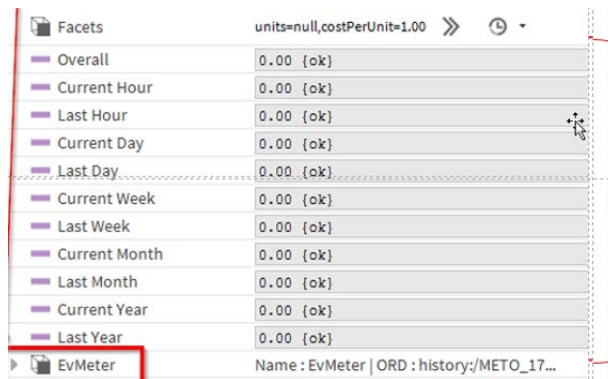To enable this feature, add a new facet with the following details:

- **Key:** niagaraHistory
- **Type:** Boolean
- **Value:** True

By setting this facet, the aggregator will export its calculated values over the time as a Niagara history, allowing for further analysis and monitoring.

Calculated Values

Results for different time periods are calculated by the aggregator on every calculation cycle. Calculations can be triggered manually by triggering the execute action. The default time frames for the calculation are as shown in the figure.

If there are values missing for instantaneous meters, a 0 would be used in its place. For a cumulative meter, the previous value would be used to calculate the delta once the next value is recorded. There is no data interpolated should there be gaps in the data.

Fig. 7 Default Time Frames Example

The values of slots are calculated as follows, for example:

Current Day Average/Totalise on Instantaneous Meter:

- The average/sum of all values recorded in the current day from all meters.

Current Day Average/Totalise on Accumulative Meter:

- The average/sum of all hourly deltas calculated for the current day from all meters.

User Defined Time Periods

In order to use the **User Defined Time Periods** feature of the **N4EnergyManager** aggregator, first an event schedule must be defined within the Aggregator.

The Event schedule is an **optional** property that can be set on an aggregator to calculate and display the Custom Periods. (E.g., the amount of energy used last week during occupancy hours). Since it is an **optional** function, it does not need to be added and the absence of the Event Schedule will not cause any functionality error.

Requirements:

1. The Event Schedule must be an **Enum Schedule** type.
2. The schedule **Default Output** must **not be null** and must be an Enum value.

3. The schedule **Facets - range** must be set.
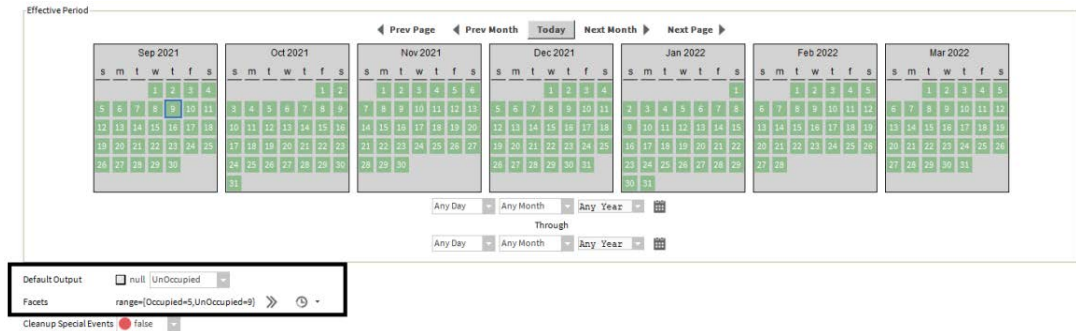
Fig. 8 Example Event Schedule.

Note: *The minimum interval that can be used is no less than 15 minutes to calculate the custom period. The 15 minute or higher minute intervals must start from the hour or 15, 30, 45 minutes after the hour to be able to calculate the cost correctly.*

Setup Event Schedule

Step 1.   Open an aggregator in the property sheet view.

Step 2.   The **Event Schedule** Ord line will display null.

Step 3.   Click the drop-down icon next to the folder icon.

Step 4.   Select **Component Chooser**. Using the pop-up, navigate through your station hierarchy selecting the appropriate Enum Schedule.

Step 5.   Once selected, click Ok.

Step 6.   Save aggregator.

Step 7.   Open Schedule and click on the Properties Tab. Click on the >> Chevron beside the Facets/range. On the new window, click on the 3 dots … and on the new pop-up window, click on the chevron again.

Fig. 9 Example Config Facets

Step 7.1.   On the Enum window add the Key/Value pairs for Enums and click to the OK button on all open windows to save the Enum Range.
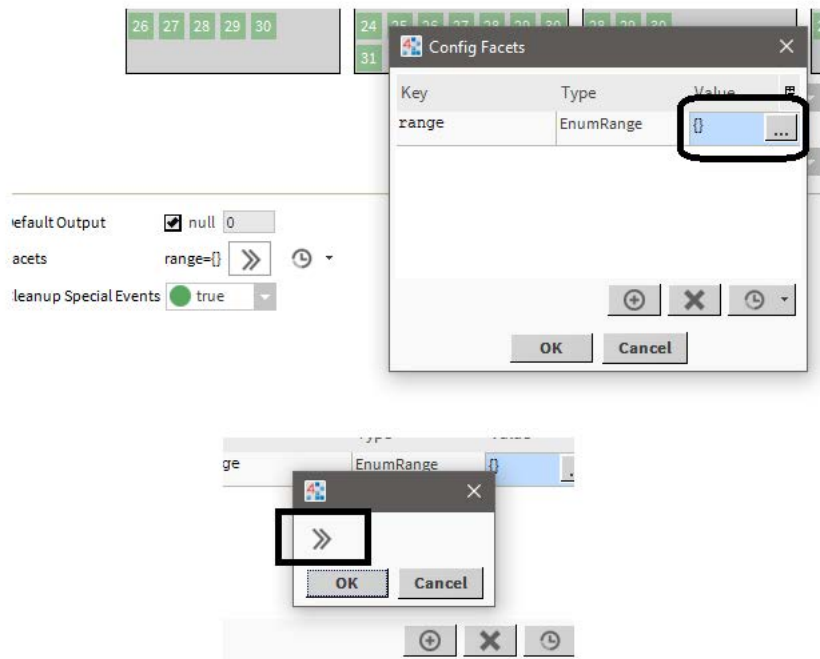

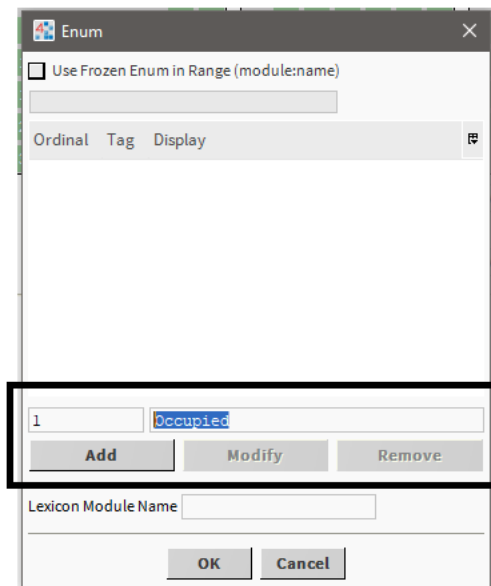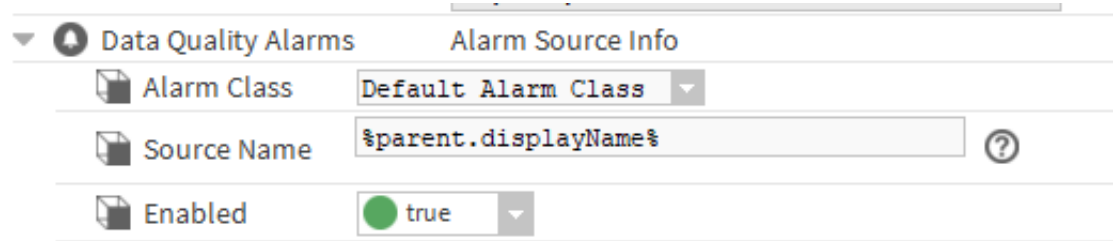**Fig. 10 Example Enum Window**

Step 7.2.   Uncheck the Default Output null check-box.
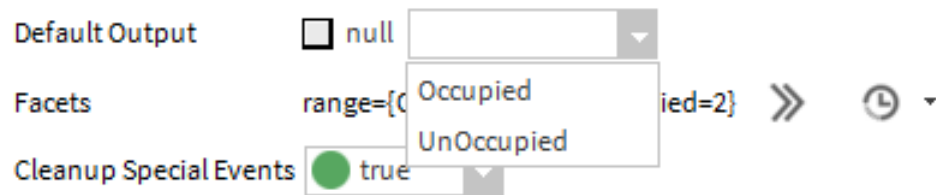
Fig. 11 Default Output Null Check-box

Step 7.3.   Set the Default value from the added Enum List and once complete, click save.

Fig. 12 Default Value Example

Step 8.   Click on the Weekly Schedule Tab. Add the time-period to the required days and set the value for it from the Event Output Drop down Enum List.

Fig. 13 Example Weekly Schedule

Step 9.   Click on the Special Events Tab:

    Step 9.1.   Add as many special events as required.

    Step 9.2.   Set priority for Special Events.
    If special event dates overlap, the priority order will be used to calculate the cost for a given time.

    Step 9.3.   If it is required to add special events in past time, the value of the Cleanup Special Events property needs to be changed to 'False' on the Property Tab.

Step 10.   Save the schedule.

Step 11.   Open the aggregator and Right Click on the Custom Time Period component:

    Step 11.1.   Highlight – Actions and Click on the – Add User Defined Time Period - Action.

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Step 11.2.   The Action will generate and add a new Custom Period
object.

Fig. 14 Example Custom Period

Step 11.3.   Select period and Report Range.

Fig. 15 Example Configuration

Step 11.4.   When the aggregator Calculate action is invoked by the
system or manually by the user, the selected period in the
selected range will be calculated.

Fig. 16 Example Custom Period Value

Setting Up Meters

A meter component describes a data source, its characteristics and offers options to configure how to process the data source.

Fig. 17 Example Aggregator Set Up

The properties of the Meter as shown in above figure can be described as:

1. **Status** – String to inform user about warning/problems

2. **ORD** – The ord of the Niagara history to be used as the data source.

3. **Scaling Factor** – A multiplication factor for the history value before it is fed into the aggregator.

4. **Meter Type**:

   a. **Instantaneous** – The data series which is not accumulated over time. E.g., temperature, frequency.

   b. **Accumulative** – The data series is a summation of the previous values (always increasing except for meter rollover). E.g., kWhr.

5. **Meter Effect** – only applicable when more than one meter is used and when meter Aggregator mode is "**Totalise**".

   a. **Additive** – the values from this meter will have an additive effect on the result. E.g., floor1 meter +(Additive) floor2 meter = sum of floor1 and floor 2.

   b. **Subtractive** – The values from this will be removed from the total. E.g.- total power consumption meter – (subtractive) solar power production meter = total non-solar consumption.

6. **Meter Roll Over Value**:

    a. Only applicable for the accumulative meter.

    b. During meter rollover, the delta is calculated as follows.

    - delta = (rollover - previousValue) + currentValue.

7. **Meter History Tolerance**:

    a. A threshold-based method to remove erroneous values.

    b. Any values greater than the threshold will be ignored. **if abs(value) > threshold** resulting value is dropped**.**

8. **Interval** - The auto detected history interval. This interval is used for data quality calculations.

9. **COV** – is the history type **change of value.**

10. **Integrity** – Data Integrity of the input history (number of available records/ no of expected records).

11. **Offline** - Flag to indicate that the meter is offline, that is, meter has no reading within the offline threshold.

12. **Offline Threshold** – Time interval used for detecting whether a meter is offline or not.

    a. The interval is a non-negative value with units of seconds, minutes, hours, days, weeks, months, or years.

    b. The interval can be inherited from **Data Quality Service** by setting the status of the value to "null" (see Data-Quality Alarms for details)

13. **Inactive** - Flag to indicate that the meter is inactive, that is, recent meter values are the same within the inactive threshold.

14. **Inactive Threshold** – Time interval used for detecting whether a meter is inactive or not.

    a. The interval is a non-negative value with units of seconds, minutes, hours, days, weeks, months, or years.

    b. The interval can be inherited from **Data Quality Service** by setting the status of the value to "**null**" (see Data-Quality Alarms for details).

Replacing Meters

It's a common occurrence where a meter is replaced in the field due to hardware failure. Depending on whether a new Niagara history is created or not, there are several paths that a user can take to ensure correct behaviour of the correspondent aggregator.

- If Niagara history of the meter is not changed and:

    - The meter is instantaneous, then no adjustment is needed.T

    - he meter is accumulative, then the history might start from zero after meter replacement. In this case, the aggregator will have an erroneous delta at the transition time. To alleviate this, the meter rollover value may be set to last value of the failed meter so that the delta at the rollover is calculated correctly. Note that the meter rollover value will apply to all transition times, whether it happened due to a natural meter rollover or due to meter replacement.

- If Niagara history of the meter is or can be changed and:

    - The meter is instantaneous, then a user can proceed with the following steps:

        - Add another meter with the new history to the aggregator.

        - Recalculate the aggregator.

    - The meter is accumulative, then similar steps can be performed, namely:

        - Add another meter with the new history to the aggregator.

        - Set meter mode to **Additive**.

        - Recalculate the aggregator.

Note that adding another unique history can be considered only if the limit of unique histories in N4 Energy Manager license is not reached (see Checking Your License Status for details). If no new unique histories can be added to the aggregator, one can import old history into new one using CSV Import with **Import policy** = **Merge with existing history**. For accumulative meters, the aggregator with merged history might have erroneous delta values at the transition times.

Machine Learning models

A Machine Learning component stores machine learning models that are used to analyze meter aggregator data.
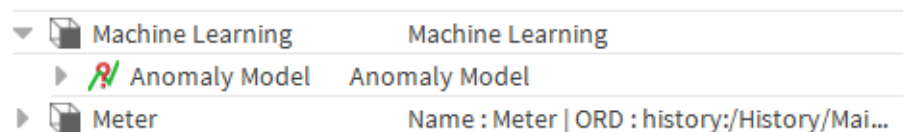

Fig. 18 Machine Learning Component of Meter Aggregator

Anomaly Model

The anomaly model's objective is to identify outliers in meter aggregator data.

This is achieved by training a machine learning model based on the historical baseline data and predicting a range of values that is likely to contain new observations, that is so called a prediction interval. Observations that do not fit within the prediction interval are identified as outliers, and a series of consecutive outliers is called **anomaly event**.

The baseline data should represent normal behaviour of the underlying meter in different modes of operation or for different seasons so that the trained model quality is maximised.

Furthermore, if the behaviour of the meter is dependent on the outdoor temperature, then one can use the outdoor temperature aggregator data to train a better model. **N4 Energy Manager version >=3.8.0** provides such outdoor temperature aggregator data as part of the weather service (see Weather Service).

The overall data flow is visualized in figure Flowchart of the Anomaly Model:

- The historical aggregator and optionally weather baseline data are used to train a model.

- Current data, or more generally any data that was not used in the model training, and thresholds (see later in the section) are fed into a model.
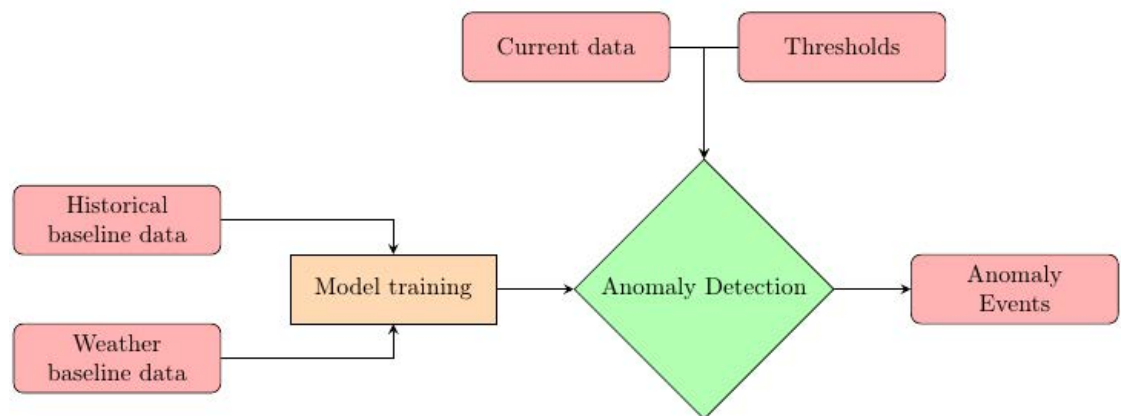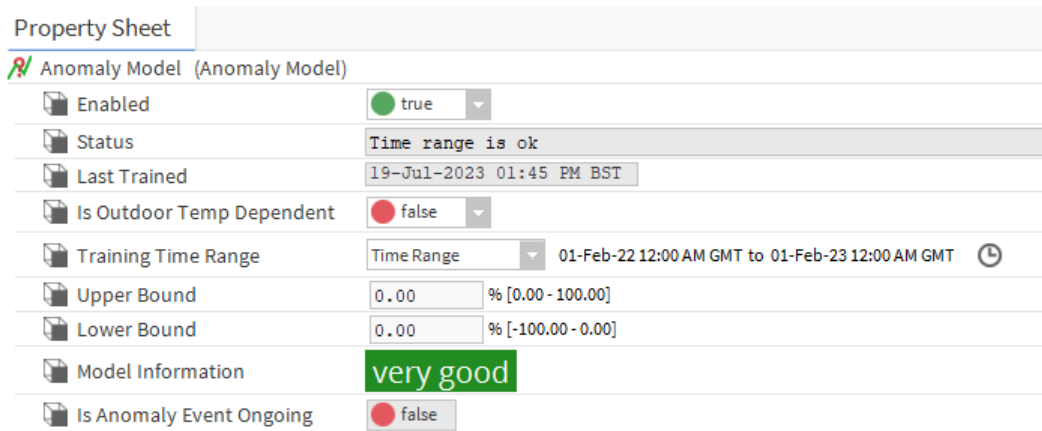
- Anomaly events are computed.

Fig. 19 Flowchart of the Anomaly Model

The anomaly model utilizes hourly-aggregated data for model training and prediction.

Below figure Anomaly Model Property Sheet presents the property sheet of the Anomaly Model component.

Fig. 20 Anomaly Model Property Sheet

The individual slots of the component can be described as follows:

1. **Enabled** – Flag to enable/disable the component.
2. **Status** – String to inform user about the status of the component.
3. **Last Trained** – Last time when the anomaly model was trained.
4. **Is Outdoor Temp Dependent** – Flag to indicate whether to use outdoor temperature data in model training.
5. **Training Time Range** – Dynamic time range for model to be trained on.
6. **Upper Bound** – Percentage of prediction interval to add to its upper value.
7. **Lower Bound** – Percentage of prediction interval to remove from its lower value.
8. **Model Information** – Sub-component containing details and metrics of the trained model.
9. **Is Anomaly Event Ongoing** – Flag to indicate whether meter aggregator data is in anomaly state since the last hour.

Note: *A series of consecutive outliers in the Aggregator's data is called **Anomaly Event**. In **N4 Energy Manager**, an anomaly event span across minimum 1 hour since the Anomaly Model operates on hourly aggregator data.*

Train an Anomaly Model

To train a model, one need to go through the following steps (see figure Anomaly Model Engineering Steps):

Step 1.   Open the Anomaly Model's **Property Sheet.**

Step 2.   Enable the model and choose the **Training Time Range** – the time range must cover at least 2 weeks.

Step 3.   If **Status** = "Time Range is ok", then invoke the **Train** action.

Step 4.   If **Status** = "Anomaly events are computed for …" and **Model Information's** label appeared, then a model is trained and anomaly events are automatically computed the time range between start of the training time range and current time.
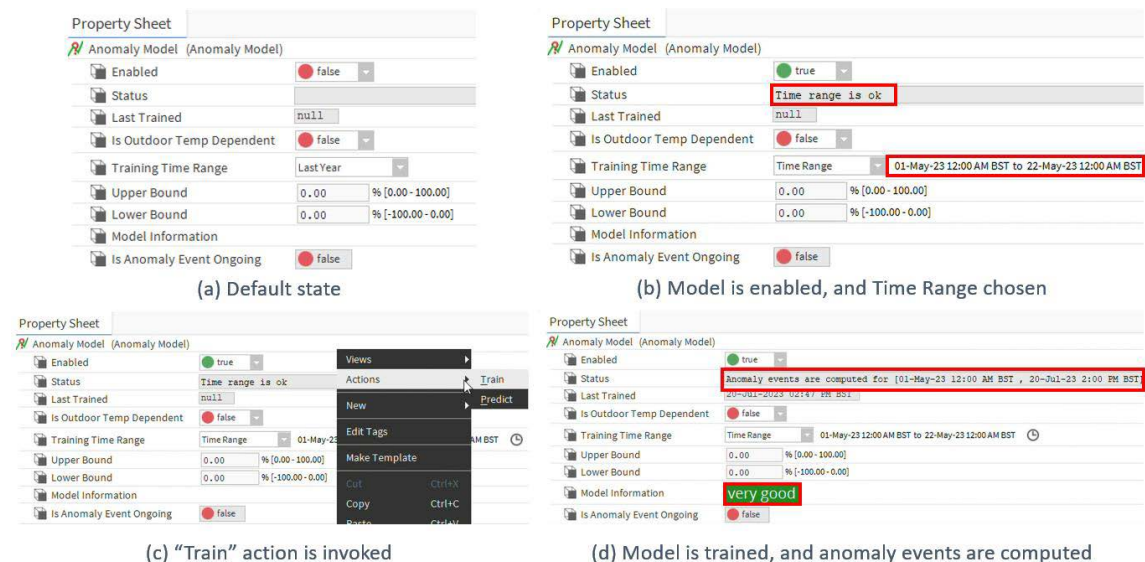
Fig. 21 Anomaly Model Engineering Steps

Include Weather Data into a Model

To use outdoor temperature data in model training, one need to perform the following steps:

Step 1.   Add a **Site** component, define the **Weather Station Ord** and link the current aggregator to the **Site** (see Grouping of Aggregators).

Step 2.   Enable the **Is Outdoor Temp Aggregator** flag in the Anomaly Model's property sheet.

Step 3.   If **Status** = "Outdoor Temp Aggregator from weather service is chosen", then invoke the **Train** action.

Below figure Anomaly Model with Weather Dependence shows an example of a setup described above.

Fig. 22 Anomaly Model with Weather Dependence

The weather station can be remote or local (see Weather Station for details). In the case when user has own weather data, one can also unhidden the Outdoor Temp Aggregator slot from the Slot sheet and set it to the ord of an aggregator that has weather history.

Post-train Actions

After the model is trained, the **Model Information's** properties are populated (see below figure) includes:

1. **Outdoor Temp Aggregator** – Ord of the weather aggregator in the model.

2. **Training Time Range** – The time range that was used for model training.

3. **R2** – The coefficient of determination R^2.

4. **CVRMSE** – The coefficient of variation of root mean square error.

Fig. 23 Model Information Component of Anomaly Model

Table 1 Association between R^2 and Model Information Label

R^2 Value Range	Model Information Label
$R^2 > 0.9$	Very good
$0.9 \geq R^2 > 0.8$	Good
$0.8 \geq R^2 > 0.7$	Fair
$0.7 \geq R^2$	Poor

The value of the property **R^2** drives the label of the property **Model Information**, which represents the quality of the trained model (see Table 1). The better a model is at making predictions, the closer the ?2 to 1. If model quality is poor, it means that the model is unable to capture patterns within the meter aggregator data. There might be several reasons for it:

• Too much variation of data within chosen training time range.

• Incorrect setup of meters within the aggregator: e.g. accumulative meter type instead of instantaneous.

• Too short training time range for good model predictions.

• If weather data is included, it might be not correlated with the meter aggregator data.

Together with the trained model, the anomaly events are computed for the parent aggregator. These can be visualized in the Anomaly Console Chart (see Anomaly Console).

(a) "Predict" action is invoked

(b) Start time of prediction is chosen
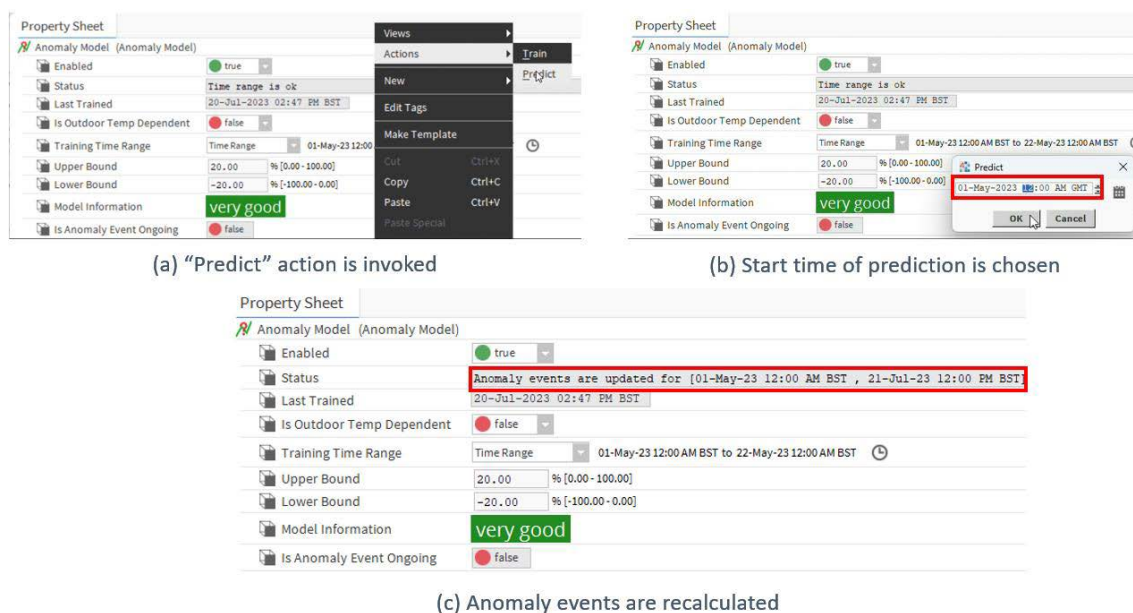
(c) Anomaly events are recalculated

Fig. 24 Anomaly Model Predict Action Flow

Note: *Anomaly events are updated automatically every hour starting from the timestamp of **Last Trained** property.*

One can trigger recalculation of anomaly events starting from a particular timestamp till current time by invoking a **Predict** action (see figure Anomaly Model Predict Action Flow). This action is triggered automatically every hour right after the model is trained.

The **Upper Bound** and **Lower Bound** properties of the Anomaly model can be set to widen the model's prediction interval by a certain percentage on the upper and lower boundaries, respectively. These properties are useful for limitation of amount of anomaly events generated and viewed in the Anomaly Console Chart. Once these properties are set, the anomaly events are automatically recomputed with updated bounds (see figure Upper/Lower Bound Setup in Anomaly Model).

Fig. 25 Upper/Lower Bound Setup in Anomaly Model

Once the desired configuration is set and anomaly events are computed, one can use the Anomaly Console chart to visualize the anomaly events and have them exported in PDF format.

Setting an Ongoing Event Alarm

As discussed previously, the "Is Anomaly Event Ongoing" flag of the property sheet (see figure Anomaly Model Property Sheet) indicates whether the aggregator is in the anomaly state or not, that is, the flag is true when there is an anomaly event since the last hour and false otherwise.

This attribute can be used to set up an alarm for the Alarm Console. To do so, it is required to add this attribute via "Composite Editor" to the Aggregator and link it to a **Boolean writable** with **BooleanChangeOfStateAlarmExtension**. Here are the necessary steps:

Step 1.   Expose the **Is Anomaly Event Ongoing** slot on the aggregator using the **Composite Editor**.

Step 2.   Link the **Is Anomaly Event Ongoing** slot to a Boolean writable using the wiresheet view.

Step 3.   Add **BooleanChangeOfStateAlarmExtension** on the Boolean writable.

Summary of the Data Flow

Below figure Flow Chart of Anomaly Model represents the summary of the end-to-end setup of the Anomaly Model with different options available.
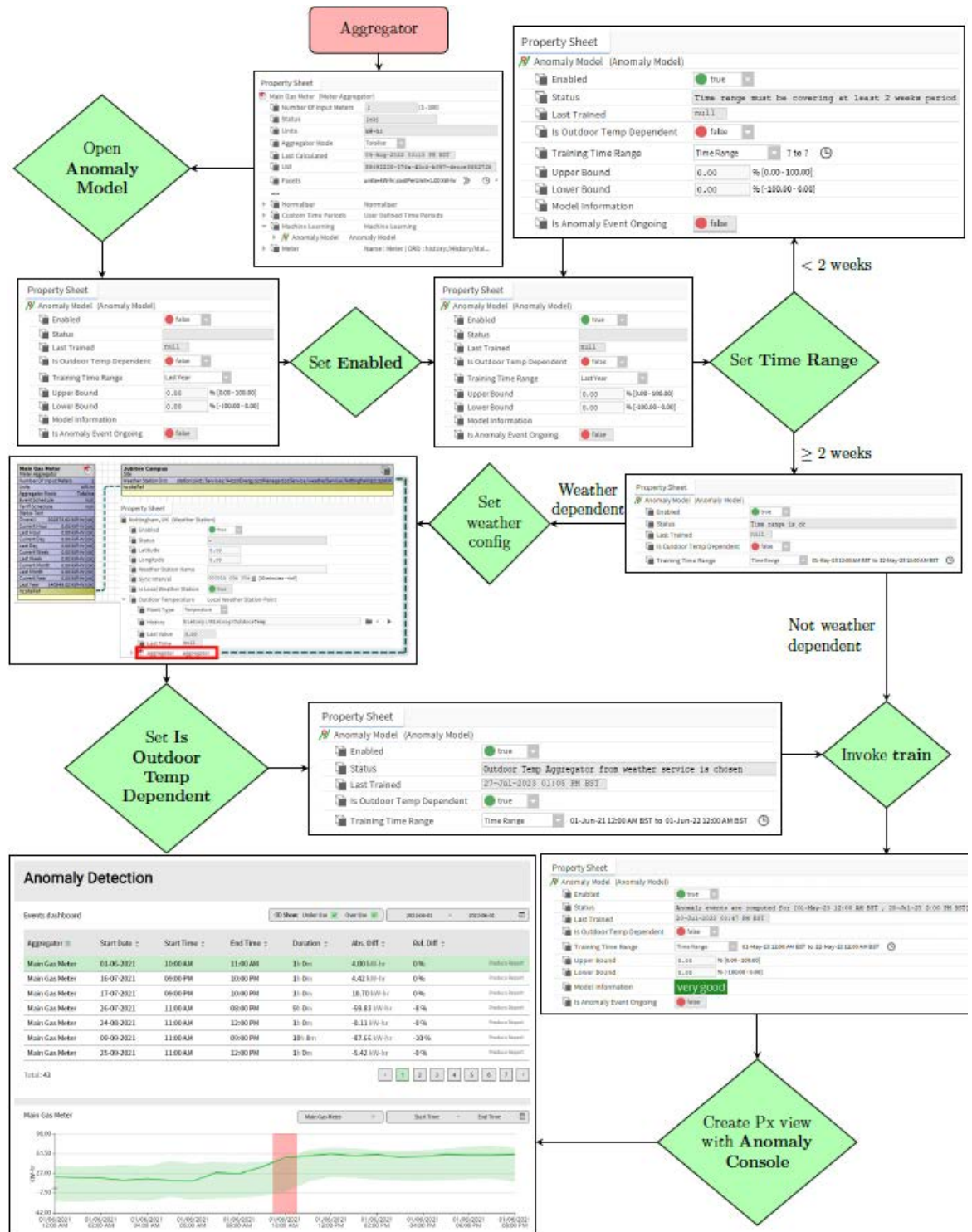
Fig. 26 Flow Chart of Anomaly Model

Anomaly Console

The anomaly events computed using the **Anomaly Model** of an aggregator can be visualized using the Anomaly Console chart.

Widget Configuration

This widget can be accessed from **N4 Energy Manager** Palette (see N4 Energy Manager Palette for details). The properties of the widget that can be seen on Below figure are common to other charts (see Common Chart Properties).

Fig. 27 Anomaly Console Widget Properties

Chart Data Binding can be used to set a list of **Aggregator Ords** which anomaly events are visualized in the Anomaly Console chart (see figure Chart Data Binding of Anomaly Console). There are three options:

- **No Ords are Provided** – Anomaly events of all aggregators that have **Anomaly Model** enabled will be shown.

- **Aggregator Ord** – Anomaly events of the chosen aggregator will be shown.

- **Site Ord** – Anomaly events of all aggregators linked to the chosen site will be shown.
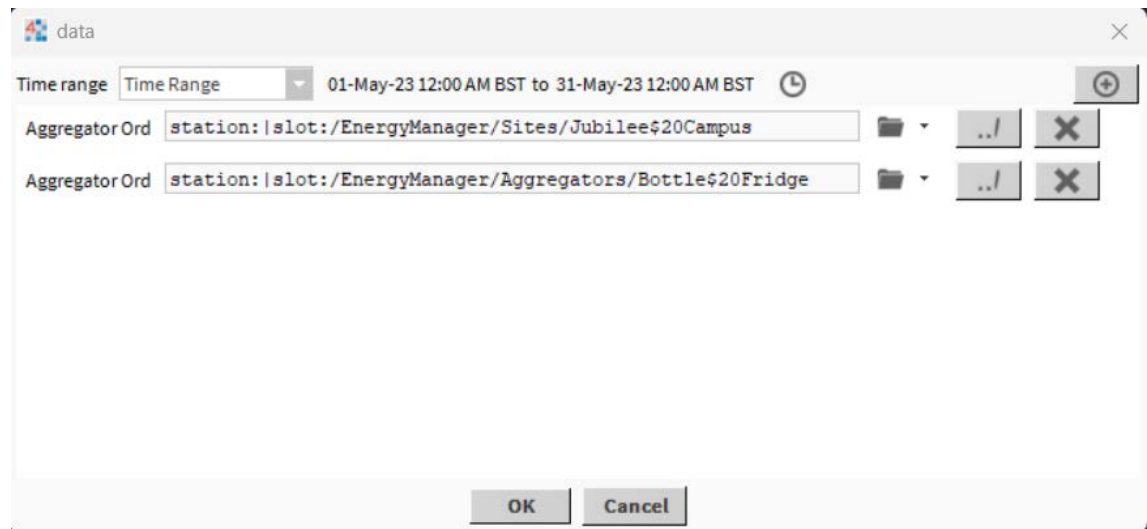
Fig. 28 Chart Data Binding of Anomaly Console

Anomaly events are populated for the time range pre-set in the "Time range" property. The default time range is last 30 days.

Anomaly Console Chart

Anomaly Console chart helps to view all anomaly Events on one view from all the aggregator that has enabled the machine learning model on which user can have different views by filtering data and sorting the data.
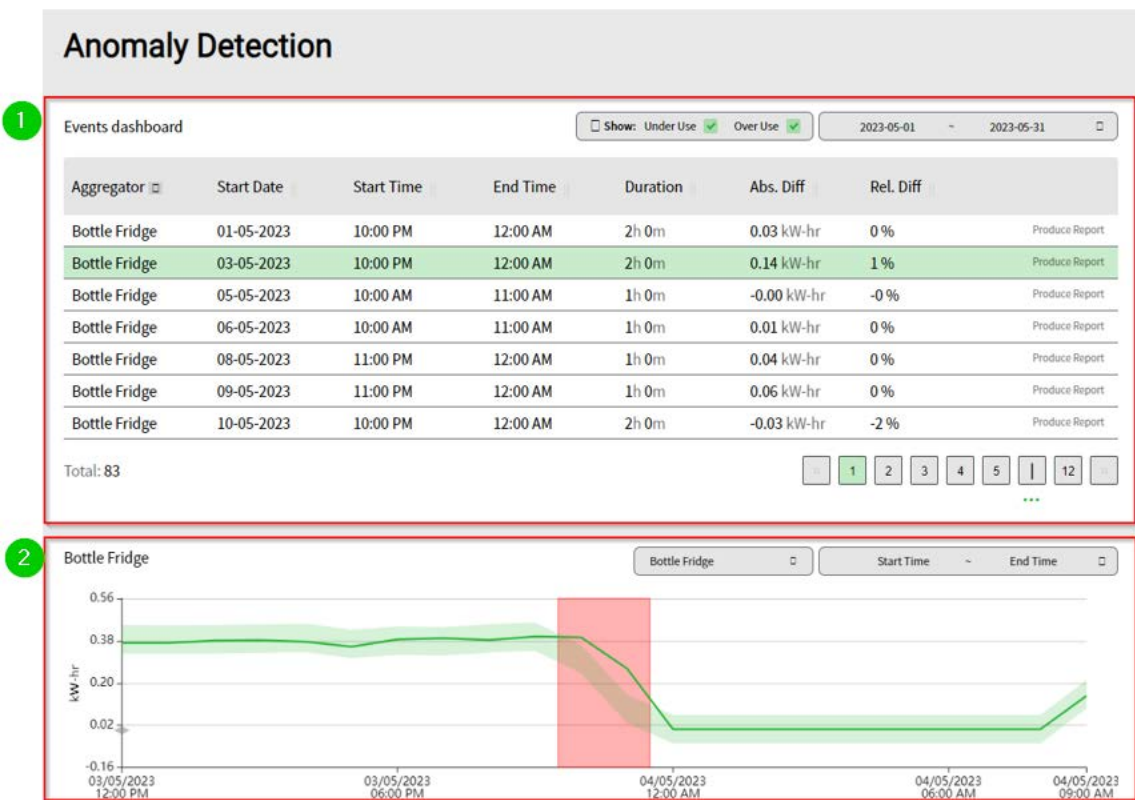
Fig. 29 Example of Anomaly Console Chart

1. **Events Dashboard** – The table reflects the list of all Anomaly events predicted by machine learning model in the chosen time range.

2. **Chart Content** –

   • The chart area displays the selected event (From Table) aggregator's data with the event time.

   • It shows the predicted value and actual value over selected time range and aggregator from the date picker and drop–down.

Events Dashboard
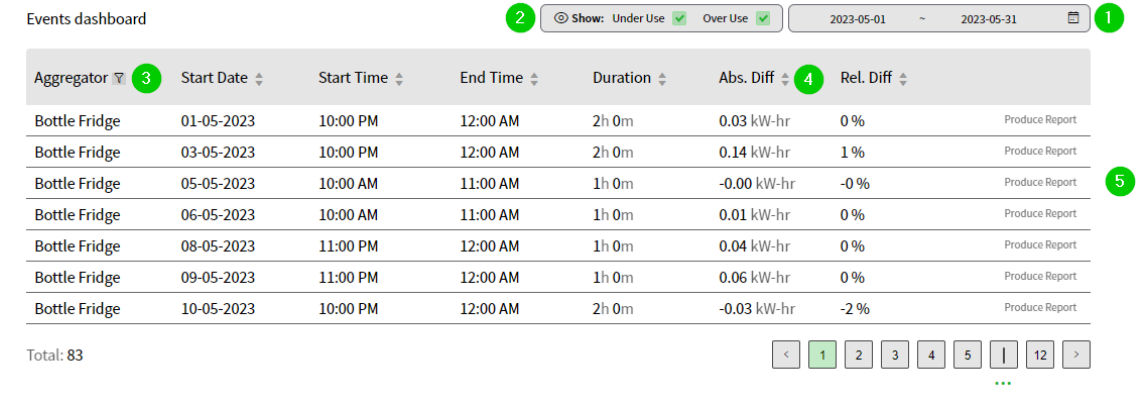
Fig. 30 Example of Populated Events Dashboard

1. The user can choose a date range to update the table with a list of anomalies that occurred during that time.
2. Filter that works on top of the table, to get separate views for anomaly events that overshoot and undershoot the prediction interval, respectively.
3. Filter that alters the list of events entries in the table based on the selected aggregators.
4. Individual sorters that sort the dashboard view based on (Start Date, Start Time, End Time, Duration, Absolute Difference, and Relative Difference).
5. Click the row highlights, and it populates the chart view for a time range = [Event Start Time – 10 hours, Event End Time + 10 hours].

Note: *The Chart can be populated by clicking on entries (events) in the table or by selecting the aggregator from the drop-down and selecting the date range from the date picker.*

Chart View

Here is some description on the chart view.

Figure 32 – EXAMPLE OF CHART VIEW IN ANOMALY DETECTION

It shows the aggregator's output over time.

The red bar highlights the event, and you can download the report with a chart view by clicking on it.

Model predictions are represented by green confidence bands.
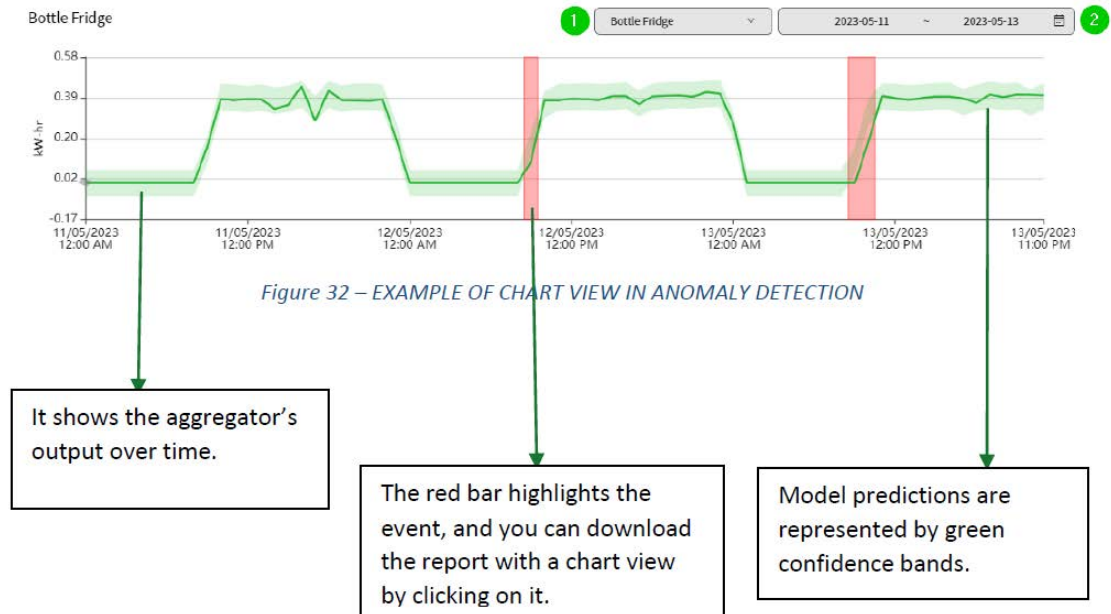
Fig. 31 Example of Chart View in Anomaly Detection

1. The User can select/change the aggregator in the chart view to see the aggregators output over time along with the upper and lower bound.
2. User can choose a date range with the selected aggregator to populate the chart for the chosen time range even if there are no anomaly events.

Note: *Whenever user clicks on the table row, the existing data on the chart view is replaced by the event data with time range = [Event Start Time – 10 hours, Event End Time + 10 hours]).*

Report View

Users can view the Chart view in a separate window, which also allows to export the view to PDF format.
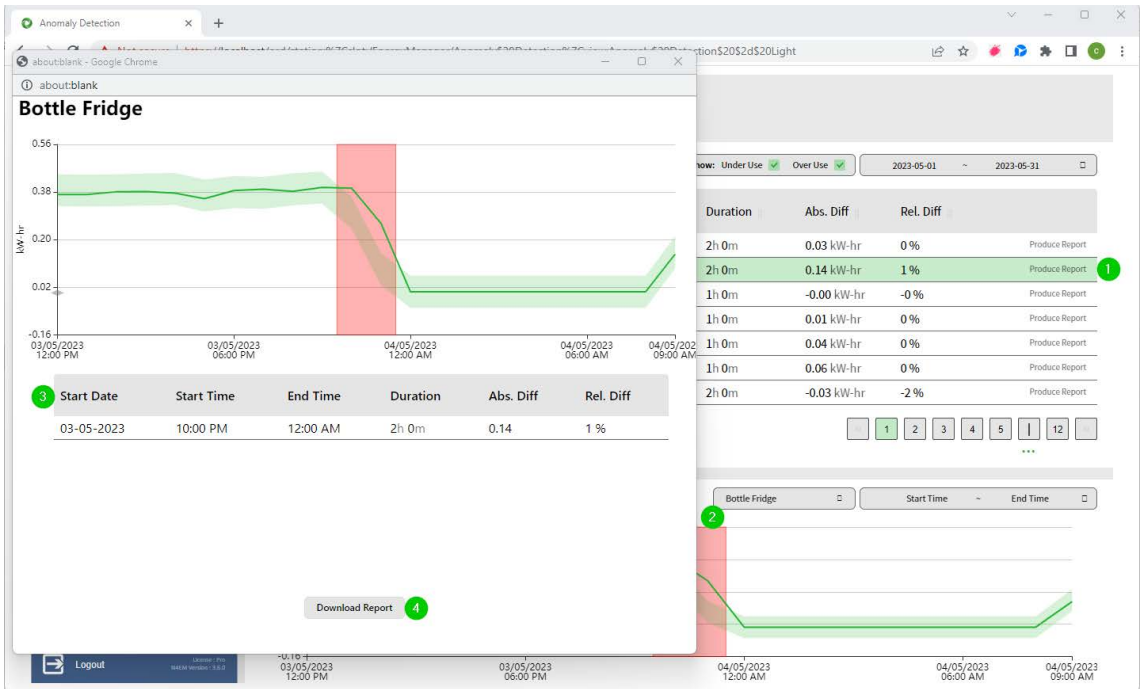
Fig. 32 Example of Download View

Above figure describes the report view and how to access it as follows:

- **Produce report** - Button which brings a report pop-up view upon a mouse click.

- **Red bar** – Has the same functionality as above button, brings up the pop-up.

- All events that appear on the report view are listed in this static table.

- User can export the view into PDF file by clicking on the Download Report Button.

Grouping of Aggregators

When dealing with substantial number of aggregators in the station some of which might share the same location (e.g. meters in a building) or represent instances of a larger component (e.g. chillers of the chiller plant), one can use the site component to group them together. This can be achieved by leveraging Niagara's "relations" concept. Moreover, the site component can be used to store common site-level information such as weather station used by the site, address, tariff information, area and so on.

Fig. 33 Site Component's Property Sheet

In **N4 Energy Manager version 3.8.0**, a site name and a weather station can be set in the site component.

To link aggregators to a site, a Haystack Dictionary must be added to the **TagDictionaryService** from the Haystack palette (see figure Adding Haystack into Dictionary Service).

Fig. 34 Adding Haystack into Dictionary Service

Steps to engineer a site component:

Step 1.   Open folder in which the site needs to be added.

        a. Right click on the folder and select **Views > Wire Sheet**.

Step 2.   Open the Palette ensuring that the **N4 Energy Manager Palette** is opened.

Step 3.   **Expand** the folder **Utils**.

Step 4.   Drag & drop the **Site** component onto the **Wire Sheet**.

Step 5.   Set the **Site Name** and **Weather Station Ord**.

Step 6.   Create inbound relations from site to the aggregators with "relationId" = "**hs:siteRef**":

        a. Select aggregator(s) to be linked to a site.

        b. Right click on them and select "**Relation Mark**".

        c. Right click on the site component and select "**Relate From "agg1", "agg2" …**".

        d. Select "**hs:siteRef**" from the drop-down menu and Click **Ok**.

        e. The Relation sheet of the site component should show all relations (see figure Site Component's Relation Sheet)

Relation Sheet					
Relation Id	Slot	Dir	Type	Other Path	Other Slot
hs:siteRef	-	◀	baja:Relation	slot:/EnergyManager/Aggregators/Main$20Gas$20Meter	-

Fig. 35 Site Component's Relation Sheet

Note: *Niagara help has several topics on how to add a relation between components. One might search for **Using Relations** or **Adding a Relation using Relation Mark** in the Niagara help's search tab.*

Energy Comparator
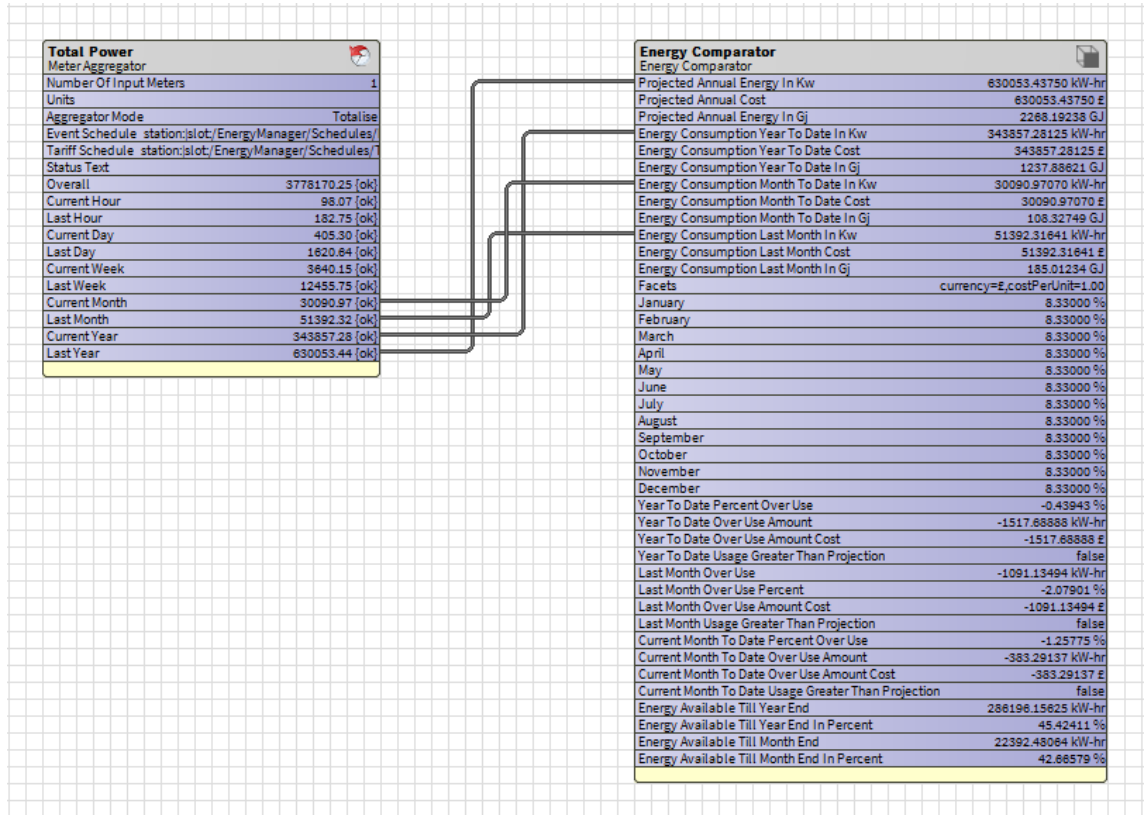
Fig. 36 Example Energy Comparator Wiresheet

The energy comparator is used to define monthly and yearly energy targets and assess performance. The following data is required to setup the component:

- The comparator needs to be linked to the TotalPowerMeter aggregator already created. Right–click on the home location and select the wiresheet.

- From the EnergyManager palette, drag an **Energy Comparator** component from the Aggregators menu and drop it onto the wiresheet.

- Now link the TotalPowerMeter to the aggregator to provide the historical data to the comparator.

- In the nav sidebar Right–click the TotalPowerMeter and Link Mark Right Click on the comparator and make the following links.

Meter

Current Month Last Month Current Year Last Year.

Comparator

- Energy Consumption Month to Date in Kw

- Energy Consumption Last Month in Kw

- Energy Consumption Year To Date in Kw

- Projected Annual Energy in Kw

Once this is linked, the comparator will be populated with data.

Linked Slots:

- **Projected Annual Energy** – Actual energy consumption of last year in the above case.
- **Energy Consumption Year To Date** – Total amount of energy consumed from the beginning of the current year up to the current date.
- **Energy Consumption Month to Date** – Total energy consumed from the beginning of the current month up to the current date.
- **Energy Consumption Last Month** – Total energy consumed in the previous month.

Calculated slots:

- **Year To Date Percent Over Use** – Percentage difference between the actual energy consumption year to date and the projected energy until that date.
- **Year To Date Over Use Amount** – Difference between the actual energy consumption year to date and the projected energy until that date.
- **Last Month Over Use** – Difference between the last month actual usage and projected last month usage.
- **Last Month Overuse Percent** – Percentage difference between the actual energy consumption in the last month and the projected energy consumption for that month.
- **Current Month to Date Overuse Percent** – Percentage difference between the actual energy consumption month to date and the projected energy consumption for the current month to date.
- **Current Month to Date Overuse Amount** – Amount of energy that has been overused in the current month compared to the projected energy consumption up to current date of the current month.
- **Energy Available Till Year/month End** – Actual amount of energy that can be consumed from the current date until the end of the year/month without exceeding the projected annual/monthly energy consumption.
- **Energy Available Till Year/month End in Percent** – Percentage of energy that can be consumed from the current date until the end of the year/month without exceeding the projected annual/monthly energy consumption.

All the slots related to cost are calculated based on the facets provided into the comparator and respective energy consumption

Note: *You will notice that all months from January to December have an equal percentage share (100% divided by 12 months = 8.33%). This can be adjusted as required by entering the forecast percentages for that month directly into the comparator or by incorporating a numeric point into the relevant months slot.*

N4 Energy Manager Service

There are several Niagara component tools available in the N4 Energy Manager Service (see figure N4 Energy Manager Service Property Sheet. They help with different tasks related to meter aggregators such as:

- Construction of multiple aggregators at once (see Site Hierarchy)
- Configuration of the weather service (see Weather Service)
- Setting the preferred chart interval (see Preferred Chart Interval)
- Setting the week start day (see Weekly Time Range)
- Configuration of the Data Quality Settings (see Data-Quality Alarms).

Fig. 37 N4 Energy Manager Service Property Sheet

The **N4 Energy Manager Service** has the following properties:

1. **License Manager** – Information about the license tier a user has
2. **Aggregator Worker Pool** – Component that controls the amount of worker threads to use in the aggregator calculations. Default is 4.
3. **Web API** – REST Api that the UI widgets use to get data from the station.
4. **Site Hierarchy** – Component that facilitates the engineering of aggregators.
5. **Report Manager** – Component that controls the automatic reporting feature (see Batch Reporting for details).
6. **Currency** – global setting for the currency to be used in the cost calculations.
7. **Preferred Chart Interval** – global setting for the rollup interval of the aggregator data to be used to draw charts such as line or bar chart.
8. **Week Start** – global setting for the start day of the week. This is automatically used in the charts when weekly time range is selected.
9. **Data Quality** – Global settings for the data quality.
10. **Weather Service** – Component that can bring the weather data from any station worldwide.

Site Hierarchy

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

Note: *As a prerequisite 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

Step 1.   **Expand** the station in the **Nav** side bar.

Step 2.   **Expand** Config > Services > **N4 Energy Manager**.

Step 3.   **Double Click** on **Site Hierarchy**.

Step 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.

       • 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.

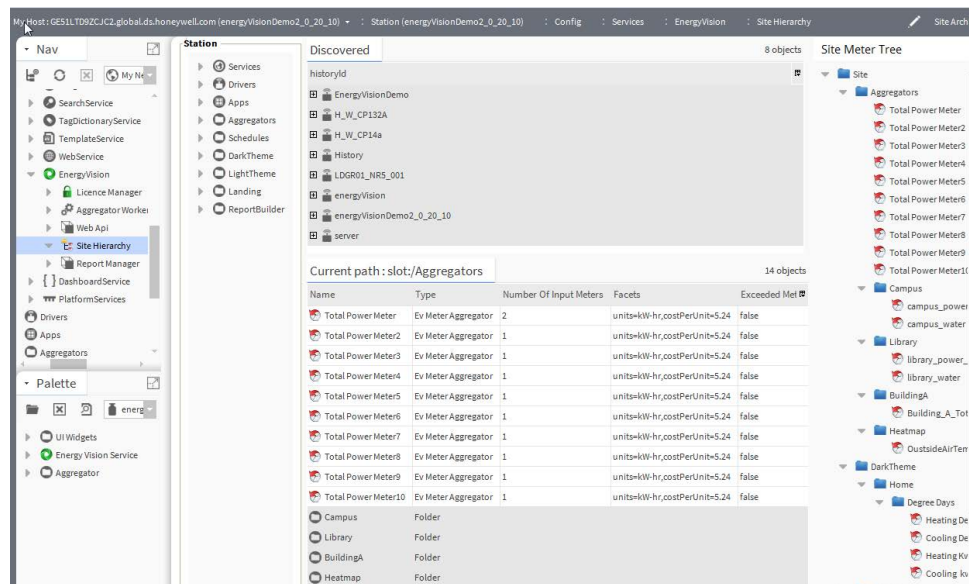Step 5.   Using the **Discovered** window, navigate through the histories.

Fig. 38 Example of Site Hierarchy

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

Assign Single History to an Aggregator

Step 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.

Step 2.   Select the **History**.

Step 3.   At the bottom of the window, click **Add**.

Step 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 to.

Step 5.   The aggregator, with the history linked to it, will now be added to the folder opened in the **Current Path** window.

Step 6.   To add further single histories, repeat steps **1, 2, 3 & 4**.

Assign Multiple Histories to an Aggregator

Step 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 to.

Step 2.   Select the **Histories**.

Step 3.   At the bottom of the window, click **Add Group**.

Step 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 to.

Step 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**.

Note: *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 the data they are processing.*

Weather Service

Starting from **N4 Energy Manager** version 3.8.0, the **Weather Service** can be used to automatically bring the historical and current weather data into a station (see figure Weather Service Property Sheet).

One can register a remote weather station and pull weather data provided by **N4 Energy Manager**. Alternatively, a local weather station can be added with user's own weather data, e.g., data from an outdoor temperature sensor. If a remote weather station is added, the historical outdoor temperature data is available starting from January 1st, 2020.

Fig. 39 Weather Service Property Sheet

The Weather Service has the following properties:

- **Register Weather Station** – Button to add a remote weather station based on the location name.

- **License Message** – Information about the result of weather data fetch.

- **License Status** – Information about the license and how many remote weather stations can be added. The remote weather station limit is governed by the N4 Energy Manager's License.

- **Default Weather Units** – the unit to use for the temperature history point and the associated aggregator. The default unit is °C.

- **Name of the Station** – Weather Station component that can be added dynamically either through **Register Weather Station** or by dragging and dropping from palette.

Weather Service Licensing

New customers of **N4 Energy Manager Pro** license starting from version 3.8.0 get weather service core license included. For existing customers, the weather service is licensed separately from the N4 Energy Manager Pro license, therefore customers are advised to contact their distributor to purchase weather service license.

Weather Station

The weather station is a component that can hold different weather station points such as outdoor temperature, humidity, cloud coverage. In N4 Energy Manager version 3.8.0, only the outdoor temperature data is provided.

Weather station can have two types of weather station points (see figure Examples of Remote and Local Weather Stations):

• Remote weather station point

• Local weather station point

They both share the same set of properties, namely:

1. **Enabled** – Flag to enable/disable the weather station.
2. **Status** – The status information about the weather station component.
3. **Latitude** – Decimal number representing the latitude coordinate of the weather station's location.
4. **Longitude** - Decimal number representing the longitude coordinate of the weather station's location.
5. **Sync Interval** – period at which the weather data is synced from the weather service. Applicable only for remote weather stations.
6. **Is Local Weather Station** – Flag to inform whether a weather station is remote or local.
7. **Name of the Point** – Weather Station Point or Local Weather Station Point component that is added automatically for remote stations and can be added manually for local stations, respectively.

(a) Remote weather station   (b) Local weather station

Fig. 40 Examples of Remote and Local Weather Stations

Remote Weather Station

The remote weather station can be used to fetch weather data from **N4 Energy Manager**'s weather service. This can be added by clicking on "Add Weather Station" button and selecting the location by name (see figure Add Remote Weather Station) in the Weather Service.
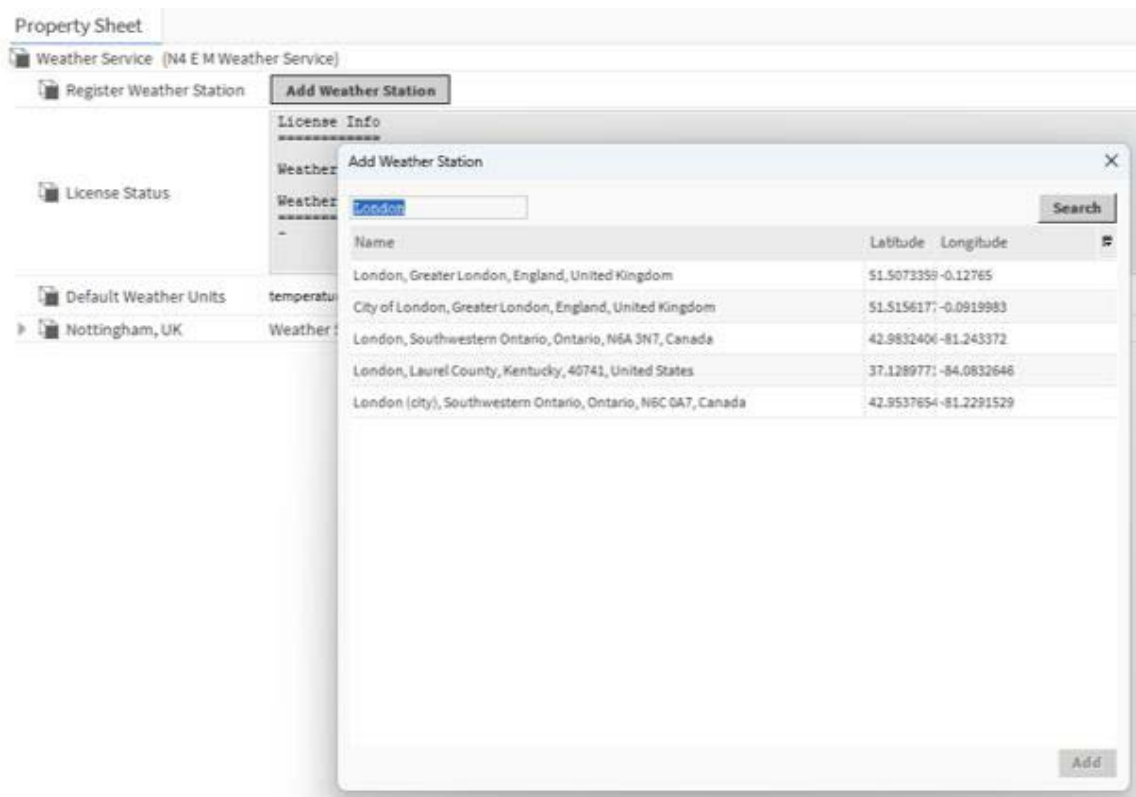
Fig. 41 Add Remote Weather Station
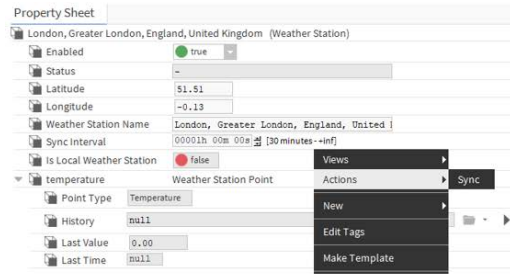
(a) Sync of weather station is being invoked
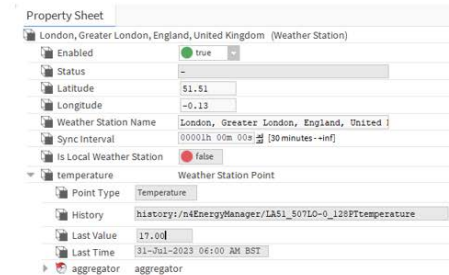
(b) Sync is successful: history and aggregator are created
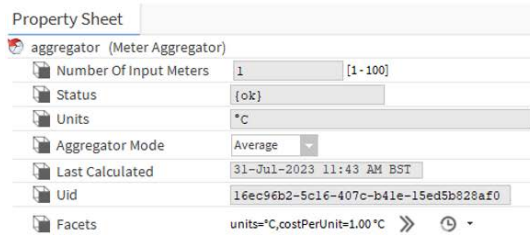
(c) Aggregator properties are populated
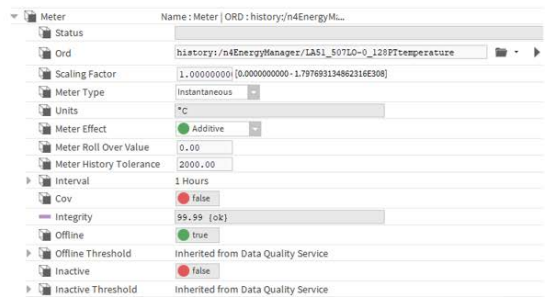
(d) Meter properties are populated

Fig. 42 Engineering Remote Weather Station Point

Once a remote weather station is added, the weather station point needs to be configured. Above figure describes the process of syncing weather data. Namely, the following steps need to be taken:

Step 1.   Invoke the **Sync** action on the **Weather Station Point** component.

Step 2.   Niagara history is created and the history Ord is shown in the **History** property.

Step 3.   Aggregator is created and its properties such as units, aggregator mode and so one are automatically populated.

Step 4.   A meter is added to the aggregator with history that was created above with the properties automatically set.

Local Weather Station

The local weather station point can be added to the Weather Station through slot sheet. A slot of type **LocalWeatherStationPoint** (see figure Example of Adding Local Weather Station Point as a Slot) must be added.

Note: *The user can manually set the history ord of the weather data in the **History** property. Once the history ord is added, a single trigger of **Sync** action on the **Local Weather Station Point** would automatically create an aggregator under the point.*
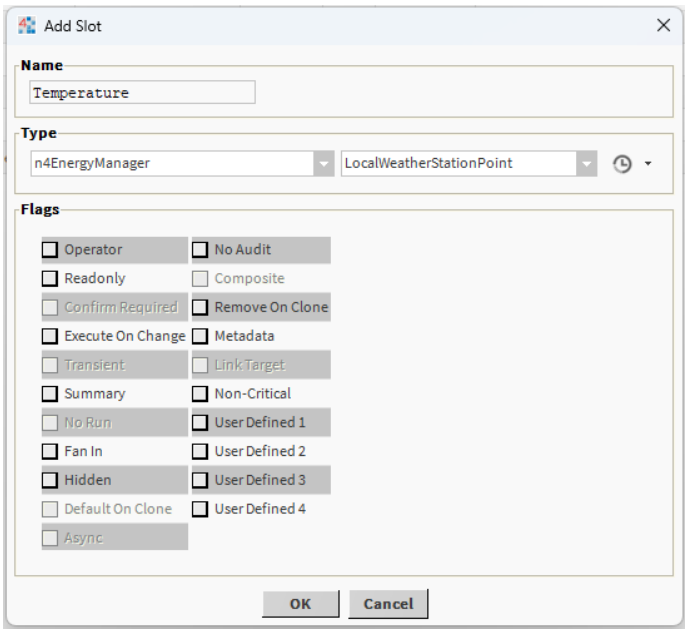
Fig. 43 Example of Adding Local Weather Station Point as a Slot

Note: *A newly created remote or local station can be referenced in the Site component which has relations to aggregators that have Anomaly Model enabled. Such aggregators can use the weather data provided by current weather station in the model training and prediction.*

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 shown below is a representation of how the data is bought into **N4 Energy Manager**:
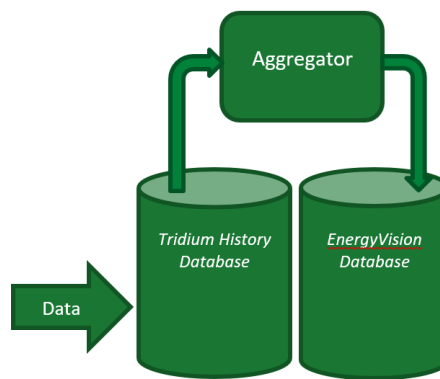
Fig. 1 File Structure

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.

N4 Energy Manager Planning

Planning your **N4 Energy Manager** system set up prior to starting is essential for a later operation.

1. **N4 Energy Manager** uses the default Niagara mechanisms that are based on absolute ords. It is therefore important to build up a good folder structure for aggregators and graphics.

2. Some **N4 Energy Manager** functions can only be used in Workbench or the Web Browser. The user will be prompted contextually when a feature is not accessible on a platform.

Recommended Browser

The display of graphics can vary between web browsers. **N4 Energy Manager** is tested using the latest version of Google Chrome, so for the best results, we recommend using **Google Chrome**.

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 the 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.

Step 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.

Step 2. Allow the station time to start running. Usually, 2 minutes (depending on the size of the station).

Step 3. Open the web browser.

Step 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.

Step 5. A login window should now appear. Enter the station's credentials.

Step 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:

Step 1.   Ensure the station is connected.

Step 2.   Expand the **station** > **Config** > **Services**.

Step 3.   Double click on **Web Service**.

Step 4.   Check **HTTP(S) Port** numbers. This will determine which port to access the station.

Note: *Ensure the latest version of Google Chrome is installed on the Server (where the **N4 Energy Manager** station is running). **This is critical to report generation**.*

N4 ENERGY MANAGER CHARTS

N4 Energy Manager provides pre-defined chart components with individual functions using a common design. All charts support HTML5 and will resize based on the Web Browser used. Charts can choose from a number of set intervals, Year, Month, Day, and Weekly. For Weekly intervals, the starting and ideal ranges can be set by the operator for comparison.
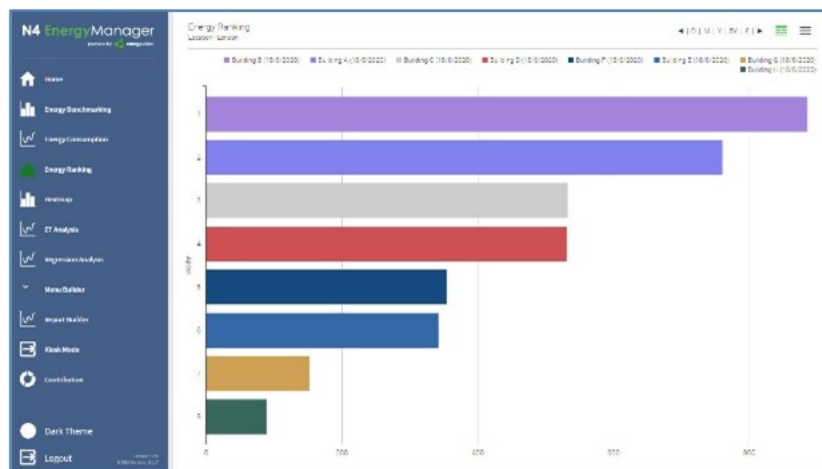
Fig. 1 Example Bar/stacked Bar Chart And Energy Ranking Chart

Fig. 2 Example Energy Ranking Chart

N4 Energy Manager – User Guide 3.8.0
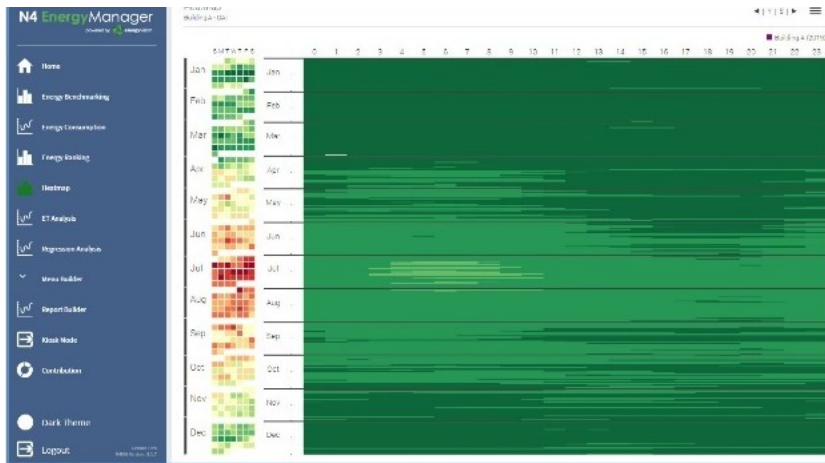
Fig. 3 Example Heat Map
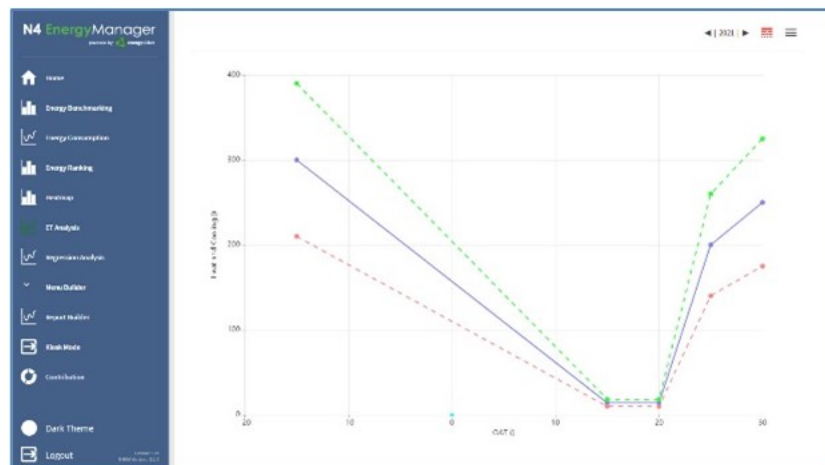
Fig. 4 Example Et Analysis Chart
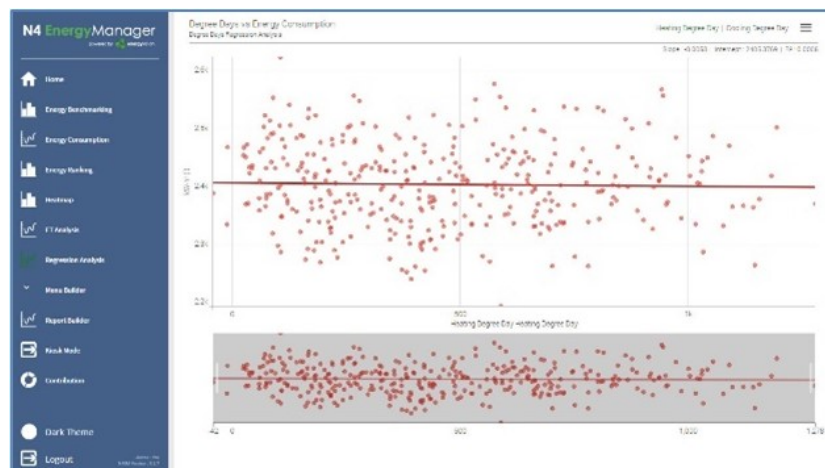
Fig. 5 Example Degree Day Regression Chart
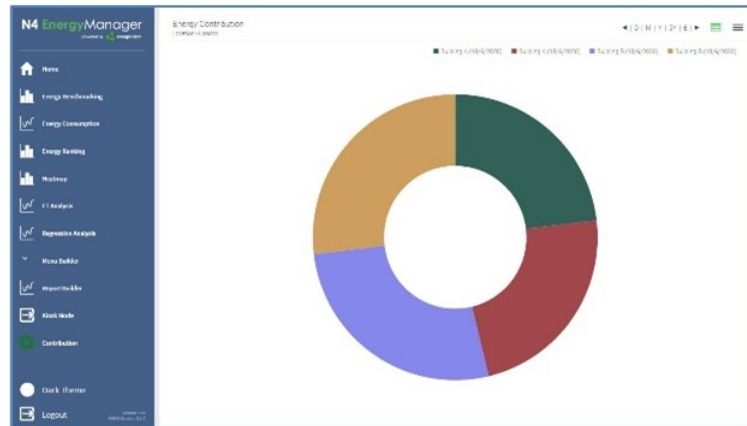
Fig. 6 Example Energy Contribution Pie Chart

Fig. 7 Example Line Chart & Gauges

Common Chart Properties

N4 Energy Manager provides default chart templates for faster engineering & intuitive operation. The common features are:

Chart Headings
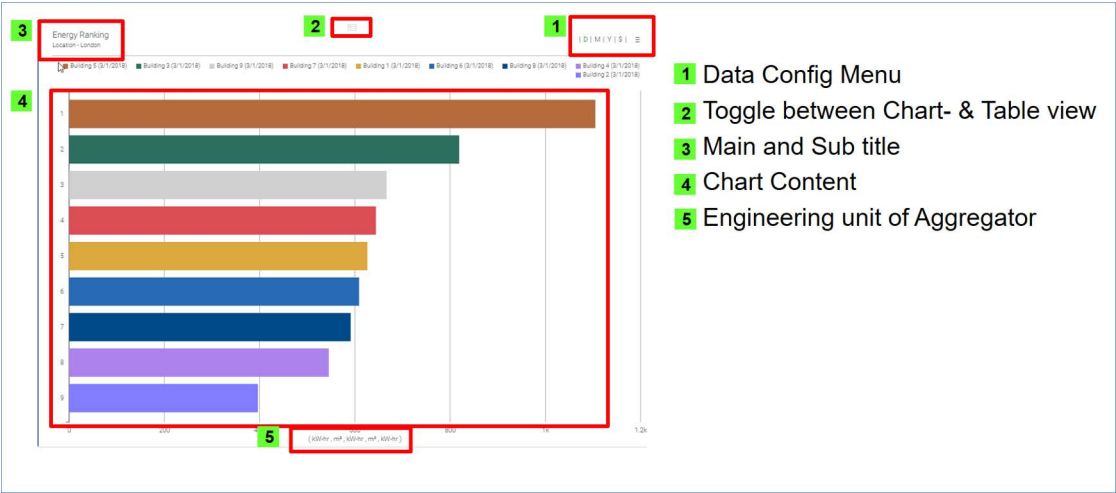
Fig. 8 Example Chart Headings

Burger Menu
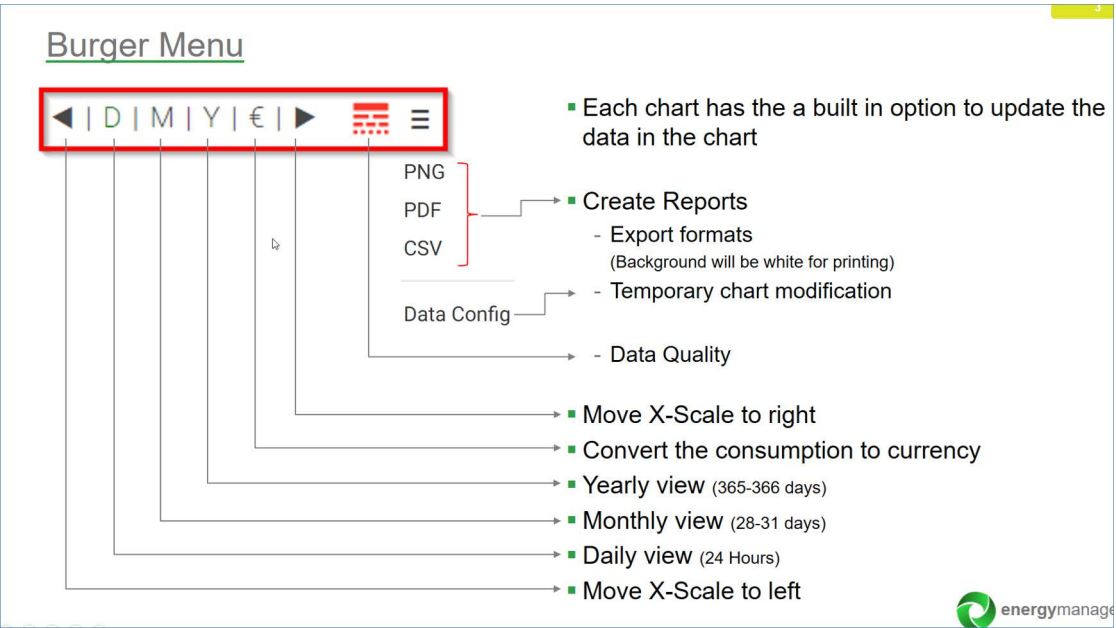
Fig. 9 Burger Menu Explanation

Data Quality
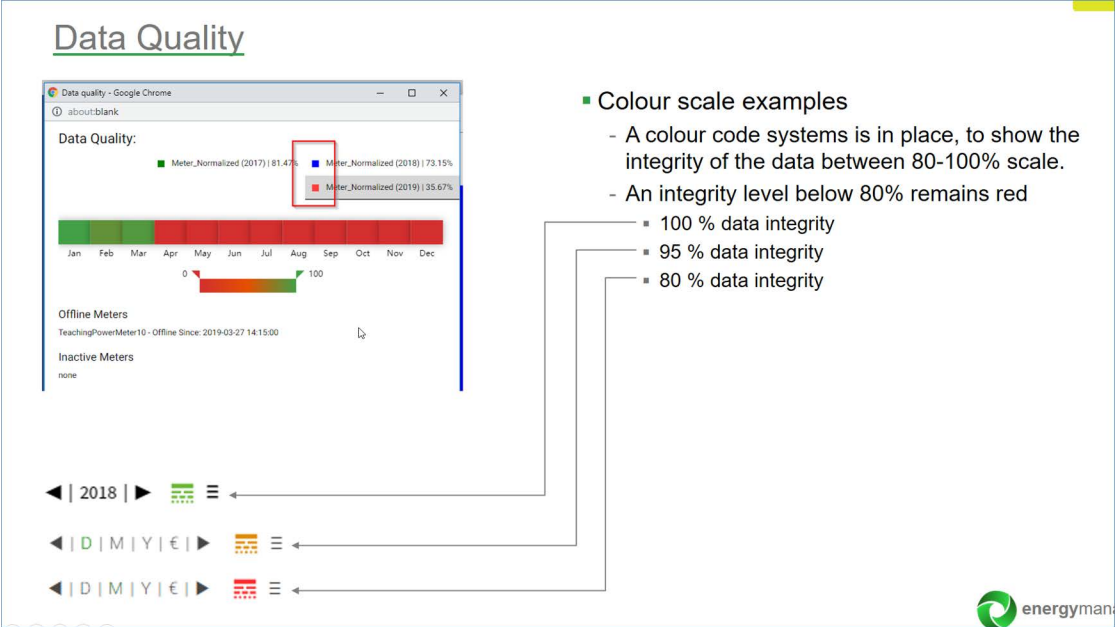
Fig. 10 Data Quality Icon Explanation

Chart & Table View
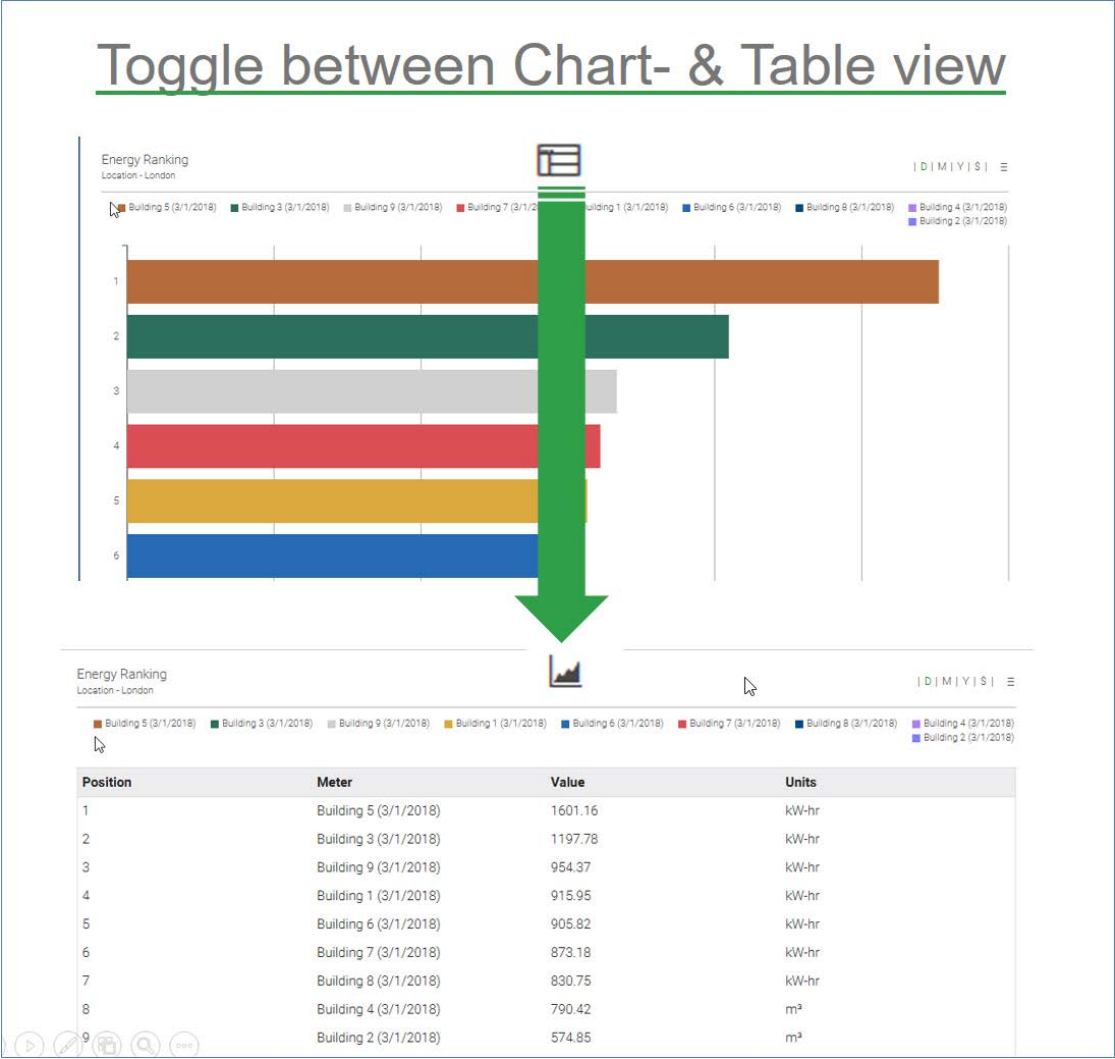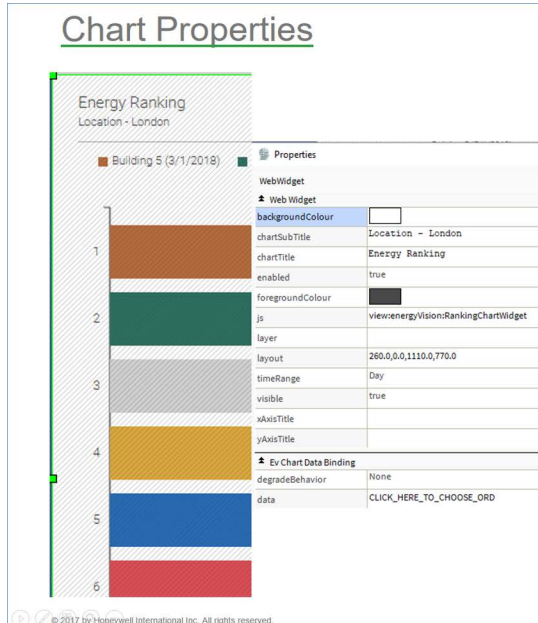
Fig. 11 Example Chart & Table View

Chart Properties

Fig. 12 Example Chart Properties

Note: *All charts support transparent background. User can select **Transparent** color to achieve this.*

Fig. 13 Example Chart Properties

Fig. 14 Example Chart Properties

Data Binding
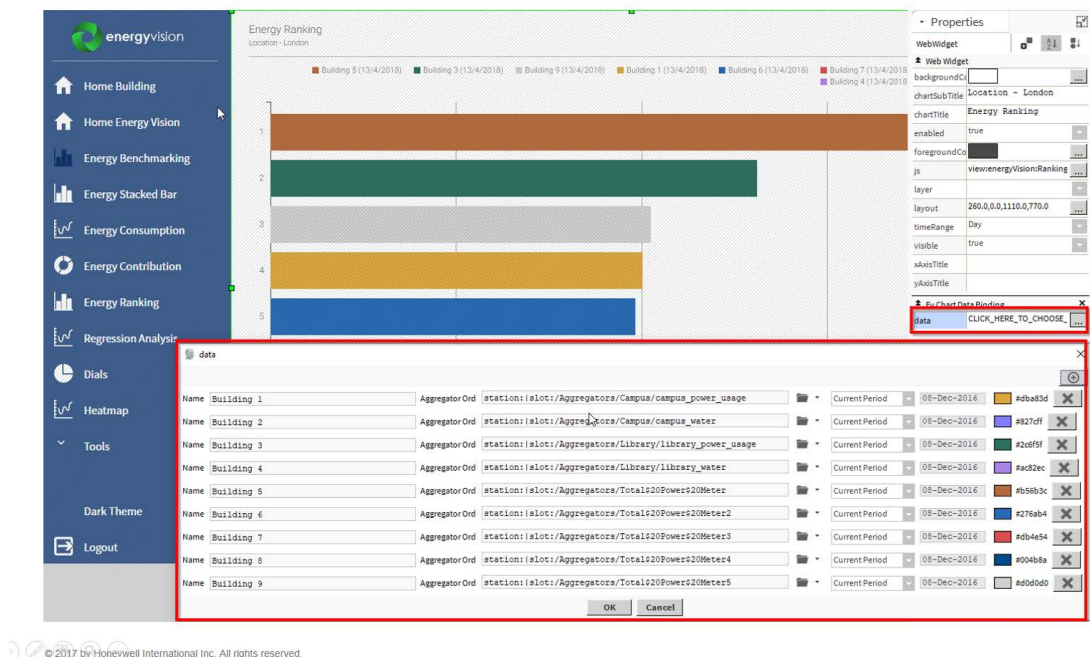
Fig. 15 Example Data Binding View
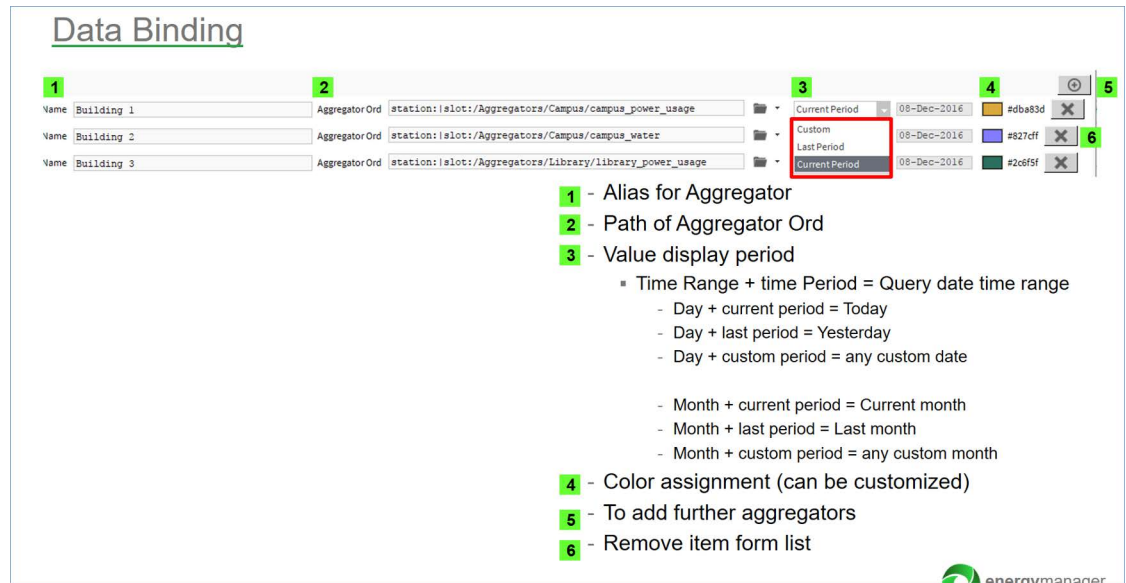
Fig. 16 Data Binding Headings

Note: *User can display the chart's data in the chosen colour on the aggregator slot sheet by selecting "null" as colour on the chart data binding.*

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.

Note: *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.*

Note: *By enabling **Show Symbols** in the Data Config|Settings (see Settings), circles representing data points will be drawn on top of each line.*

In the Line Chart, users can select the interval for data view across all time periods. This can be configured in the Data Binding section (see below figure).

Example: Available Intervals for day: 15 minutes, 30 minutes, 1 hour and Default interval.

The "Default interval" represents the preferred chart interval set in the N4 Energy Manager Service.
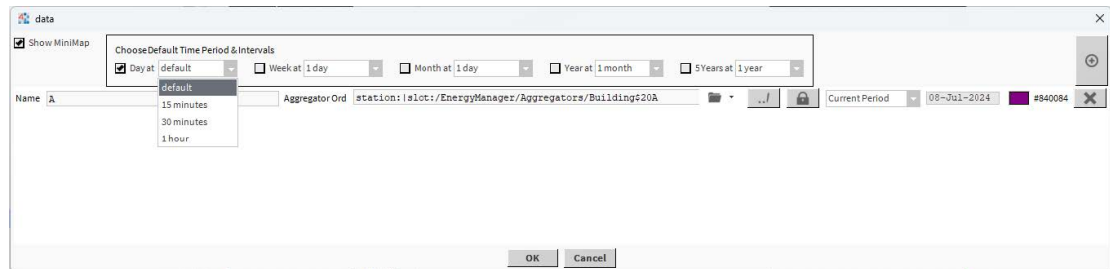
Fig. 17 Data Binding (Line Chart)
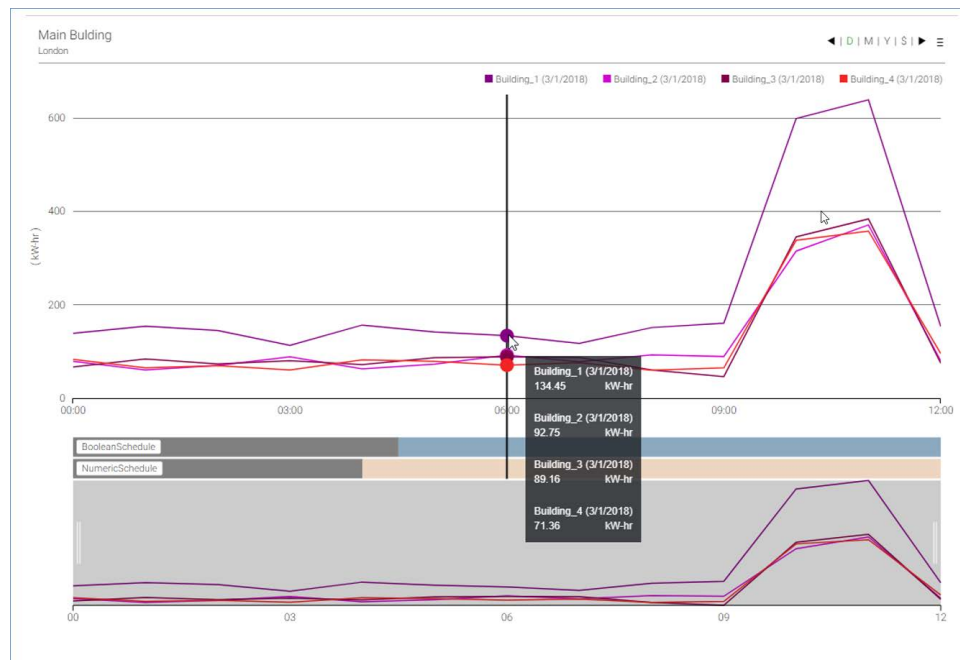
Fig. 18 Example Line Chart
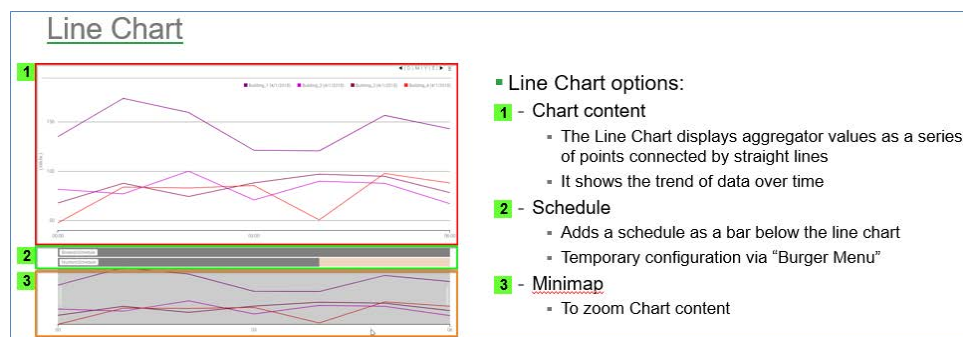
Fig. 19 Line Chart Options
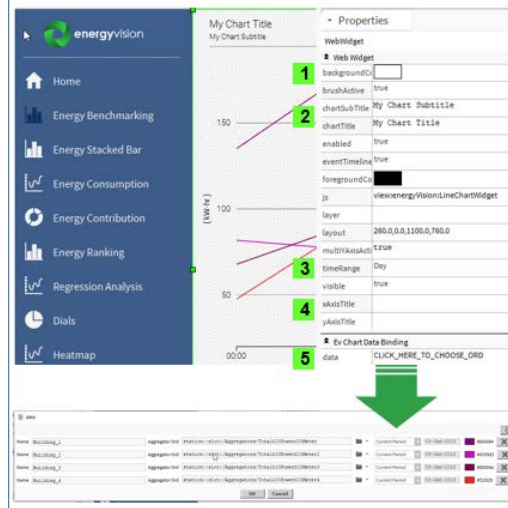
Fig. 20 Line Chart Properties
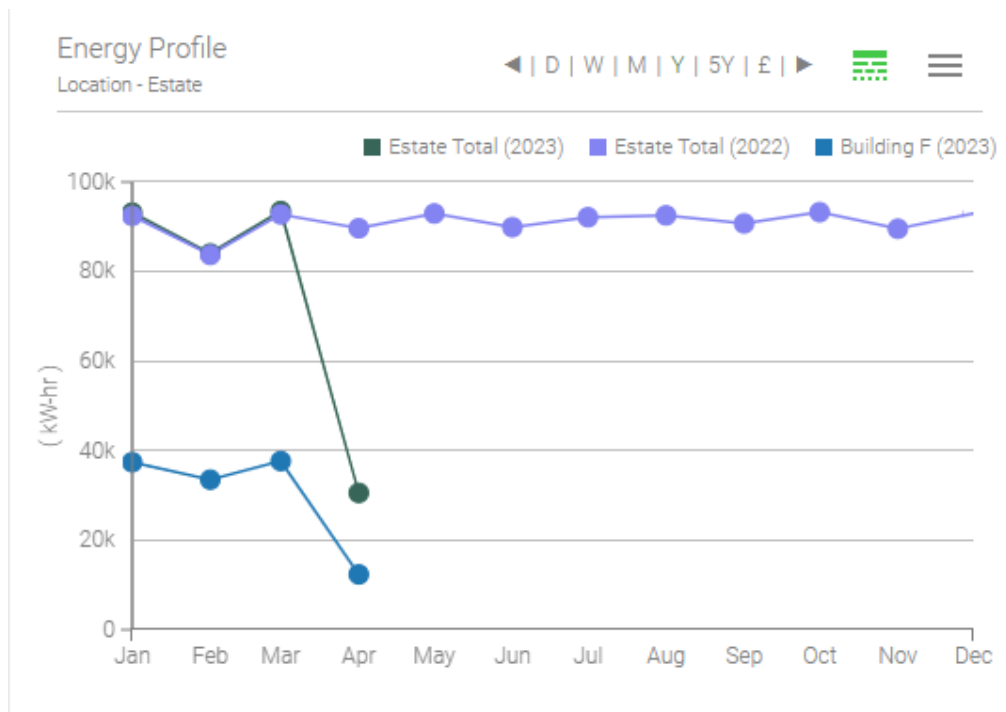
Fig. 21 Line Chart with Symbols

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.
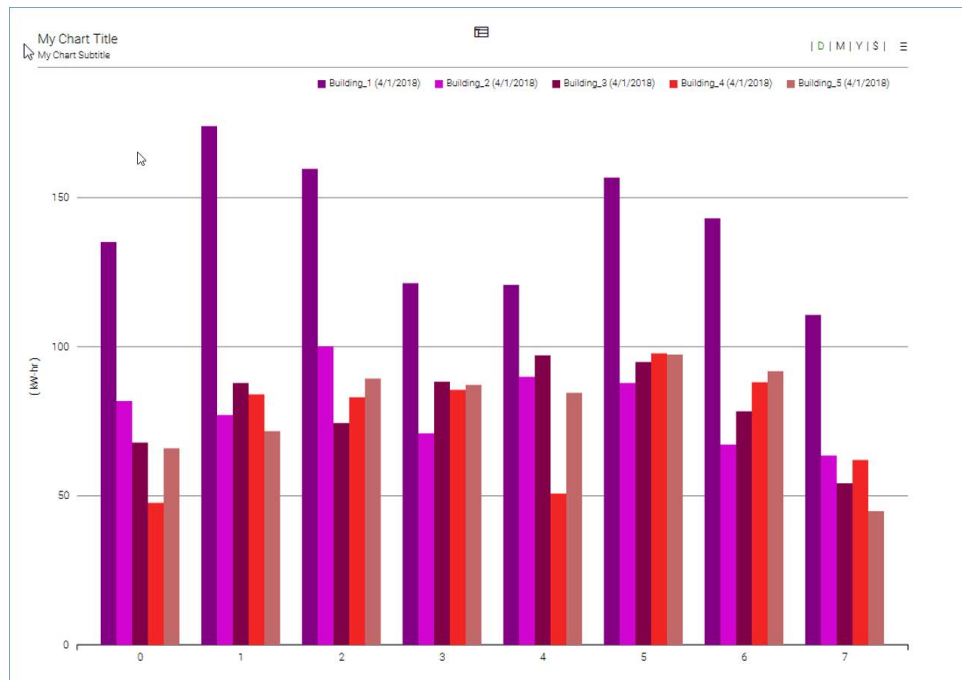
Fig. 22 Example Bar Chart

Fig. 23 Bar Chart Options

Fig. 24 Bar Chart Implementation Process

Ranking Chart

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

Note: *There is no limit on the number of aggregators that can be added to a Ranking Chart. However, large numbers may reduce performance.*
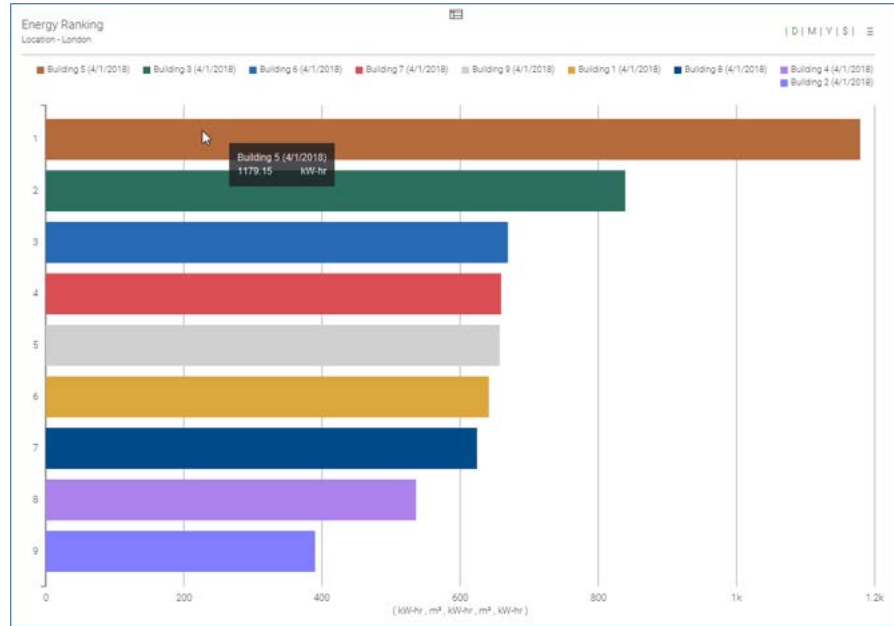
Fig. 25 Example Ranking Chart
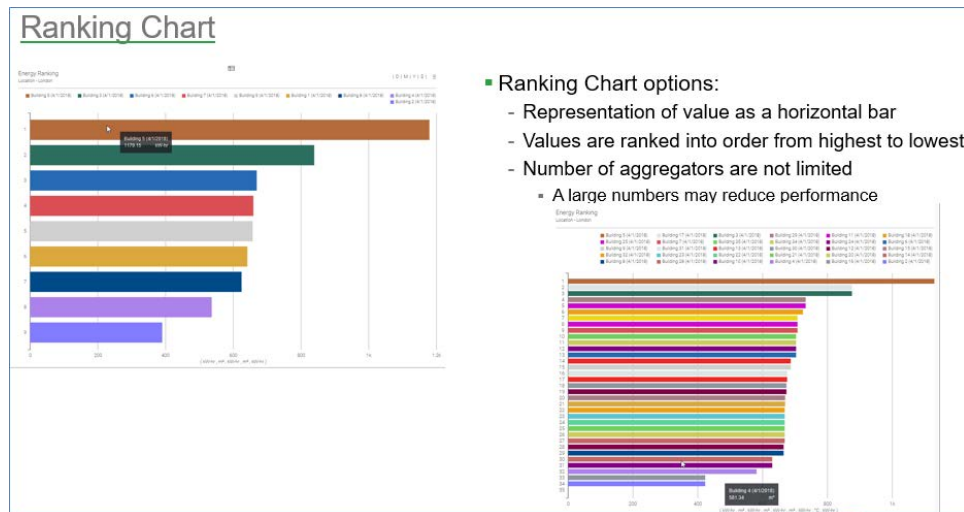
Fig. 26 Ranking Chart Options
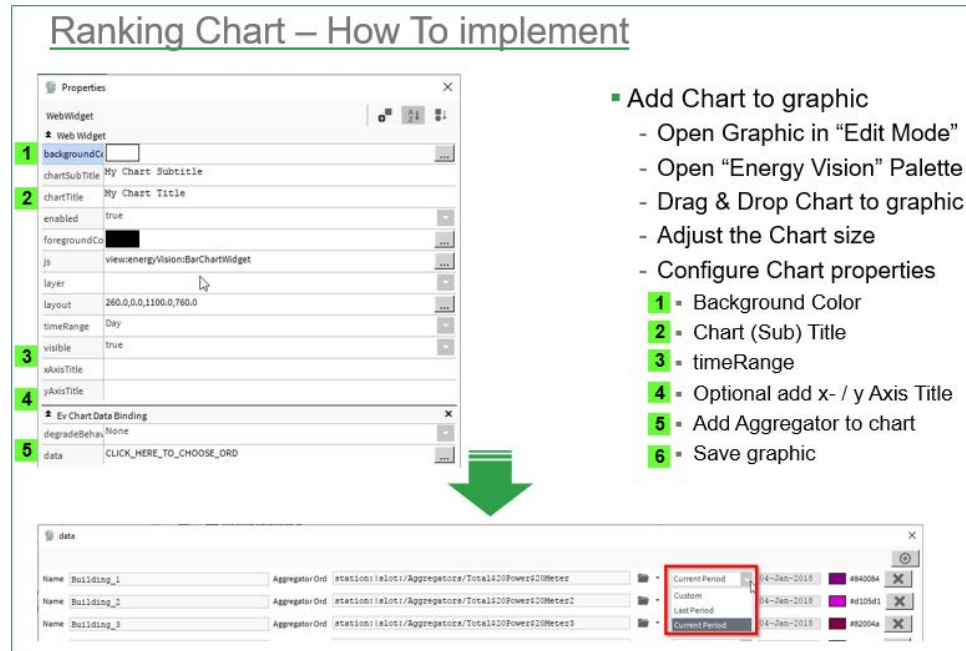
Fig. 27 Ranking Chart Implementation Process

Pie Chart

The pie chart displays the total value of all aggregators assigned to it, split into sectors of a circle. The tooltip shows the value of the sector as well as the total value of the circle.
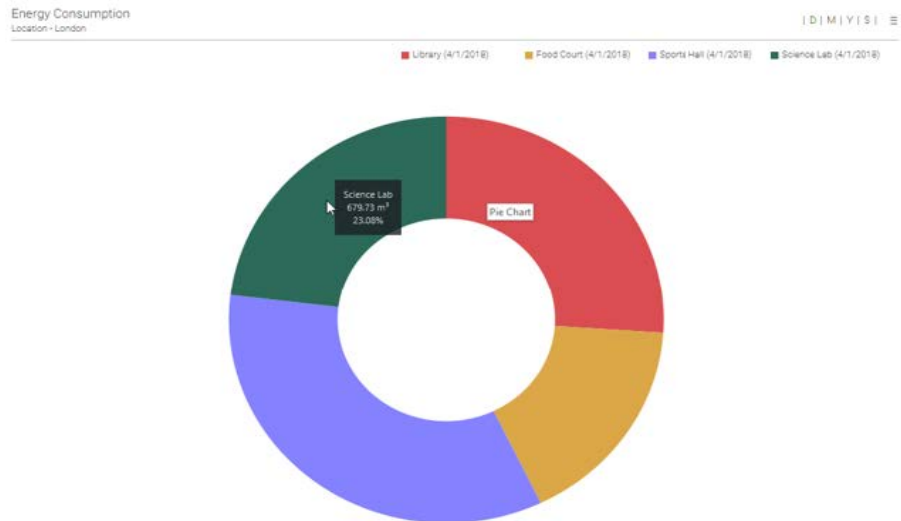
Fig. 28 Example Pie Chart
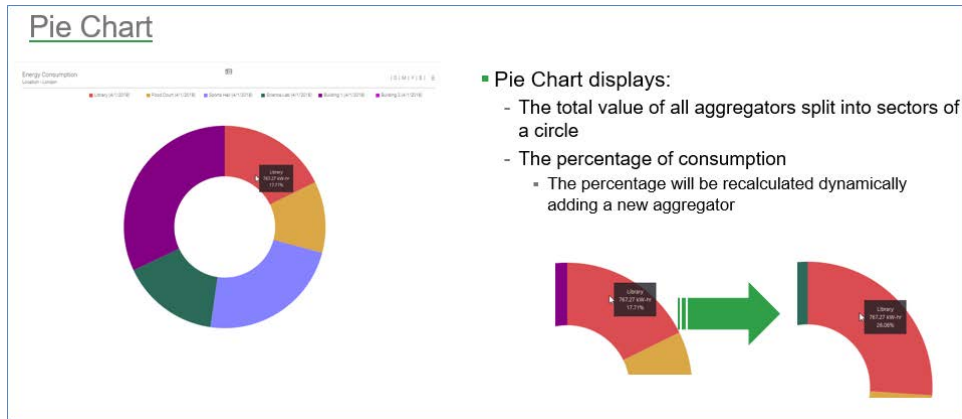
Fig. 29 Pie Chart Information
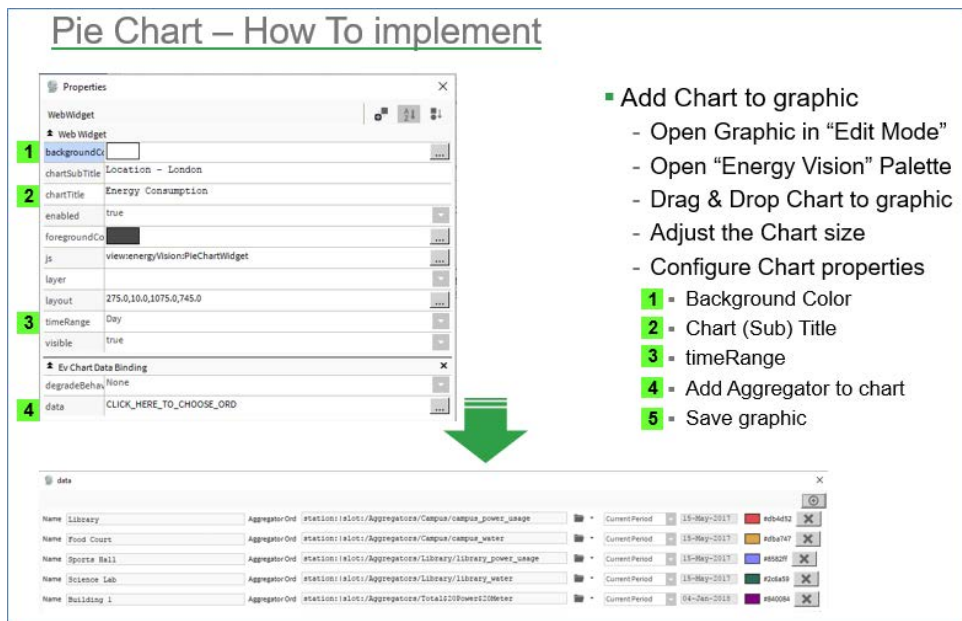
Fig. 30 Pie Chart Implementation Process

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.

Properties

The Stacked Bar Chart data configuration is slightly different. The Stacked Bar Chart has 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.
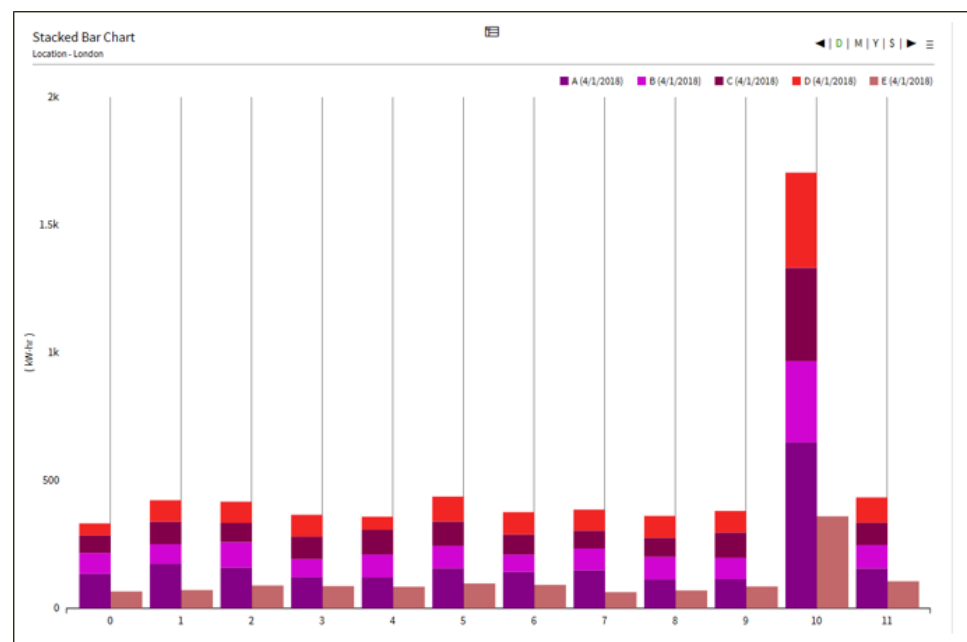
Fig. 31 Example Stacked Bar Chart
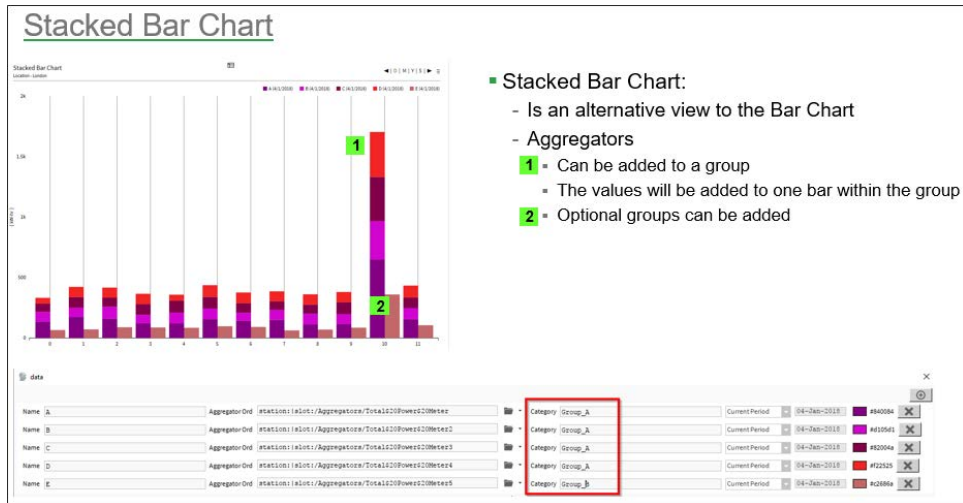
Fig. 32 Stacked Bar Chart Information
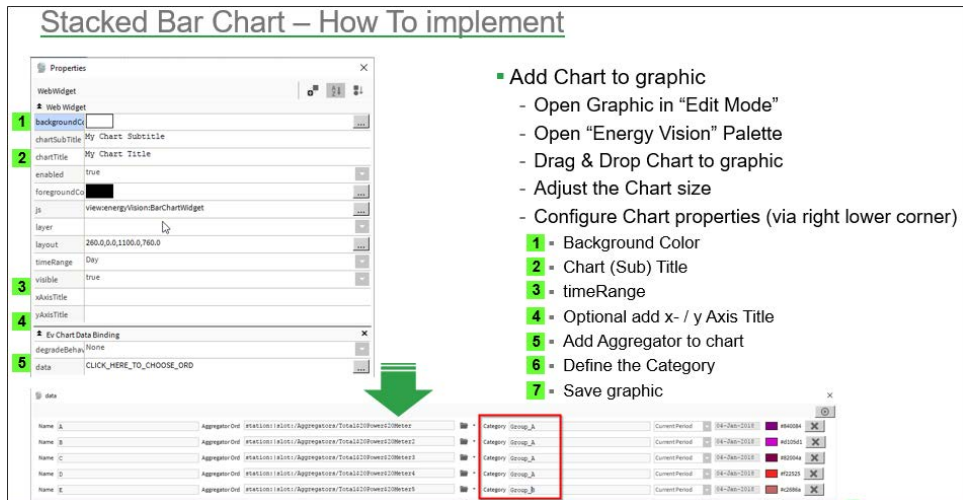
Fig. 33 Stacked Bar Chart Implementation Process

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 values. 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.
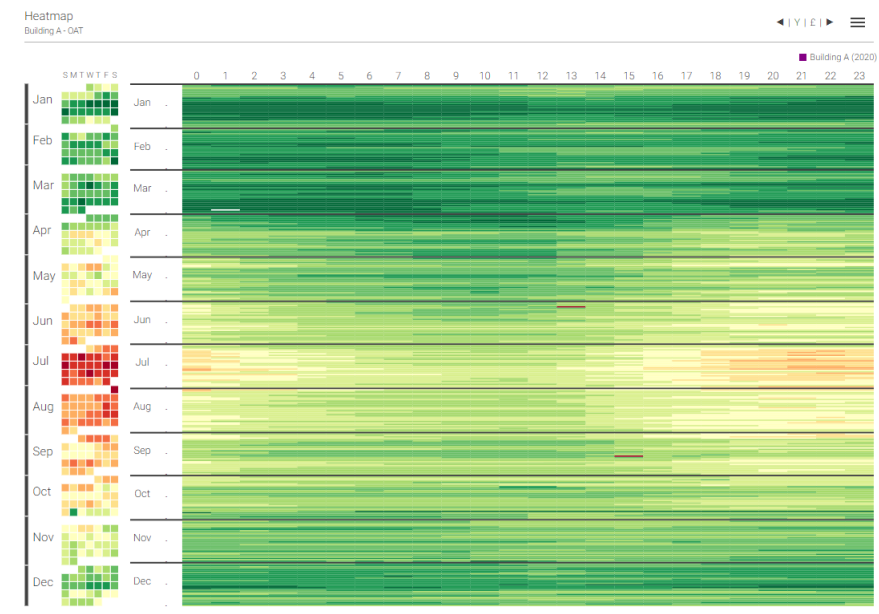
Fig. 34 Example Heat Map
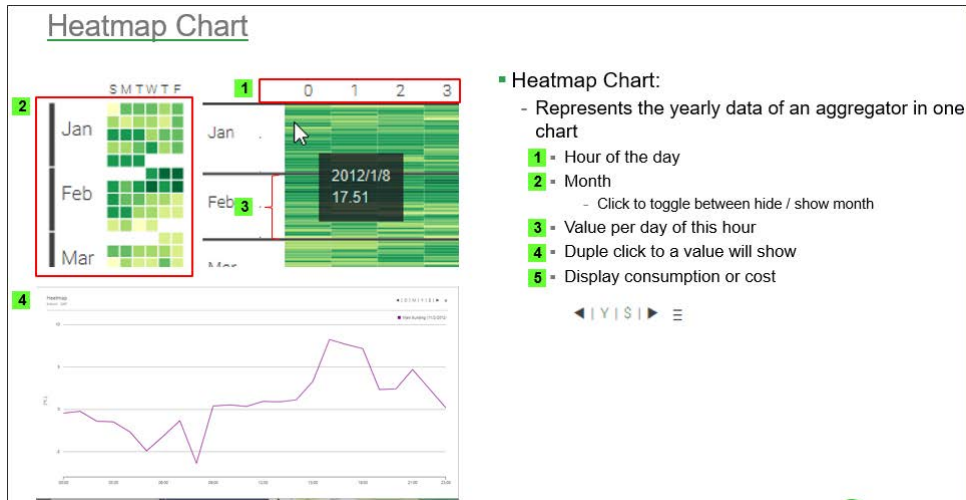
Fig. 35 Heatmap Chart Properties
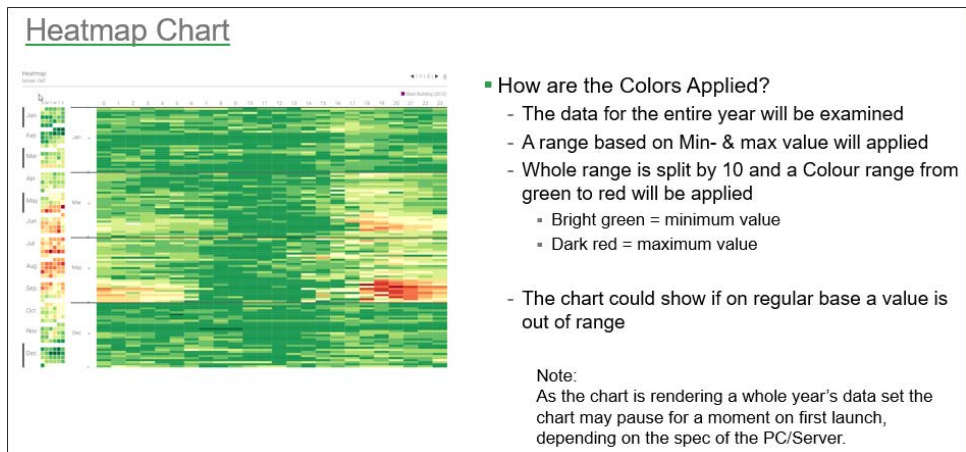
Fig. 36 Heatmap Chart Information
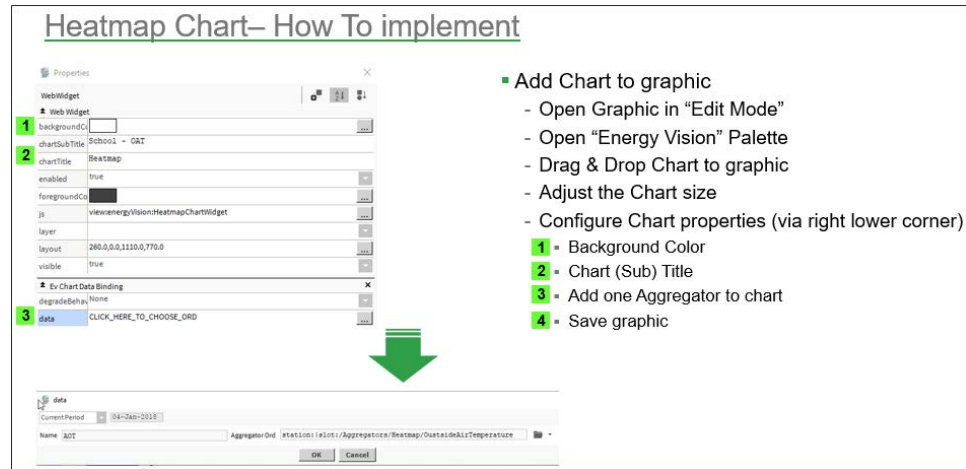
Fig. 37 Heatmap Chart Implementation Process

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.

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.
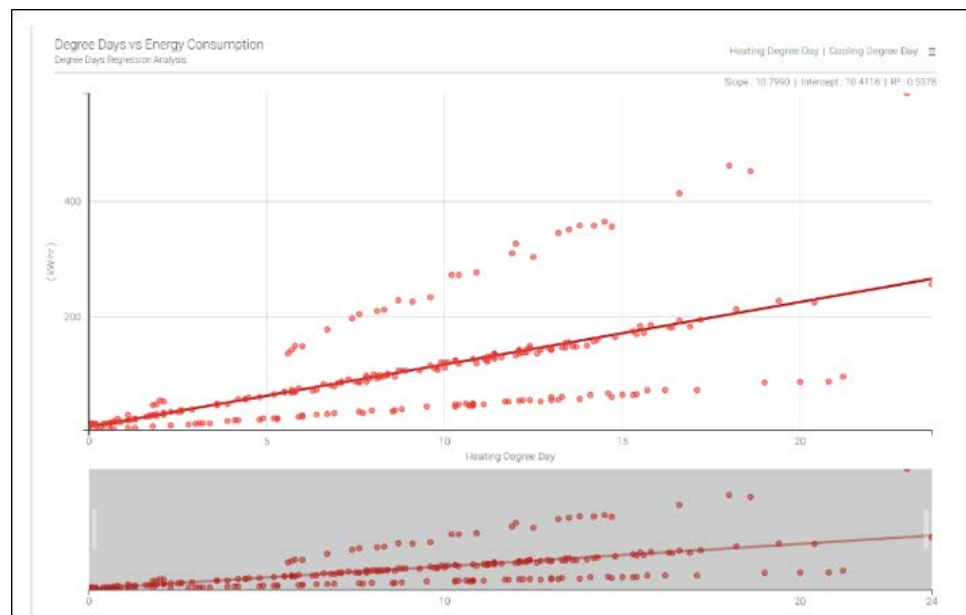
Fig. 38 Example Degree Day Regression Chart
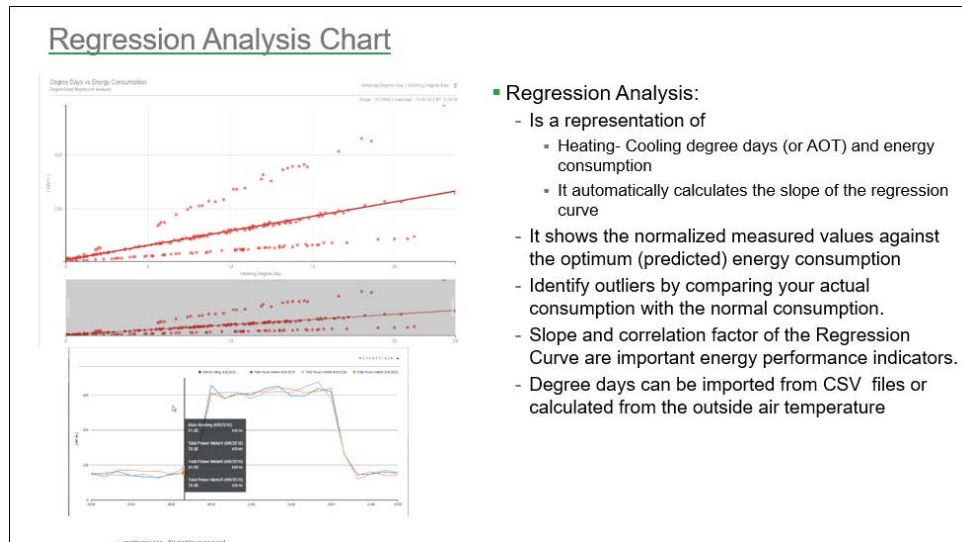
Fig. 39 Regression Chart Information

The Degree Day Regression chart has three steps to engineer:

1. **Degree Days Aggregators** must be created in the station – these differ from standard Aggregators.

2. The **Degree Day Regression** component must be added to a station. This is where the Aggregators are configured.

3. The **Degree Day Regression Chart** needs to be added to a PX Page. When the data property is configured, the **Degree Day Regression** component will be used as the data ORD.

The diagram below represents the data flow that allows the Degree Days Regression Component to calculate and then be used in the Degree Day Regression Chart.
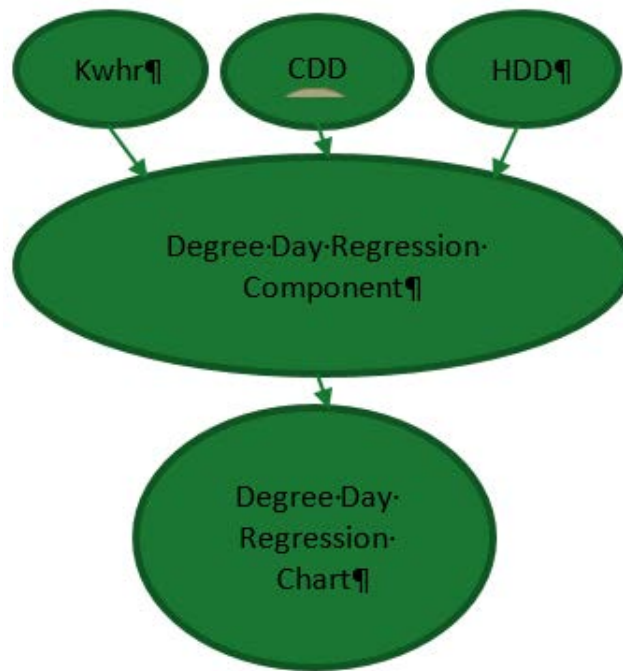
Fig. 40 Degree Day Regression Data Flow

Degree Day Aggregator

The Degree Day Aggregator inputs outside air temperature (OAT) and the baseline temperature of the building and outputs the Degree Days calculation.

Note: *The Degree Day Aggregator needs to be bound to an OAT (Outside Air Temperature).*

Note: ***What is the baseline temperature of the building?***
For heating degree days (HDD), the base temperature of a building is the outside air temperature below which that building needs heating. Cooling degree days (CDD) are the opposite, so the base temperature of a building is the outside air temperature above which the building needs cooling.
For example, a building manager may want to only turn on the AC when the outside temperature goes above 20 degrees, whereas they may want to turn on the heating when the outside temperature is only 15.5 degrees. So, in this example, the CDD base temperature would be 20 degrees, and the HDD would be 15.5 degrees.
This is a simplified explanation for the base temperature, calculating this can be quite complicated. It takes into factors such as the thermal properties of the building, heating schedules, solar heat gain, etc.
The table below gives a commonly used range of values for HDD base temperatures based on building type.

Building Standard	HDD Base Temperature
Existing Building	15.0 °C
Low-Energy Houses	12.0 °C
Passive Houses	10.0 °C

Property Sheet of the Degree Day Aggregator

Fig. 41 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.

Note: To calculate the Cooling Degree Days value the Degree Day Aggregator uses the following formula:

For each hour of the day, ((average temperature for the hour – base temperature) ÷ 24)

(The hourly value is only added to the total for the if the average temperature for the hour is above the threshold temperature).

Note: To calculate the Heating Degree Days value the Degree Day Aggregator uses the following formula:

For each hour of the day, ((base temperature – average temperature for the hour) ÷ 24)

(The hourly value is only added to the total for the if the average temperature for the hour is above the threshold temperature).

How to Engineer the Degree Day Aggregator Component

Step 1. Drag and drop the Degree Day Component from the Palette into the wiresheet on which the chart will be displayed.

Step 2. Double-click on the component.

Step 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**.

Step 4. Enter the **Base Temperature** for the building.

Step 5. Ensure the correct **Degree Day Type** has been selected.

Degree Day Regression Component

The Degree Day Regression component is used to feed data to the Regression Chart. It combines heating and cooling degree day data, energy consumption data and defines the period that will be shown on the chart.

How to Engineer Degree Day Regression Component

Step 1.   Drag & drop the component in the page folder.

Step 2.   Double click on the component to open the property sheet.

Step 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**.

Step 4.   Using the drop-down menu, select the **Time Range**.

Step 5.   Click **Save**.

Step 6.   Open the Px Page the **Degree Day Regression Chart** will appear on.

Step 7.   Select **Edit Mode**.

Step 8.   Drag & Drop the **Degree Day Regression Chart** onto the **Px Page**.

Step 9.   Double Click on the chart.

Fig. 42 Degree Day Property Sheet

    a. **Heating Degree Day** – A link to the Aggregator for Heating Degree Day.

    b. **Cooling Degree Day** – A link to the Aggregator for Cooling Degree Day.

c. **Energy** – A link to the Aggregator for energy consumption.

d. **Time Range** – Use this setting to define the range of time.

Note: *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.*

How to Engineer the Degree Day Regression Chart

Note: *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.*

Properties

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

Energy Temeprature Curve (ET CURVE)

ET Analysis helps determine how the energy consumption of a site varies with temperature. For a given time period, the kWh/m2 of a site and temperature can be superimposed onto a graph showing the ideal consumption for the period. It is used to identify energy consumption anomalies and outliers. For example, using less energy on a cold or warm day.

The user can set up for a given temperature range to show what their expectation of usage. The chart below represents outliers which fall out of the area defined by the dotted lines below.
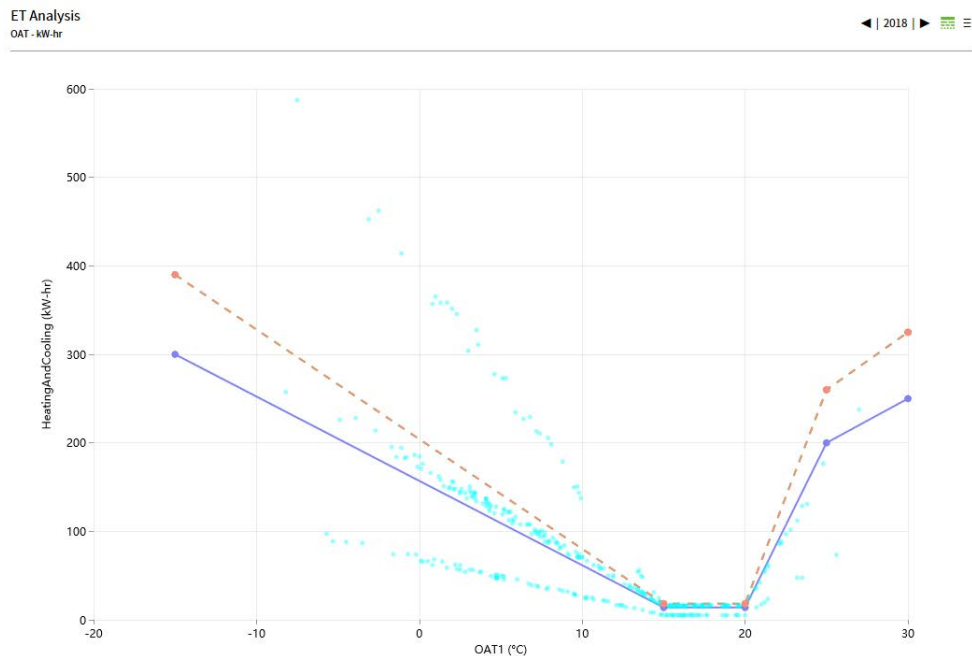
Fig. 43 Example ET Curve Chart

Adding an ET Curve Chart

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

Fig. 44 Example CT Curve Component Property Sheet

Note: *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.
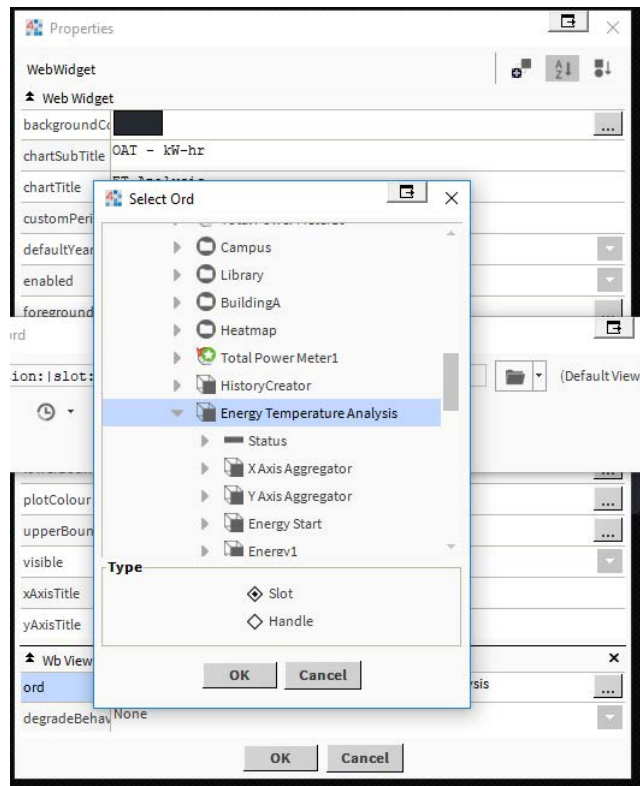
Fig. 45 Example of Binding to an ET Component

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

Estate View

Estate View provides a comprehensive analysis of data based on quadrant segmentation by employing different normalization techniques such as cost, area, or a combination of both on the aggregator output values. For example, user can compare the energy consumption of a set of similar aggregators against their associated costs. By plotting kWh/m2 on the x-axis and cost on the y-axis, user can visually analyse outliers that consume more energy and incur higher costs.

Aggregator & Site Setup

- Establish Site-Aggregator Relationship: Ensure each aggregator is linked to an appropriate site using the 'hs:siteRef' relation (see Grouping of aggregators)
- Tagging: Tag sites and aggregators with appropriate tags for better organization and filtering.

A simple configuration would be to have 1 site component which has "hs:siteRef" inbound relations from all aggregators of interest.

Note: *Tag Manager View Can be used to effectively tag Multiple Components at Once. Right click on a component, Views > Tag Manager, Select All the components you want to tag with same tag. Drag and drop in the Tag Manager. And you can Add and delete tags for Multiple Components at once.*

Widget Configuration

Drag and Drop the Estate View to the canvas from the palette once the aggregators have been configured.
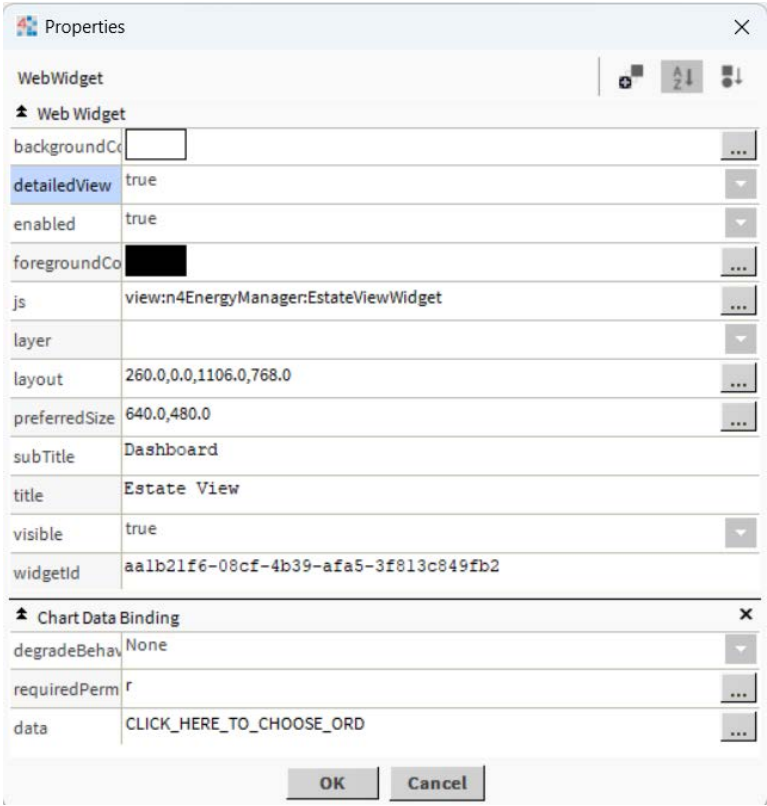
Fig. 46 Widget Properties (Estate View)

Fig. 47 Data Config

1. Select Data Query:

- Filtering Sites:
    - In the 'Site Query' field, input your query to filter sites based on tags. Example: Filter sites based on tags like "hs:geoCountry" (e.g., Scotland, England).

- • Filtering Aggregators:
    - Use the 'Aggregator Query' field to filter aggregators related to the resulting sites using aggregator tags. Example: Filter aggregators related to resulting sites based on tags such as "hs:cooling" or "hs:heating".

In the simple configuration of one site and multiple aggregators related to it, the 'Site query' can be "n:name = <name_of_site>" and the 'Aggregator Query' can be "n:type = n4EnergyManager:MeterAggregator".

2. Choose Data Normalization for Axes:

To display data on both the X and Y axes of the Scatter plot, select the suitable

normalization options.

By default, the "Out (Raw Aggregator Values)" option is checked. Here, the raw aggregator values are displayed on the axes without any normalization.

- Normalize by Cost: Selecting this option will normalize the data based on cost. The cost is calculated by aggregating values multiplied by the tariff at 15-minute intervals.

- Normalize by Area: Selecting this option will normalize the data by dividing the values by the site area associated with the aggregator.
- Normalize by Both (Cost/Area): In addition, you can normalise by both by ticking both where the normalized value is calculated by dividing the cost by the area.

3. Label Axes:

Input appropriate labels for the X-axis and Y-axis to reflect the data being visualized.

4. Quadrant Analysis Setup:

- To overlay quadrants on the plot, enter the intersection points for each time Period (Day, Week, Month, Year) in the 'X Intersection' and 'Y Intersection' fields.
- Provide a name for the quadrants in the 'Enter name for the quadrants' field (e.g., Quad, zone).

5. Customize Quadrant Colours:

• Choose colours for each of the four quadrants. It's recommended to use 15%

transparency to ensure underlying data is visible.

Views

The Estate View widget offers two viewing options: Detailed View and Simplified View.

Detailed View:

The Detailed View provides comprehensive data analysis capabilities, featuring both a scatterplot and a table. Each dot you see on the scatterplot and each row you find in the table stands for an Aggregator. And for each entry in the table, there's a dot on the scatterplot that matches up.
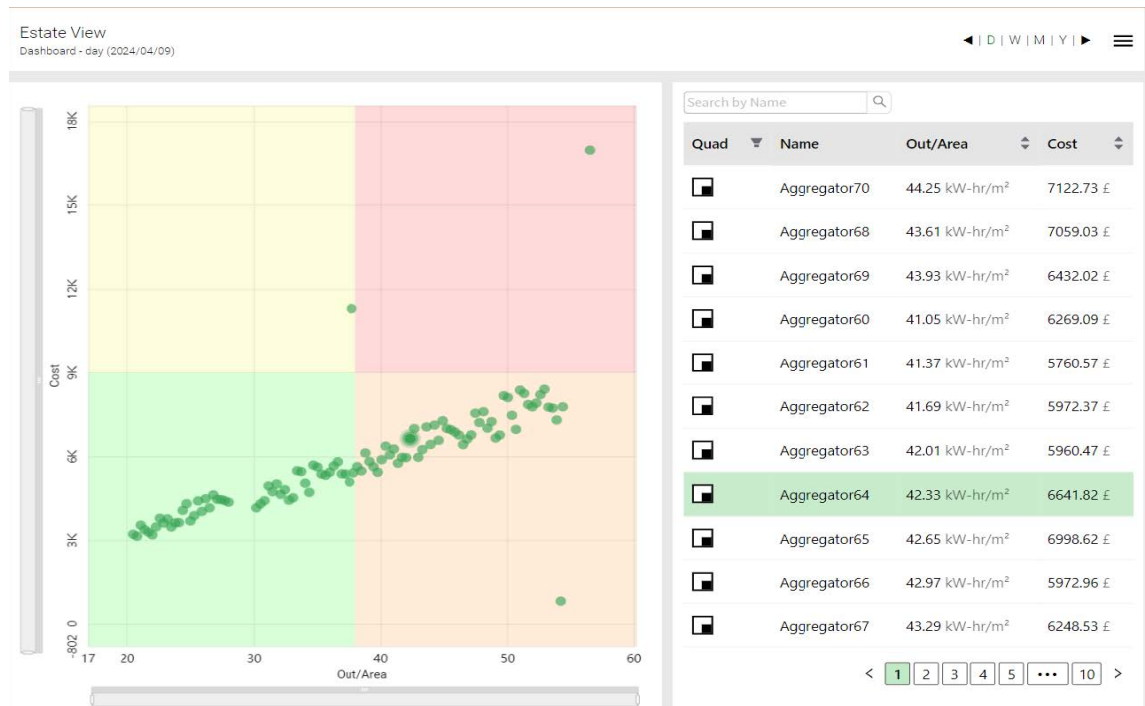
Fig. 48 Detailed View

- Sorting: Easily sort data by X and Y values in the table.
- Filtering: Filter data by quadrant for focused analysis.
- Search: Find specific data using the search bar at the top of the table.
- Interactive Highlighting: Clicking a table row highlights the corresponding dot on the scatterplot.

Fig. 49 Detailed View Features

Simplified View:

It contains only Scatterplot for simpler data analysis.
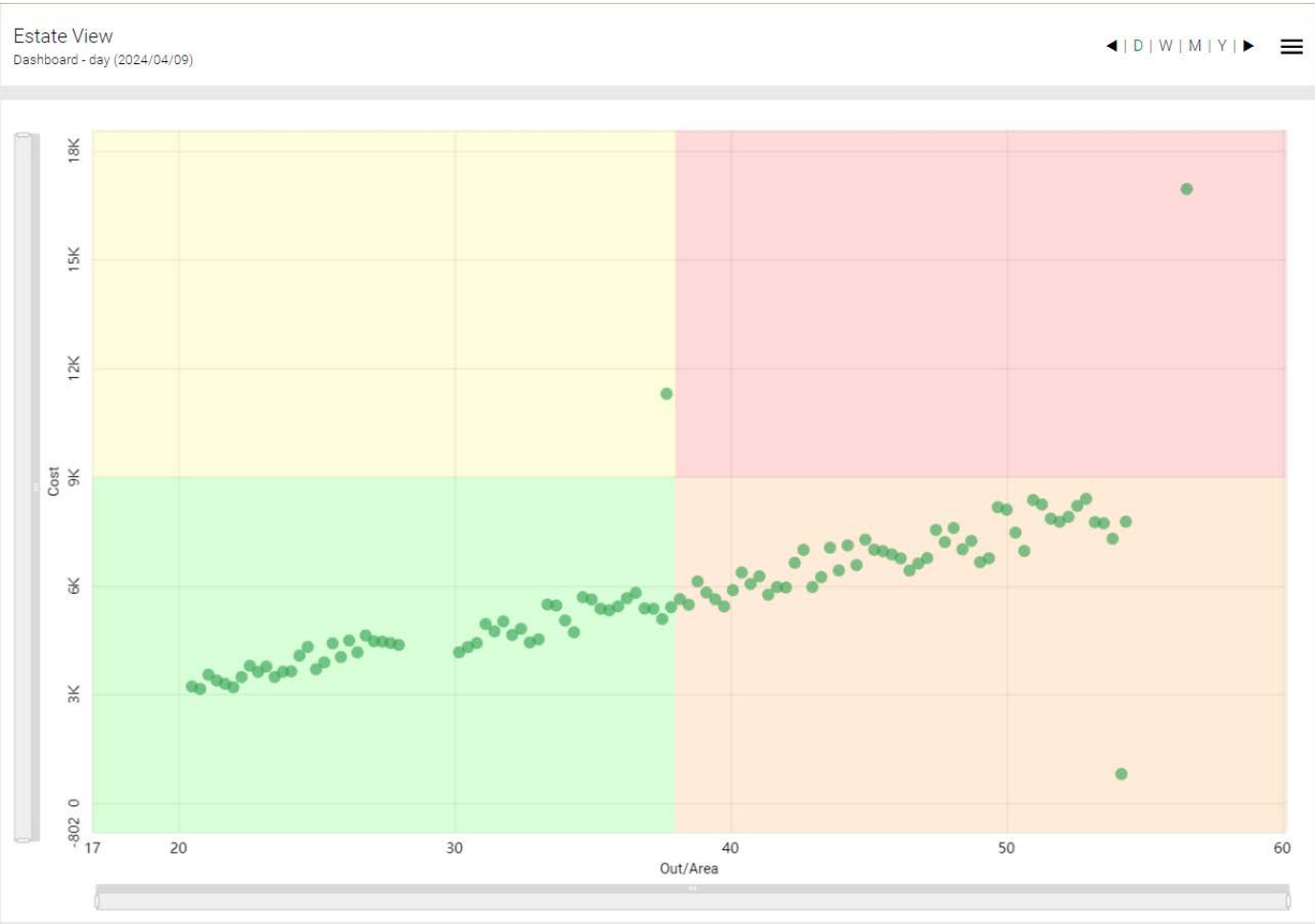
Fig. 50 Simplified View

Shared Features (Both Views):
- Each datapoint on the scatterplot represents an Aggregator. Clicking a dot opens a popup with a line chart for the chosen time range of the corresponding aggregator (refer to the Figure 35).
- We can download the PDF Report and csv file of the data through the burger menu.
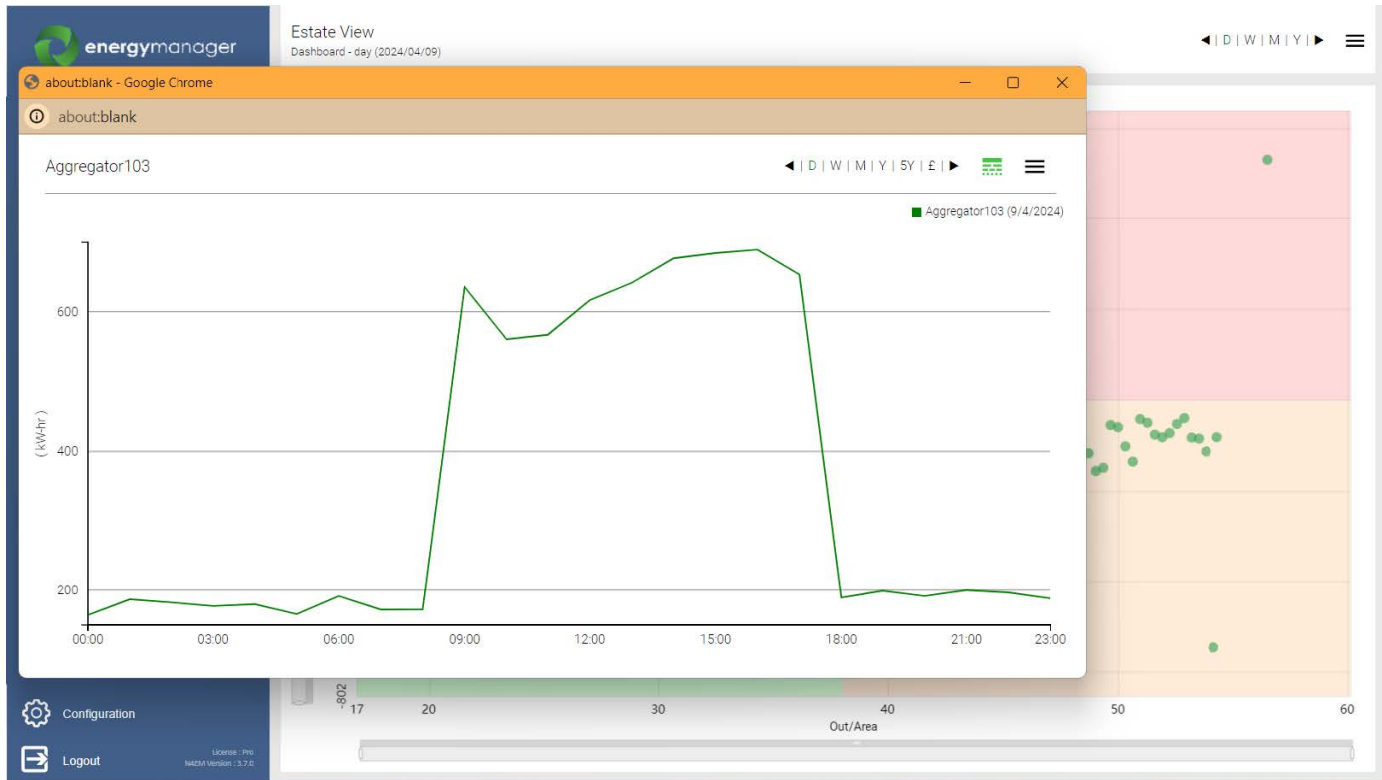
Fig. 51 Line Chart Popup from Data Point Click

Leaderboard Chart

The Leaderboard Chart is an enhanced version of the Ranking Chart. It shows value (Aggregator Output) as horizontal bars with corresponding names and an optional period and percent column. Users can customize the view by toggling the period column, sorting by value, searching by names, and navigating through paginated data.

Widget Configuration

Drag and Drop the Leaderboard Chart to the canvas from the palette.

Fig. 52 Widget Properties (Leaderboard Chart)

Users can control the visibility of the period column and percentage column by checking the respective inputs in the data binding.

Fig. 53 Data Config (Leaderboard Chart)

- NEQL Query: Users can write a NEQL query that resolves to a list of aggregators to be shown on the chart.
- Adding Individual Aggregator: Add each aggregator with its ORD by clicking the plus (+) button and specifying the period for each.
- Page Size: Users can change the page size to set the maximum number of entries shown on a single page.

View

Users can navigate to different time periods enable the cost mode.
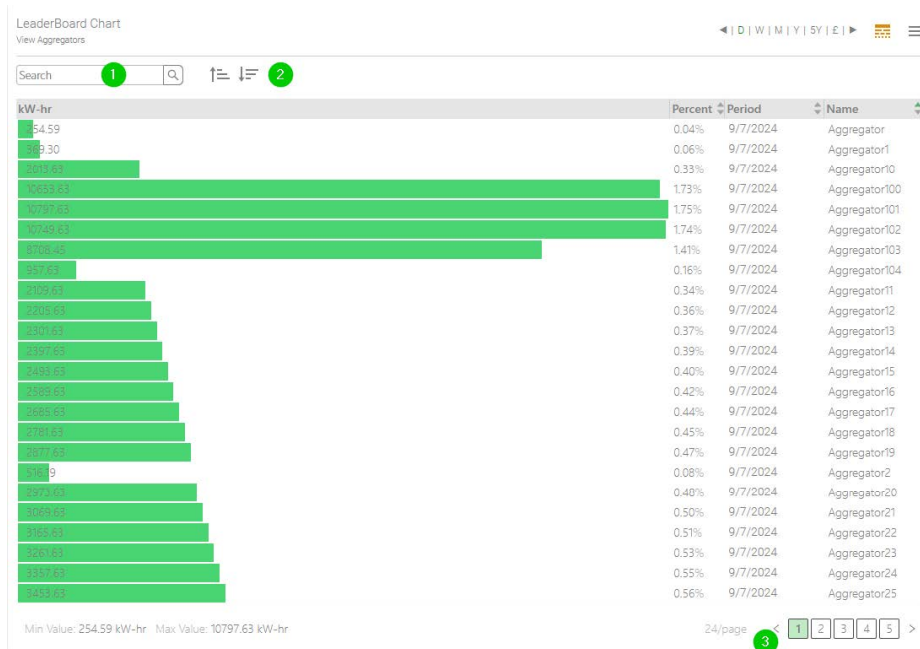
Fig. 54 **Leaderboard Chart View**

Features:

Search:
- Find specific aggregators by names quickly.

Sorting:
- Sort Aggregators by value in ascending or descending order.

Pagination:

- Handles large number of aggregators effectively by dividing them into pages.

- Users can choose the number of bars displayed per page.

Customizations:

Users can customize the chart view in the Data Config > settings.

Fig. 55 Leaderboard Chart Data Config Settings

They can change the page size, show/hide period and percent columns.
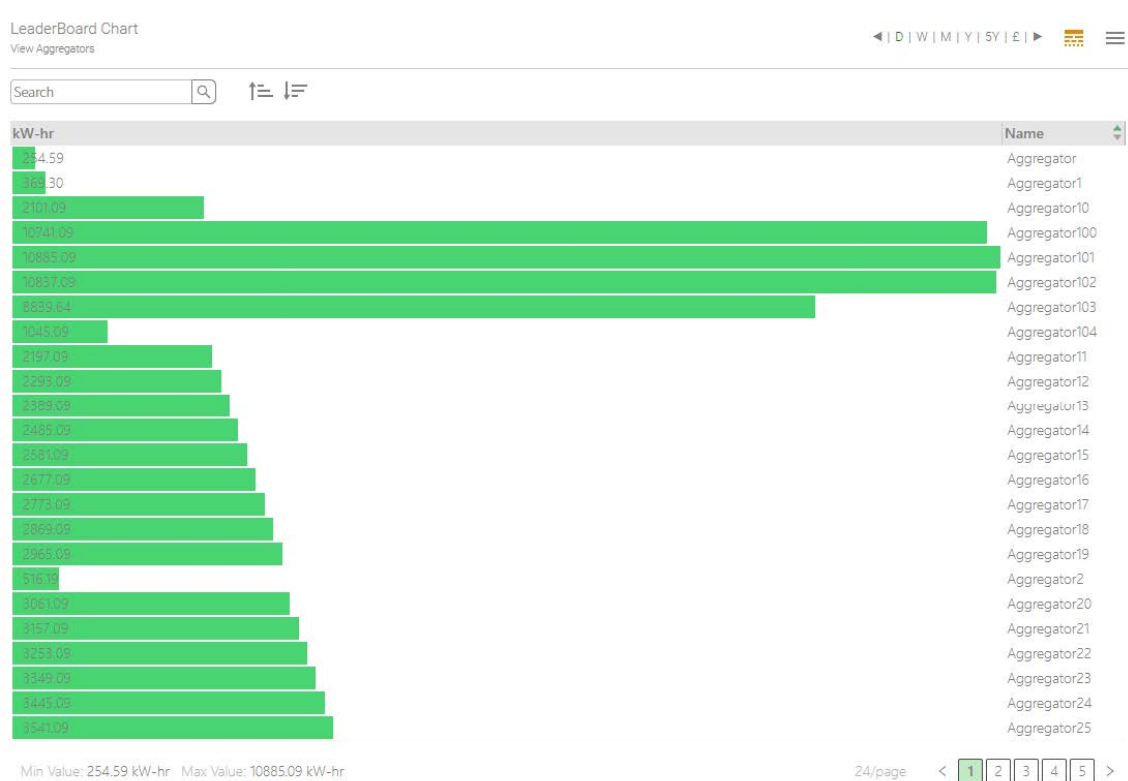
Fig. 56 Leaderboard Chart Simple View

Export Functionality

The Leaderboard chart provides various options to export both visual representations and raw data. These options ensure that you can share, present, and analyse the leaderboard chart data effectively. The available export options are PDF Export, PNG Export and CSV Data Export.
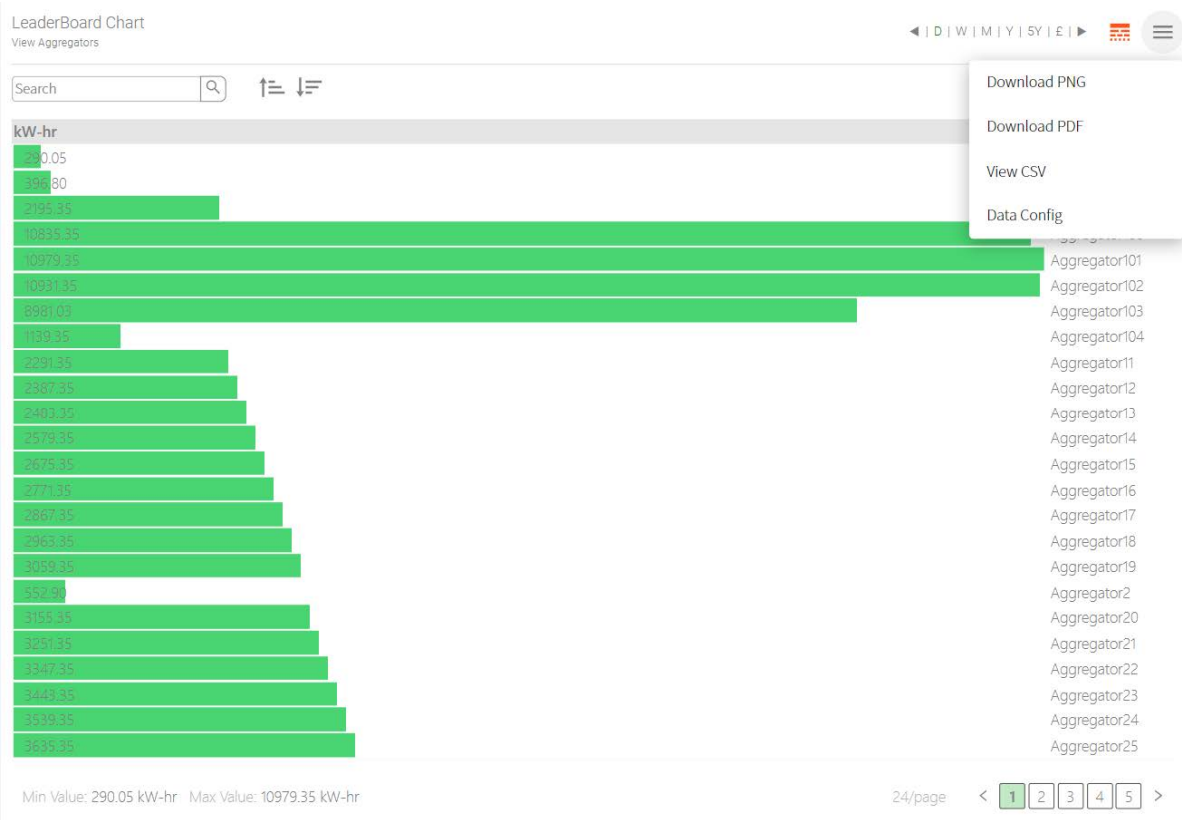
Fig. 57 Leaderboard Chart Menu

N4 ENERGY MANAGER BURGER MENU

The burger menu is intended to hide the functionality of the charts until required. It houses access to instant reports and data quality features. Any configurable option for the chart can be accessed through this menu. Settings made in the burger menu to the configuration of a chart can be saved using the save button in the date config menu. These changes are stored locally and used each time the charts are displayed.

Saving Data Config Locally

For Existing Charts

Saving of data config only works if the chart contains a property named widgetId, to add a property named widgetid to existing charts, a Niagara job must be run.

Steps for running a Niagara job:

Step 1. Go to Niagara workbench and click on **config** directory in the station.

Step 2. Then click on the **services** directory and select **N4 Energy Manager Service**.

Step 3. Right click on **N4 Energy Manager Service** and go to actions.

Step 4. In actions, click on the 'migrate px files'job.

Once the job is run successfully, the old charts can persist data config in the browser.
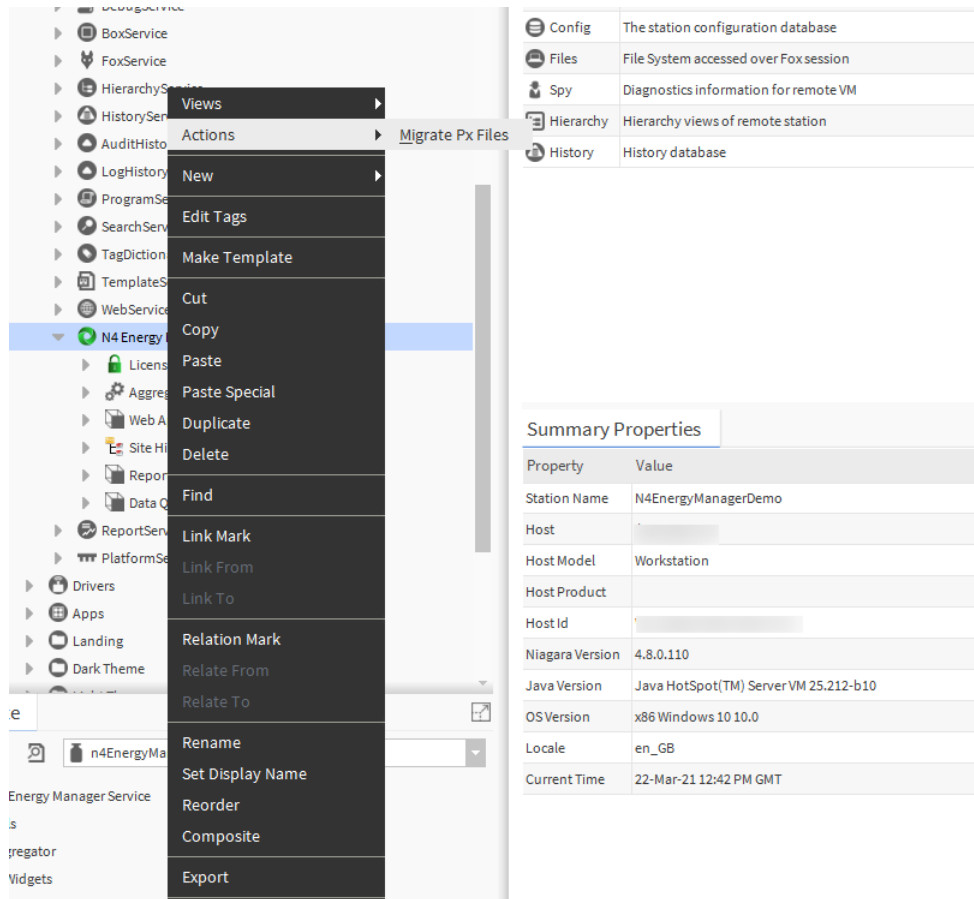
Fig. 1 Migrate PX Files Action Invocation

For New Charts

There is no need to run Niagara job when adding new charts from the palette.

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. Google Chrome must be installed on the machine to support this feature.
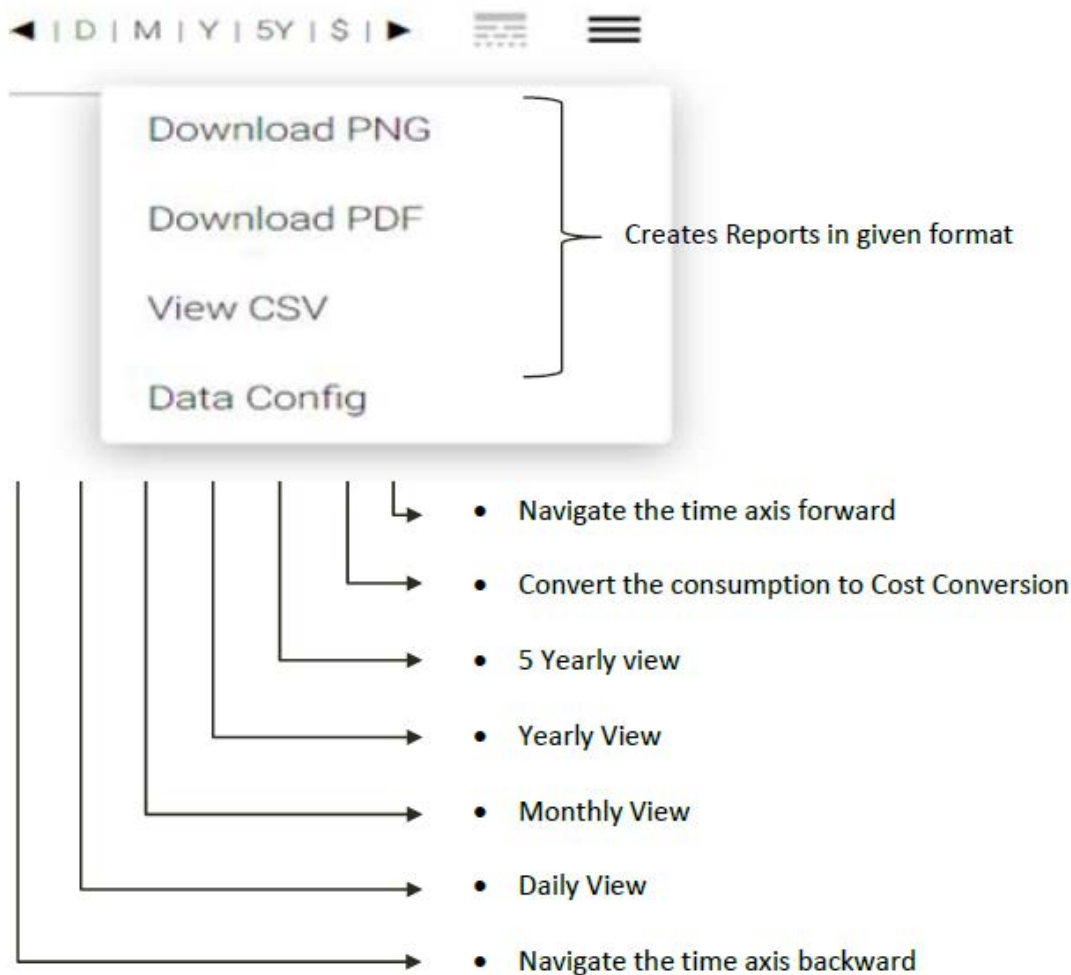
Fig. 2 Instant Reports

Daily/Weekly/Monthly/Yearly Profiles/5Y Profiles

The D|M|W|Y|5Y 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., 2nd January 2017), then the chart would compare data from the same day last year (2nd 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.

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

Note: *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.

Data Quality

Users can now view the integrity of the data displayed within charts via a 'Data Quality' icon placed at 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. Further details on this can be found in the main Data Quality section of the document.

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, 5 Yearly).

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.
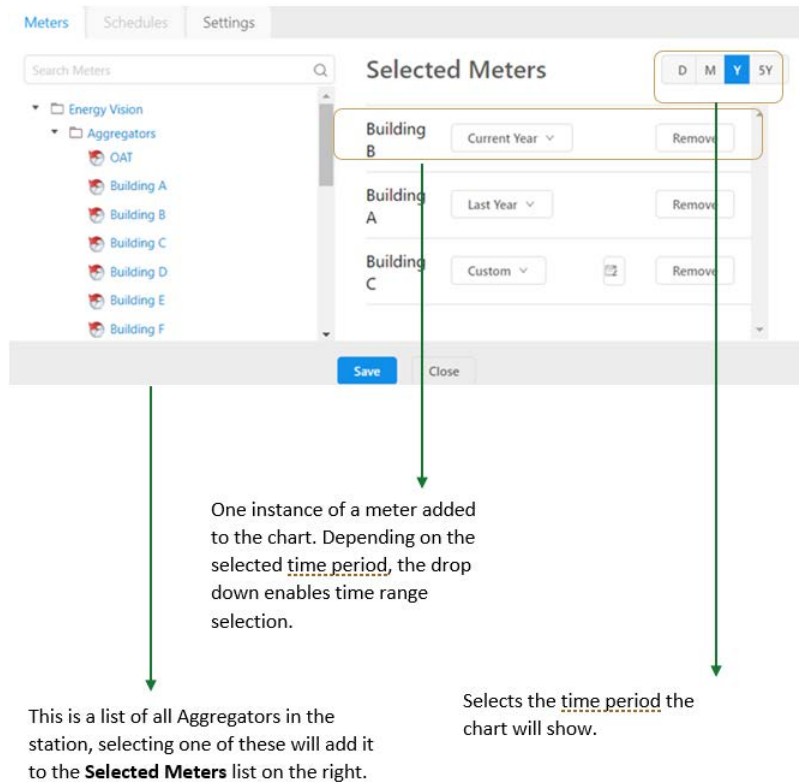
Fig. 3 Example Meter Configuration

Change Aggregator Display Name on Chart

Chart data legend display name is the selected data set target Aggregator name by default.
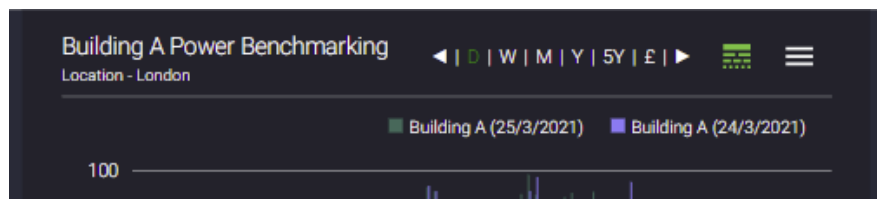
Fig. 4 Aggregator Name on Chart

Chart data legend display name on the charts can be changed through the chart Data config menu.

Rename chart data legend name:

- Open data config menu.
- Click on the Icon beside the Aggregator name.
- Change the name in the input box.

- Click on the icon or press Enter button.
- Click **Save** button on the Data Config menu.
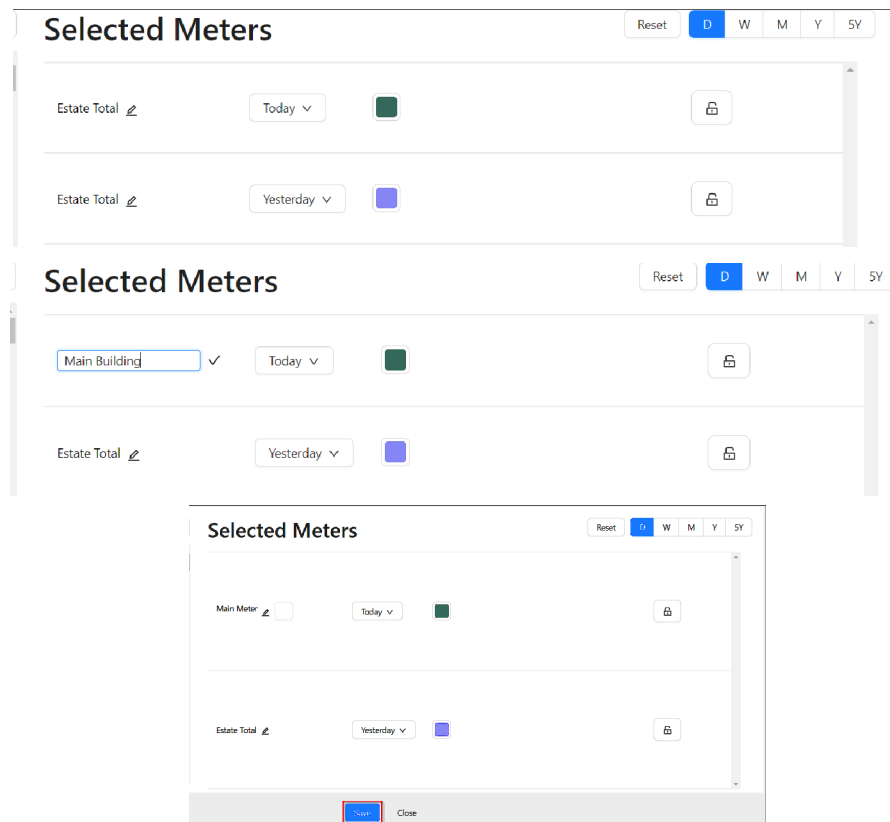
Fig. 5 Save Display Name

Note: *The Data Config menu Save option must be used to save the new display name to the data legend.*

On clicking the **reset** Button the data config reset to the defaults (Niagara data config).

The changed chart data legend name will be displayed on the chart legend.
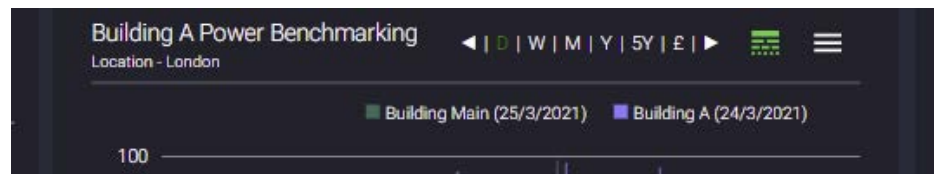
Fig. 6 Updated Chart Data Legend Name

Chart data legend name can be changed many times or Rest to the original name in the Data Config.

Reset data legend name:

- Open the Data Config menu.

- Click on the Reset button beside the Aggregator name or on the right top of the menu.
- Click the **Save** button on the data Config menu.
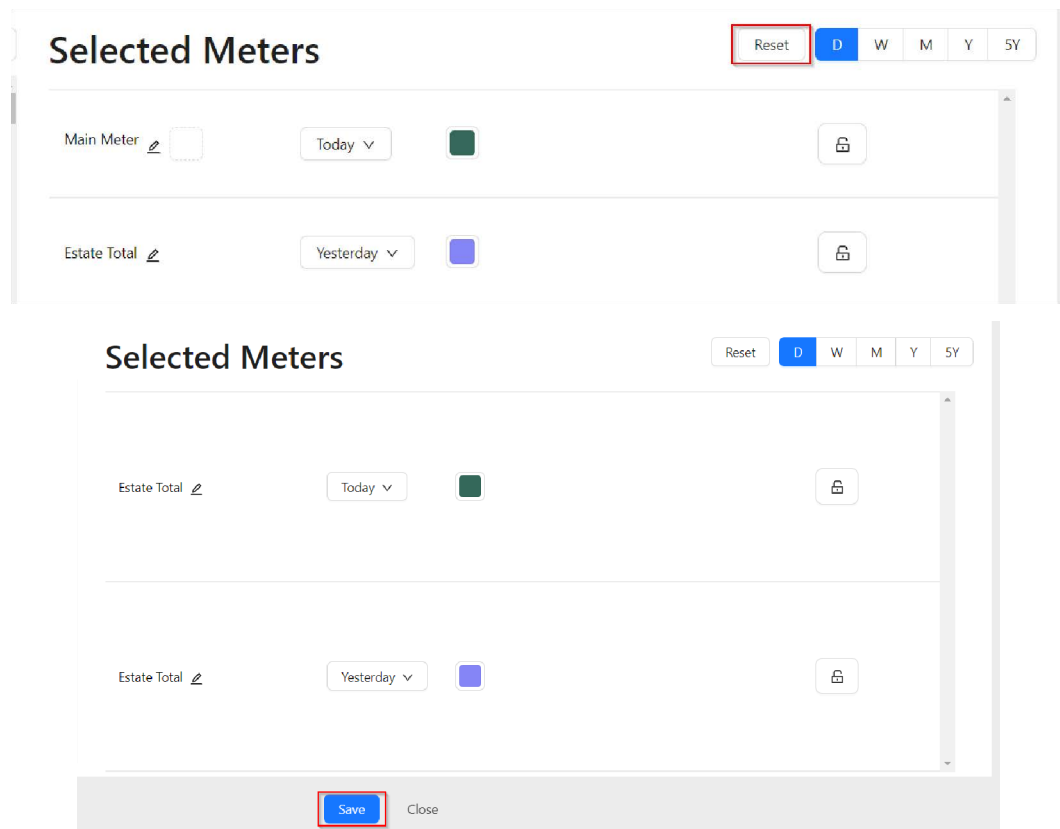
Fig. 7 Save the Updates

Original Aggregator name will be displayed on the data set legend name after reset.
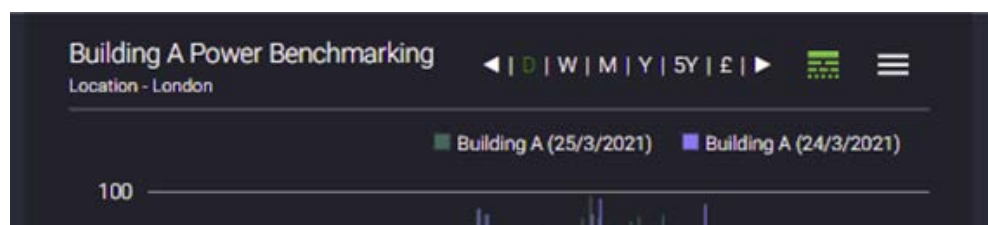
Fig. 8 Name Updated

Save User Preference in Browser

The data config allows users to change the behavior of the charts in a browser. This includes adding additional data points to a chart, changing the time span, updating the name of an aggregator, and chart-specific features such as enabling multiple y-axes on a line chart. The changes made by the user to a chart are stored locally in the browser cache. These changes remain available between browser refreshes and even when the user logs out and then logs back in. This means the charts are not reset when the page is refreshed or when navigating between pages. To revert the changes, use the reset button.

Fig. 9 Reset User Chart Preference.

Since the data is stored in the local browser cache, there are the following limitations:

- The changes are not available across different browsers and machines.

- Preferences are lost when the cache is cleared.

This will be addressed in a later version by syncing the changes to the station.

Lock Ideal Time Range

- Meters can have ideal time locked for a time range from the data config popup for the charts.

- As an engineer meters can be locked from the work bench and can have the default time locked for the ideal time period.

Steps to lock the ideal time range:

Step 1.   Click on the burger menu.

Step 2.   Lock the selected meter.

Step 3.   Save.
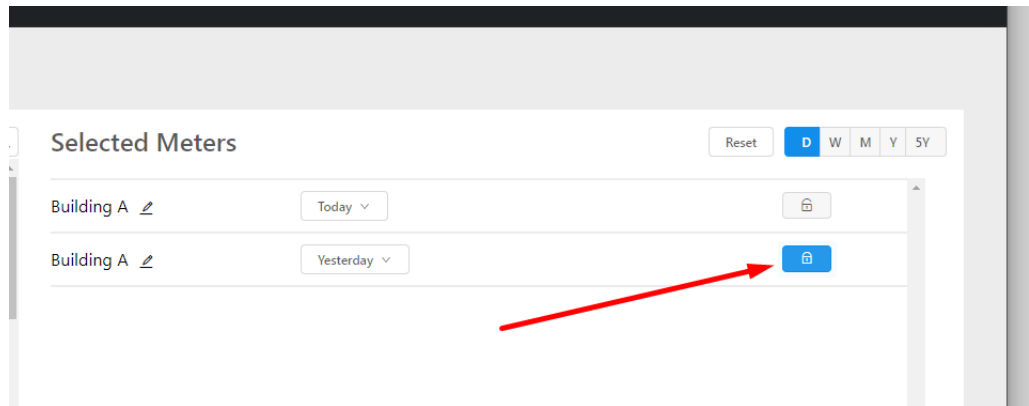
Fig. 10 Save Ideal Time Range

- Locking to default time range can also be achieved by clicking on lock icon on the meter in the data binding.

Steps to lock on the work bench as an engineer:

Step 1.   Choose a chart.

Step 2.   Toggle to edit the chart.

Step 3.   Double to have a menu option.

Step 4.   Choose Click here to choose ord.

Step 5.   And lock the required meter.
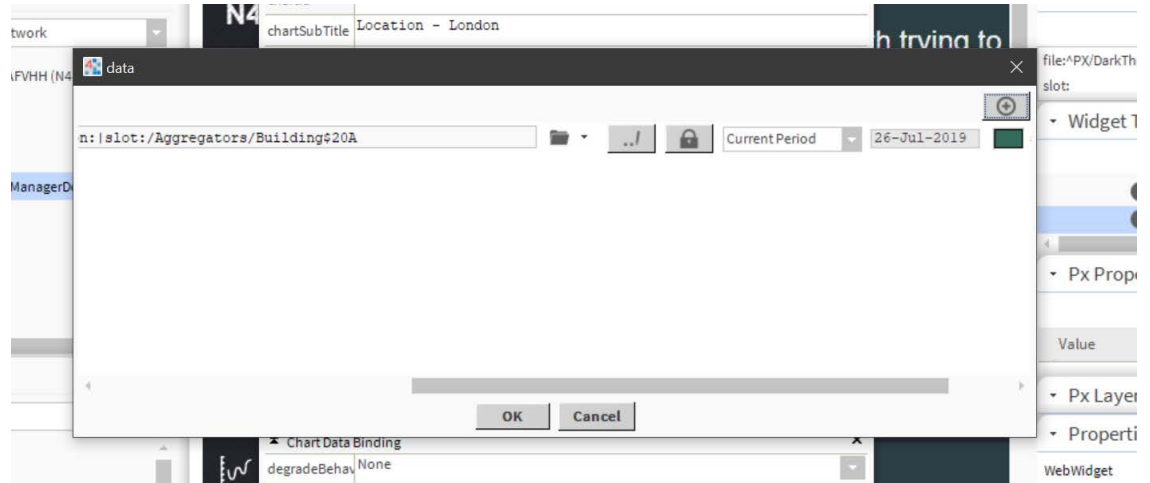
Fig. 11 Lock Required Meter

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Schedules (Special Add-on for Line Chart)

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.

Note: *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.

Show Symbols – If enabled, this will display circles corresponding to data points on top of lines. This is only available in line charts.

6 BATCH REPORTING

Batch Reports give a powerful way to generate customized 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. The default is disabled. The service needs to be **Enabled**.

    b. The 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.

Note: *If you are upgrading from a previous version of **N4 Energy Manager**, it is best practice to delete the **n4em** folder from within your Niagara install directory. This is to ensure the latest version of the packaged Chromium browser is available for PDF Report generation.*

Note: *The first time you use Batch Reporting in **N4 Energy Manager**, Workbench will likely require the certificate to be approved via the **Certificate Manager**. More information can be found in the FAQ section of this guide under **Accepting TLS Certificate**.*

Adding an Automated Report (Workbench Configuration)

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

- Check your license if the Batch reporting feature is enabled.
- Enable the Report option under Energy Manager Service.
- Add the Niagara Report Service into the services section from the Niagara report module.
- Create your recipients in Workbench from the Niagara report module.
- Create the report template name and recipient in Workbench.
- Design the report via Web Browser.
- Manual execution/Test of the report.

Step 1.   Create a new folder under the Station:

      a. Name something relevant (e.g., energyReport).

      b. Open the wiresheet of the folder.

Step 2.   Ensure the **N4 Energy Manager** Palette is open in the Palette window:

      a. Expand **Aggregator.**

Step 3.   Drag & Drop the **PDF Report Generator** onto the wiresheet of the **energyReport** folder:

      a. Give the component a name (e.g., energyReport).

Step 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. **.**

Step 5.   In the Palette window, open the report Palette:

      a. Expand **Reporting**.

      b. Drag & Drop the **FileRecepient** component onto the wiresheet.

      c. Link the out slot of the **energyReport** to the **route** slot of the **FileRecepient**.

      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 Wire Sheet shows the wiresheet of this configuration.

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

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

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

Note: *When using the report builder, the user is able to change the names of the selected aggregators using data config popup.*

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

Fig. 1 Automated Reporting Property Sheet
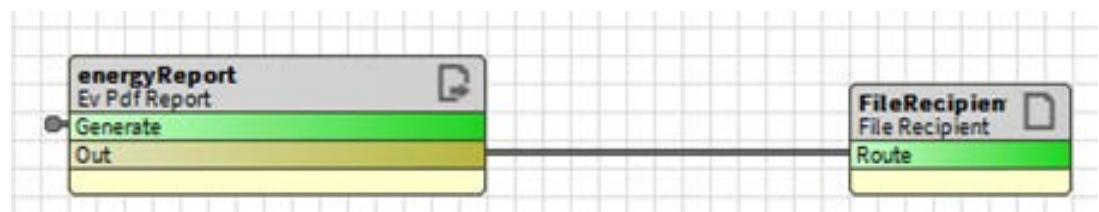
Fig. 2 Wire Sheet

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.

Step 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.

Step 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 below shows the layout of the report designer and how each section is referred to in the following guide.
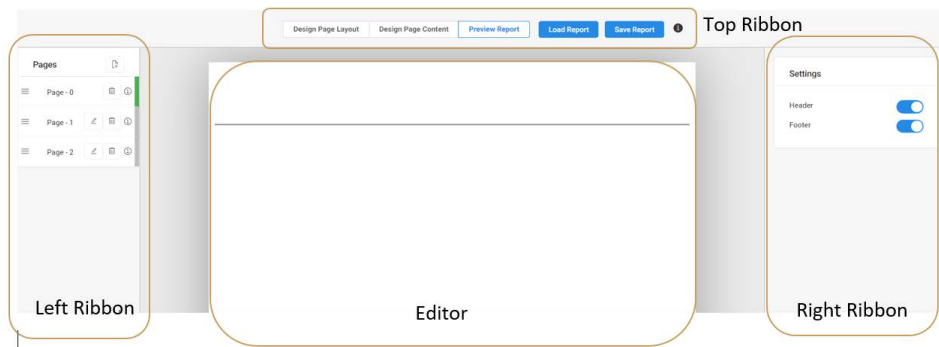
Fig. 3 Report Designer

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 below).
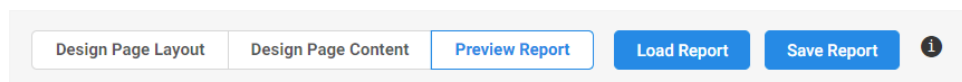
Fig. 4 Mode Selection

- **Design Page Content**
  - Allows the content of the page to resized and edited.
  - When this is selected the Add Widget option will appear.
- **Preview Page**
  - Allows the current page to be previewed as it would appear exported.
- **Discard Changes**
  - This will revert back the report to last saved state.
- **Save Report**
  - This will save the report.
- **Preview Report**
  - Allows the report to be previewed as it would appear exported.

Note: *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 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.
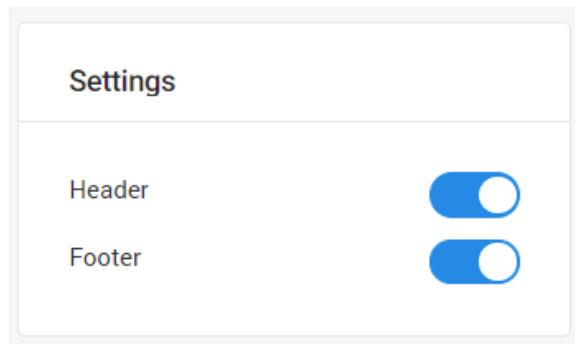
Fig. 5 Settings

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.
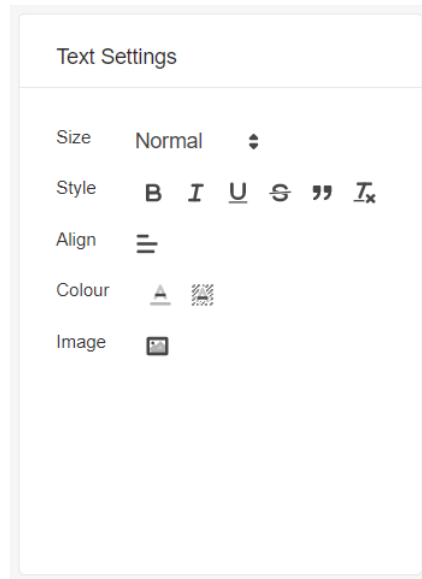
Fig. 6 Text Settings

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.
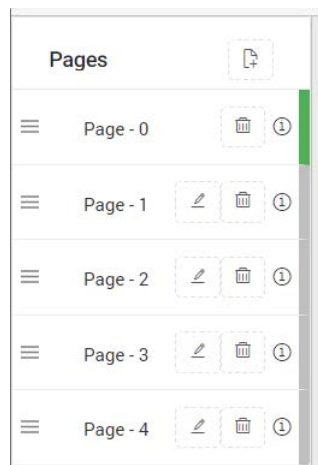
Fig. 7 Pages

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.

Note: *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.
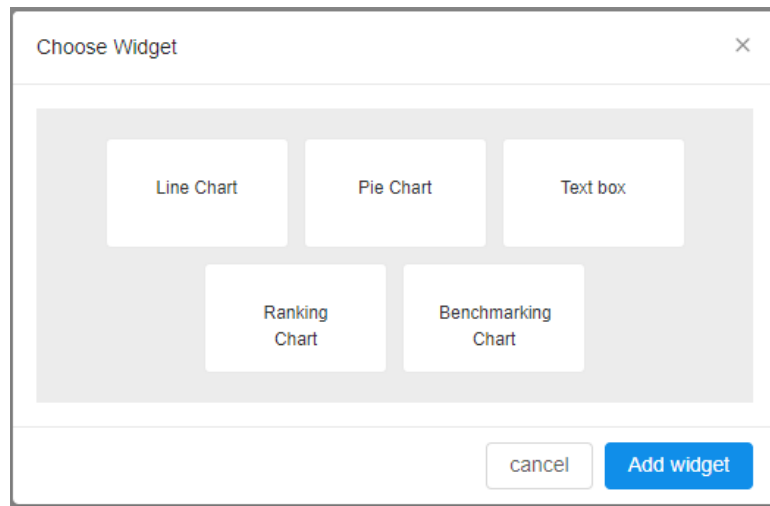
Fig. 8 Add Widget

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).

Note: *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.*

Bound Table Widget

It is used to display and format live values from the station within the report. The table is composed of: a title, description, and rows. Each row is composed of: a label, and a value. In design mode, the row also shows a format field.
Figure below is an example of a bound table, when viewed in **preview** mode.

Fig. 9 Bound Table in Preview Mode Once Data is Added

Figure below is an example of a bound table, when viewed in **design** mode.

Fig. 10 Bound Table in Design Mode Once Data is Added

To add a bound a table click add widget and select **"bound table"**. Once the bound table widget is added you will want to add some rows (bound labels).

To add a row:

To add a new row, click on + button at bottom at of widget.
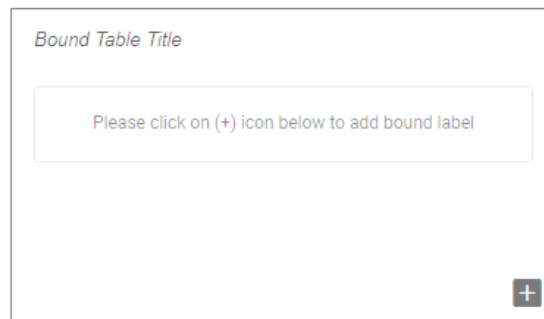
Fig. 11 Adding a Row in Design Mode

• Once clicked you can see a input box opened (see figure for reference).

• Enter the slot path into the input box and press **Enter** key to add or press **ESC** key to Cancel. For example:

Ex: station:|slot:/Aggregators/Building$20A/currentMonth
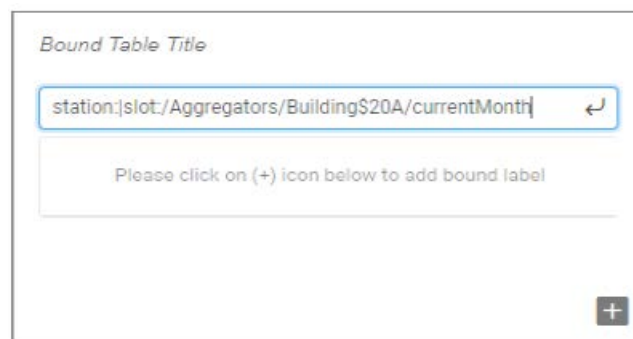
Fig. 12 Inputting The Slot Value to The Input Box

- Once Enter key is pressed then a row containing 3 columns is displayed. These are: the label, value and format. When hovering on the label then entire slot path is shown in a tooltip.
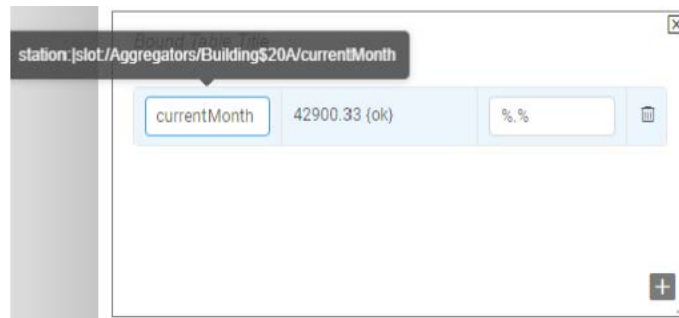
Fig. 13 Bound Label And Value in The Editor Mode

- The first cell is the label and is editable. It allows you to rename the property.

- The second cell is the value and is not editable. It will show the formatted value.

- The third cell is format and is editable. By default it is %.% which prints the value and the status, e.g. 42900.33 {ok}.

- To add another row click on + button again.

- In preview mode there will be only 2 columns: label and value.

Note: *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.*

Formatting the Bound Label Values

Niagara Formatters (see Niagara Help for full documentation) can be used to format the Bound values (see figure for examples).

Here are some example formatters:

- default: %.%

- units: **%value% %parent.units%**

- time: **%time()%**

- prefix and suffix: **Energy usage is %.% for bldg xxx.**

Fig. 14 – Bound Table in Content Edit Mode

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

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

Setting Title and Description

The title can be clicked and edited. The space between the title and table is a description free text field (**Error! Reference source not found.**).

Fig. 15 Description Text in Design View

In preview mode the format column is not present, and the value column is wider (**Error! Reference source not found.**).

Fig. 16 Bound Table in Preview Mode

Preview Modes

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

Viewing the Completed Report

Click on the button **Preview Report** to see the complete report in a new tab.

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.

Note: *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

Note: *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.*

N4 Energy Manager allows you to build your reports or tenant bills using template Excel spreadsheets built using Microsoft Excel. **N4 Energy Manager** will automatically create bills or reports from the templates and generate pdf documents for email or print. This feature can create bill or reports using a variety of time periods, including monthly, weekly or quarterly.

Pre-requisites

The reporting service for Niagara should be installed and activated before this feature is configured and used.

Tariff Schedule

A Tariff schedule can optionally be added to the aggregators to calculate and display the aggregator's corresponding usage in the cost view of charts for a specific time interval. It is an optional feature and does not need to be explicitly added. Where omitted, the cost calculation will fall back to the aggregator facet **costPerUnit** value if set.

Note: *The minimum interval that can be used is 15 minutes to calculate the cost. The 15 minute or higher minute intervals must be aligned to the hour or 15, 30, 45 minutes past the hour to be able to calculate the cost correctly.*

Tariff requirements:

*   The Tariff schedule must be a type of Numeric Schedule.
*   The Numeric Schedule default output value must be set to not null. on page 111
*   The default value will be used to calculate the cost if no daily schedule is set in the Weekly schedule.
*   If the **Numeric Schedule** is not set correctly, then the cost calculation will fall back to the default value as described above, and an error message will be displayed on the aggregator **Status Text property.**

- If the **Tariff Schedule** is not set at all, the cost calculation will fall back to default value automatically and message which will be displayed will not cause any functional error.

Setup Tariff schedule

Step 1.   Open the aggregator in the property sheet view in which the Tariff schedule needs to be added.

Step 2.   The **Tariff Schedule Ord** line will display **null**.

Step 3.   Click the drop-down icon next to the folder icon on the **Tariff Schedule** property.

Step 4.   Select **Component Chooser**. Using the pop-up, navigate through your station hierarchy selecting the appropriate **Numeric Scheduler**.

Step 5.   Once selected, click **OK**.

Step 6.   Save aggregator.

Step 7.   Open Schedule and click to the Properties Tab.

    a.   **Uncheck** – Default Output null check-box.

    b.   Set default value higher than zero.

Step 8.   Click on the **Special Events** tab.

    a.   Add as many special events as required.

    b.   Set priority for Special Events

       • If special event dates are overlapping, the priority order will be used to calculate the cost for a given time.

    c.   If it is required to add Special events in past time, the value of Cleanup Special Events property needs to be changed to 'False' on the Property Tab.

Step 9.   Click to **Weekly Schedule** tab:

    a.   The Default value should be applied as a base value.

    b.   Add as many time periods as required for Weekdays.

Step 10.   Save the scheduler.

Step 11.   Open any N4 Energy Manager chart on the station.

    a.   Click on the £ symbol to display calculate cost.

b. The scheduler corresponding period cost value will be applied to the chart data.

Fig. 1 Assign NumericSchedule for Aggregator

Fig. 2 Tariff Schedule Default Value Must be Not Null and Higher than Zero.

Weekly Schedule

In the Weekly schedule, the default value will be used from the default output. To calculate a specific cost at specific time/time range, a new Daily schedule needs to be added and cost value set on it. Any number of Daily schedules can be set with the restriction specified in the requirements.
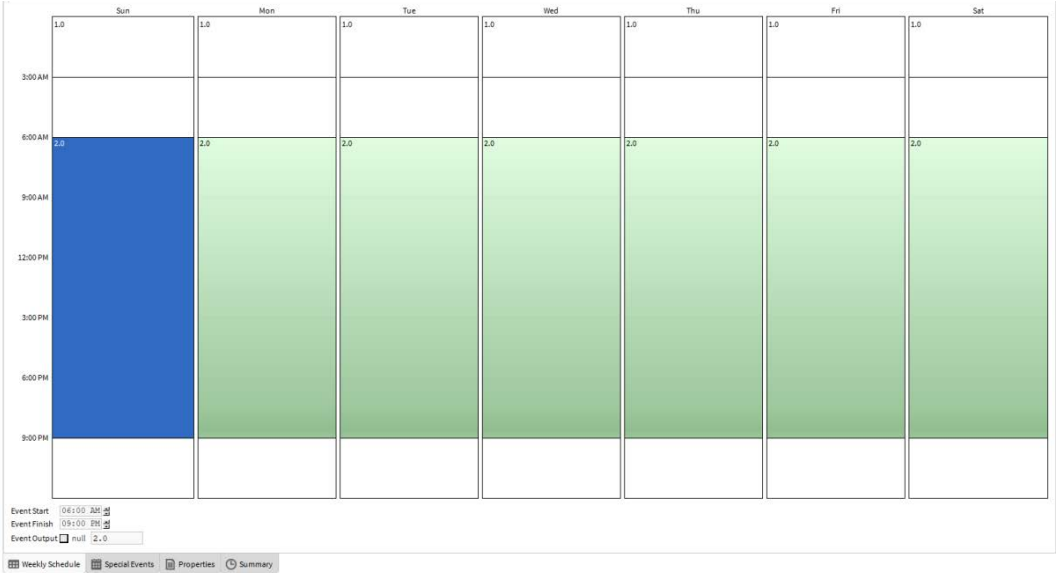
Fig. 3 Weekly/Daily schedule Cost Setup

Special events:

Special events will be prioritized and will overwrite the Daily schedule value(s).

There is a priority between the Special events that can be controlled by the scheduler itself.
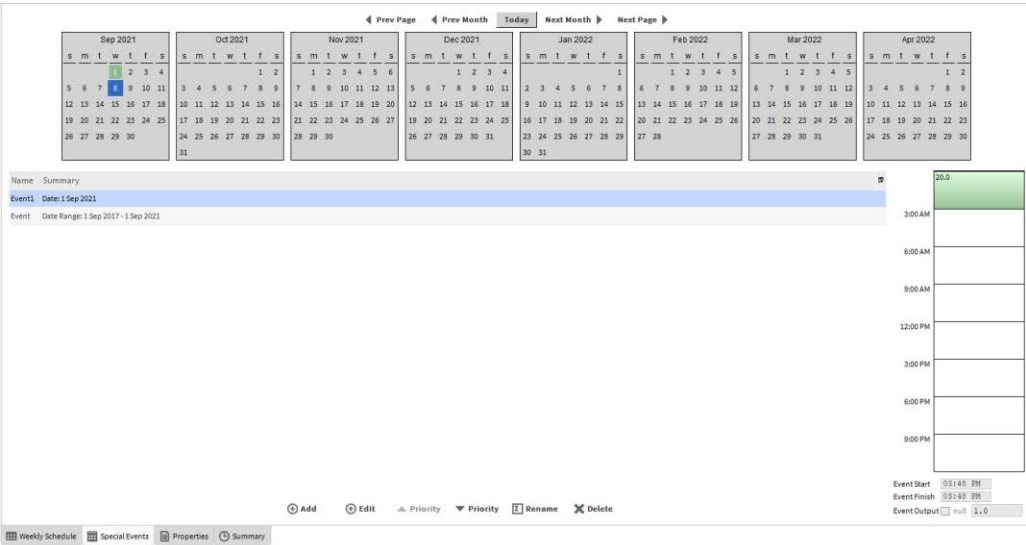
Fig. 4 Special Events
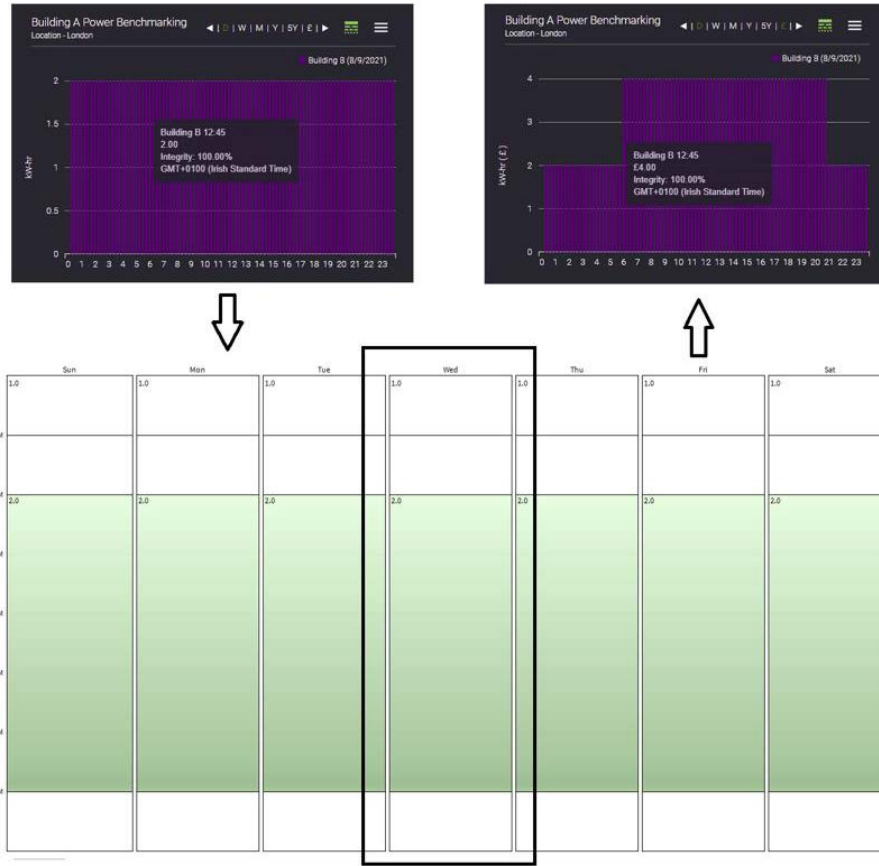
Fig. 5 Cost Value Applied to the Daily Chart View Period.

Note: *The tariff data and cost conversion calculation cannot be currently transferred to the Excel report.*

Workflow

Microsoft Excel is required to be installed on the PC to allow changes to be made to the templates.

Export all Aggregators

Step 1.   Navigate to **config** and create a new folder (called e.g. All_aggregators) and open the wire sheet.

Step 2.   From Palette, enter **N4 Energy Manager** expand **Utils** and add components **ExportAllAggregators** and **BExcelExport** to the wire sheet.

Step 3.   Navigate **config** > **files** and create a new folder for file recipient (e.g., ExcelReport).

Step 4.   Connect the components **ExportAllAggregators** and **BExcelExport** to a **File Recipient** as shown below.
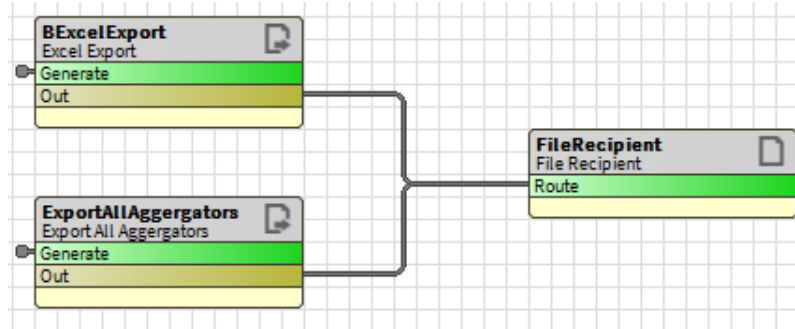
Fig. 6 Connect Components

Step 5.   Right click **ExportAll Aggregators** and select **Actions** > **Generate**.

Step 6.   Navigate **config** > **files** > **ExcelReport** (Excel report containing all aggregators with the station should be available under folder. The report should look like the figure below once open.

	AggregatorID	AggregatorName	Unit
1	AggregatorID	AggregatorName	Unit
2	slot:/Aggregators/Building$20B$20KPI$20Normalisation	Building B KPI Normalisation	1
3	slot:/Aggregators/Heating$20Degree$20Days	Heating Degree Days	
4	slot:/Testing/Relativised/Charts1/Test	Test	in²
5	slot:/Aggregators/Building$20F	Building F	
6	slot:/Testing/Relativised/Charts/Food$20Court	Food Court	K/s
7	slot:/Aggregators/Building$20G	Building G	
8	slot:/Aggregators/Building$20H	Building H	

Fig. 7 Example Export of All Aggregators in a Station

Report Template (s)

There are two options to use templates for Excel Reporting:

• Reuse and modify the default template coming with Energy Manager installation setup.

• Manual template creation.

Reuse and Modify the Default Template

Reusing an existing template can be achieved by locating the template in the templates folder of the release and copy it into the station. When a report is run, the template is used by the process to populate the data tab which drives the custom layout of the template itself.

Manual Template Creation

Step 1.   Create an excel template with sheet name **data** using the excel template that came with the release or create a new workbook with a tab named **data**.

Step 2.   Add aggregator Id's to the excel template (first column) starting from cell 'B1' as shown below and save it under share files.

	A	B	
B1		slot:/Aggregators/Building$20B$20KPI$20Normalisation	
1		slot:/Aggregators/Building$20B$20KPI$20Normalisation	
2	name	Building B KPI Normalisation	
3	unit	1	
4	count		2972
5	tz	Europe/London (+0/+1)	
6			
100	01/03/2020 00:00		0
101	01/03/2020 00:15		0.365032136
102	01/03/2020 00:30		0.286787927
103	01/03/2020 00:45		0.948991954
104	01/03/2020 01:00		0.122684613
105	01/03/2020 01:15		1.604724169
106	01/03/2020 01:30		0.338646531
107	01/03/2020 01:45		1.953859568
108	01/03/2020 02:00		0.520954788
109	01/03/2020 02:15		1.155905008
110	01/03/2020 02:30		0.099702001
111	01/03/2020 02:45		0.435257524
112	01/03/2020 03:00		0.11433012
113	01/03/2020 03:15		0.837152839
114	01/03/2020 03:30		1.171193361
115	01/03/2020 03:45		2.099998713
116	01/03/2020 04:00		0.938001096
117	01/03/2020 04:15		0.869348705
118	01/03/2020 04:30		1.220317602
119	01/03/2020 04:45		1.739819884
120	01/03/2020 05:00		0.723166585

data | Static | Inventory List | +

Fig. 8 Aggregator ID's
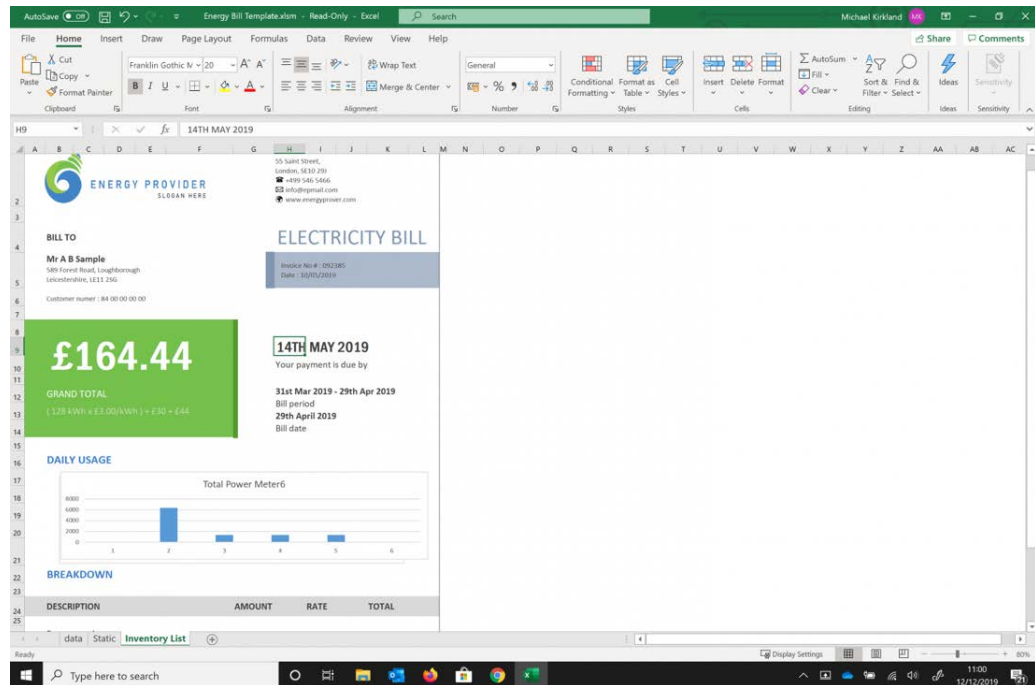
Fig. 9 Manual Template Created

Generate Report Using Template

Step 1.   Navigate **config** > select the folder containing **ExcelReport**.

Step 2.   Double click on component **BExcelExport**.

Step 3.   Import the excel template.

Step 4.   Select the period:

   a. **Week** – Will generate the previous week from the time of executing.

   b. **Fortnight** – Will generate the previous fortnight from time of executing.

   c. **Month** – Will generate for previous month from time of executing.

   d. **Quarter** – Will generate for the previous 3 months from time of executing.

   e. **Year** – Will generate for previous year.

Step 5.   Right click on the component and select **Actions** > **Generate**
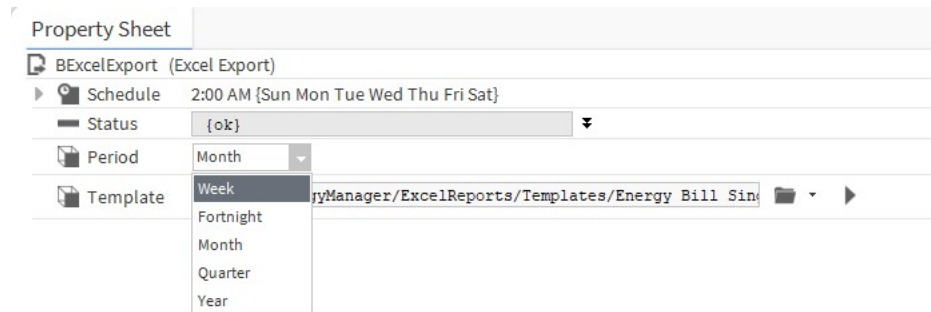
Fig. 10 Property Sheet Pane

Note: *Different versions of Excel may behave differently when refreshing the template data. A forced refresh of Excel formula may be needed to display the results.*

Excel reports can also be configured to append the date to the file name ensuring subsequent report runs do not overwrite previous versions. This can be achieved through the properties of the report component.

Fig. 11 Generating Excel Reports

Reports contain the following information,

Data Sheet:
1. **Header** (name, unit, count and time zone).
2. **Time zone** of the system which generated the report.
3. **Records** start from row 100, as row 0-99 is reserved for header values.
4. The data for a monthly time range.
5. For aggregators with a single accumulative meter, the first/last meter readings.

Tariff Sheet:
1. Time zone of the system which generated the report.
2. Record starts from row 100, as row 0-99 is reserved for header values.
3. The Tariff data for time range chosen. (If the tariff schedule is not set in the aggregator, the values in the column will fall back to the aggregator facet **costPerUnit**)

8 ENGINEERING N4 ENERGY MANAGER

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 To expose the Palette, follow these steps:

Step 1.   Click **Window** the top bar.

Step 2.   Select **Side Bars.**

Step 3.   Select **Palette.**

Now the Palette sidebar is opened, the **N4 Energy Manager** Palette can be accessed:

Step 1.   In the Palette window, click the **folder** icon.

Step 2.   The **Open Palette** window will now open.

Step 3.   In the filter search box, search **N4 Energy Manager.**

Step 4.   Select **N4 ENERGY MANAGER**, click **Ok.**

Step 5.   The N4 ENERGY MANAGER Palette will now be open in the Palette
window.
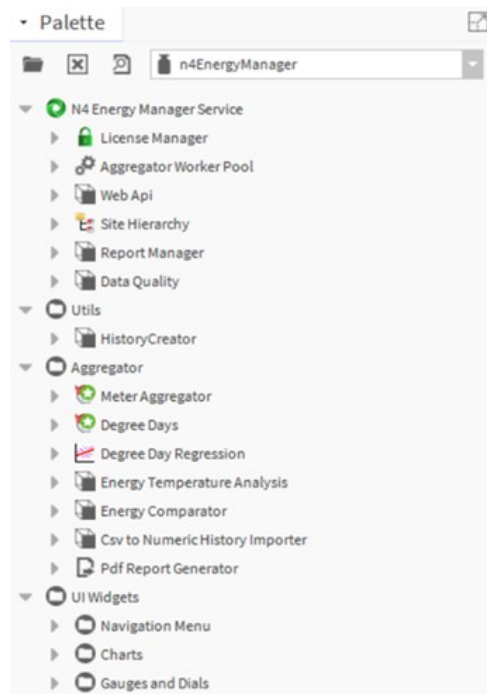
Fig. 1 Example Palette

- **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:

  - **License Manager** – The service that is responsible for managing the
licenses for **N4 Energy Manager**.

  - **Aggregator Worker Pool** – The service that allows the user the modify the
amount of 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 a 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 the 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:

Step 1.   Ensure the chart has been configured with the appropriate aggregator.

Step 2.   Hover over the chart.

Step 3.   A table icon will appear:

        a.   The table icon is a toggle button. Click once to initiate and click again to deactivate.

Step 4.   Click on the table icon to convert the graph to a table view.

Step 5.   The chart will now convert to a table.

Step 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.

Note: *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.**

Note: *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.*
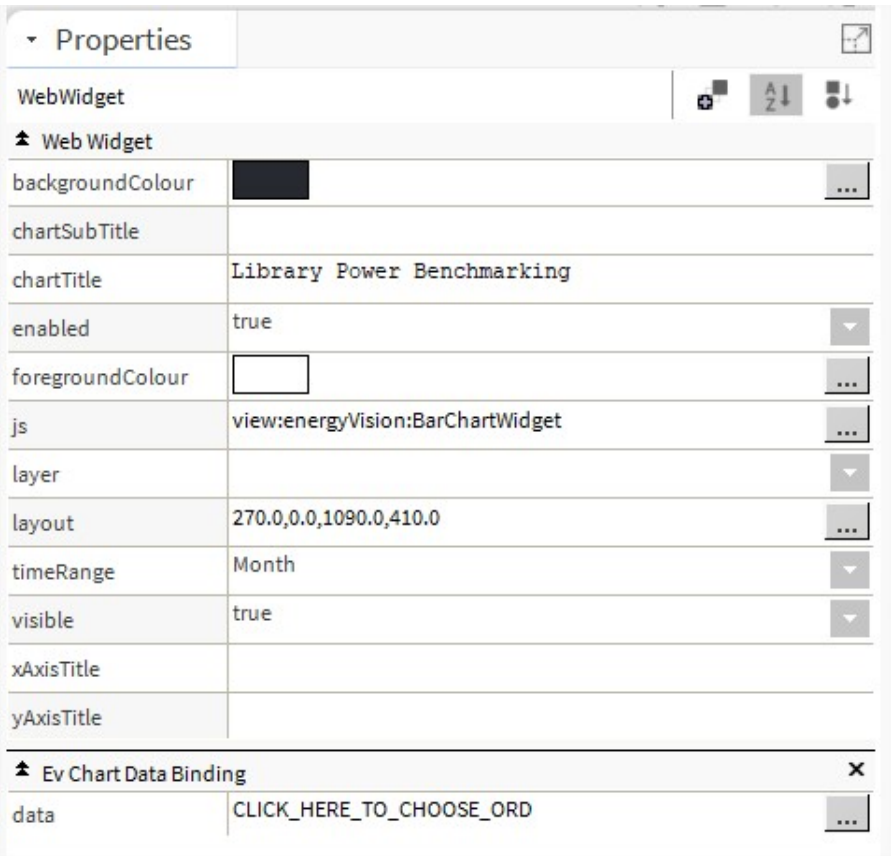
Fig. 2 Example Widget

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 pop up.

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.
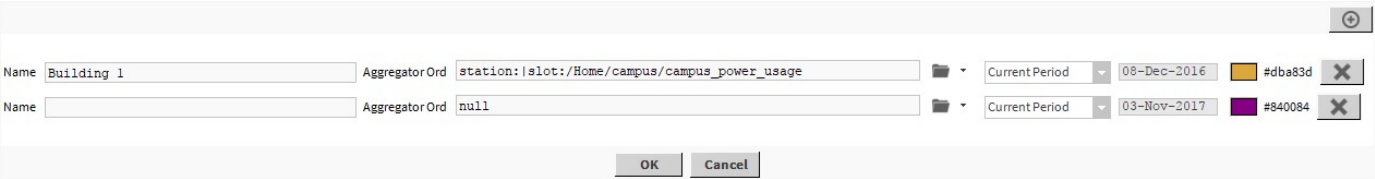
Fig. 3 Example Chart Configuration

Step 1.   **Click** the **drop-down arrow** on the right of the folder icon,
select Component Chooser.

Step 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.

Note: *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.

Fig. 4 EXAMPLE OF YEN CURRENCY ON A CHART
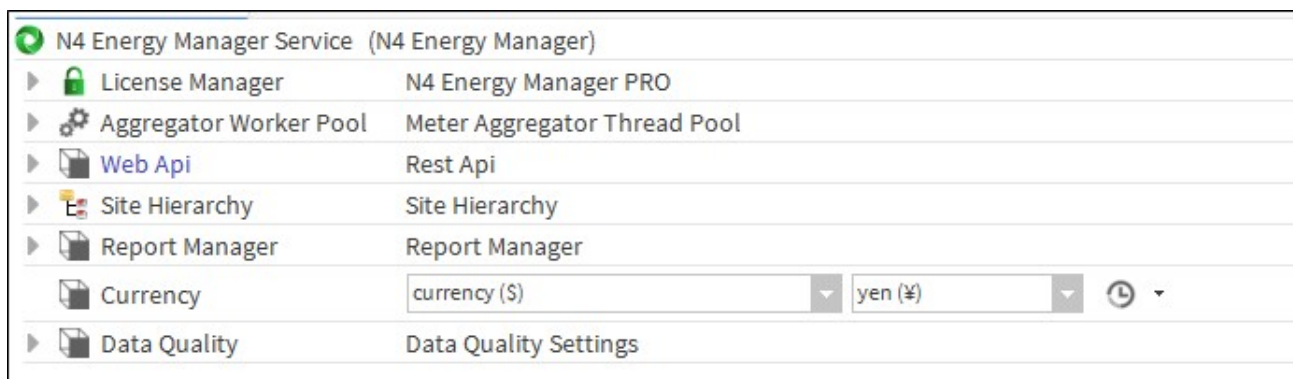
Fig. 5 Example Currency Selector In Energy Manager

Preferred Chart Interval

This feature provides the ability to configure the time interval for the charts globally. The chosen interval is used by the charts when displaying hourly information. *E.g., A choice of 30 Minutes would force the charts to display two data points for every hour.*

Precondition:

- **Config** > **Services** > **N4 Energy Manager** Service
- Set **Preferred Chart Interval** to e.g., 15 minutes.
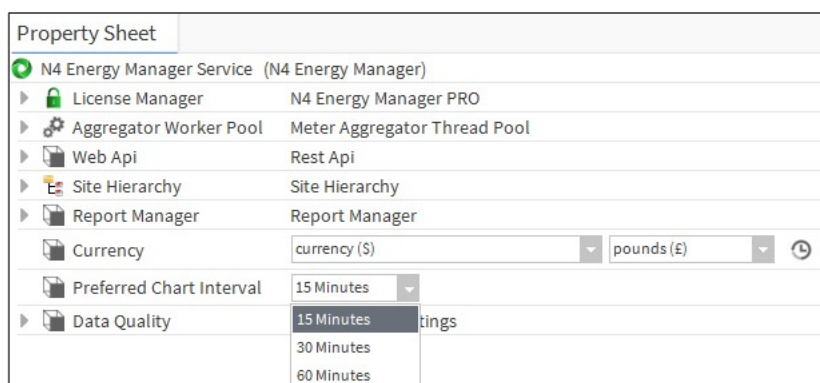
Fig. 6 – Preferred Chart Interval Options In The Property Sheet

Steps to create charts with e.g. 15 minutes time interval:

Step 1.   Navigate to defined PxPage under **Station** > **config** > Select the **PxFolder**.

Step 2.   Toggle to **PxEditor** mode.

Step 3.   Add a new **Line** or **Bar Chart**.

Step 4.   Double click on the chart.

Step 5.   Select **Ord** to connect the aggregator to the chart for current period, last period and custom.

Step 6.   Set the time range to **Day** and click **OK**.

Step 7.   The chart should be displayed with 15 minutes interval.
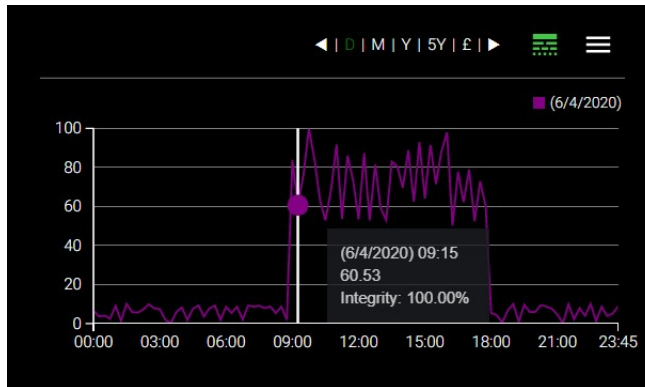
Fig. 7 Example Line Chart With 15Min Time Interval

Note: *The time interval for the line chart in the pop-up window of the Heatmap chart is forced to be 60minutes when displaying hourly information.*

Weekly Time Range

User can choose a weekly time range on all applicable charts. Weekly chart with the start of week can be configured from the n4Energymanager service *Week Start* property.

Steps to choose start of week:

Step 1.   From the station navigate to N4 Energy manager service.

Step 2.   Choose the week from the drop named week start.

Step 3.   Save the changes.

Step 4.   Choosing weekly chart would draw the chart for the week start chosen above.

Fig. 8 Property Sheet

Steps to choose week as default interval:

Step 1.   Toggle Px page to edit mode.

Step 2.   Add Line, Bar, Ranking or Pie chart.

Step 3.   Double click on the chart.

Step 4.   Set the time range to week.

Step 5.   Save.

Fig. 9 TimeRange

5 Year Time Range

Users can choose a five year time range on all applicable charts. The 5Y along with lastPeriod can be used to display past data up to a 10-year period.

Steps to create charts with 5 years interval:

Step 1.   Toggle the Px page to **Edit** mode.

Step 2.   Add Line, Bar, Ranking or Pie Chart.

Step 3.   Double click on the **Chart**.

Step 4.   Set the **timeRange** to 5 years.

timeRange	5 Years	
visible	Day	
xAxisTitle	Week	
	Month	
yAxisTitle	Year	
⬆ Chart Data	5 Years	
degradeBehav	None	
data	CLICK_HERE_TO_CHOOSE_ORD	...

OK   Cancel
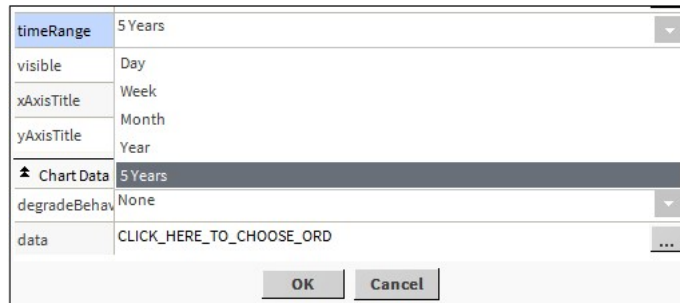
Fig. 10 Example Of The Time Range Being Set

Step 5.   Select the **Ord** to add an aggregator to the chart.

Step 6.   Click **OK** to save the changes and toggle the page to view mode:

a. The chart should display the data in 5 years' time range as shown below in the Bar chart.
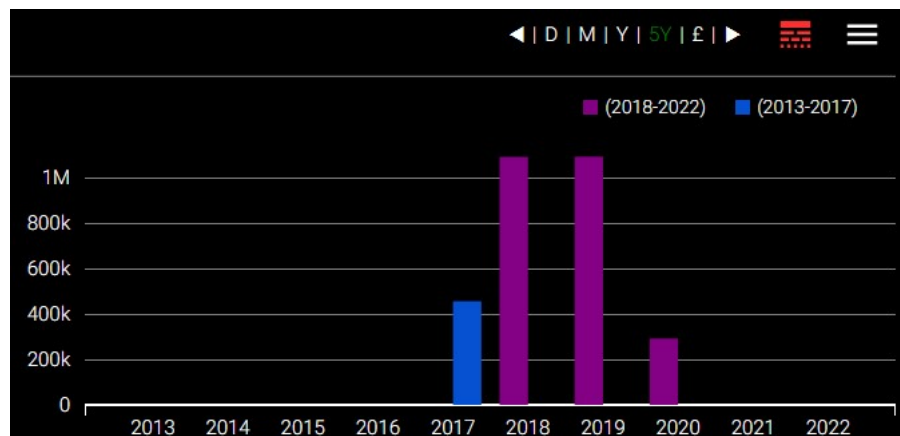
Fig. 11 – Example of a Bar Chart Displaying a10year Period

Chart Relativization

Relativization is a process of binding Niagara widgets to relative ORD's following a naming convention. It is possible to design a common px page template with relativized ORD's and assign it as a view on multiple folders to avoid duplication and reduce errors.

N4 Energy Manager charts can be bound to relative and absolute aggregator ORD's. ORD's could be relativized manually or by using chart data binding popup

Precondition:

- Create new folder (called e.g. Relativize) with px view.

- Ensure aggregators for the charts site under the folder.

Steps to create relativize chart:

Step 1.   Add line, bar, pie, ranking and stacked bar chart to the px page.

Step 2.   Double click on each of the charts.

Step 3.   Select the **ORD** chooser.

Step 4.   Add aggregators to the chart.

Step 5.   Click on the **Relativize** button and select **OK** to save changes.
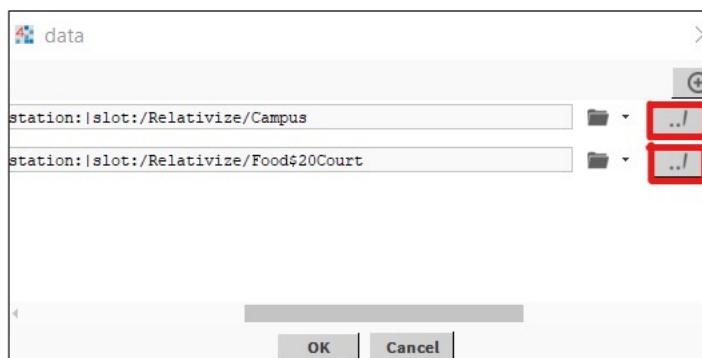
Fig. 12 – Example Relativized Folder

Step 6.   Navigate **config** > **Relativize** folder.

Step 7.   Duplicate the folder.

Step 8.   Change e.g. the units on any of the aggregators from the original folder.

The changes to the aggregator unit should only apply to the charts in original folder.
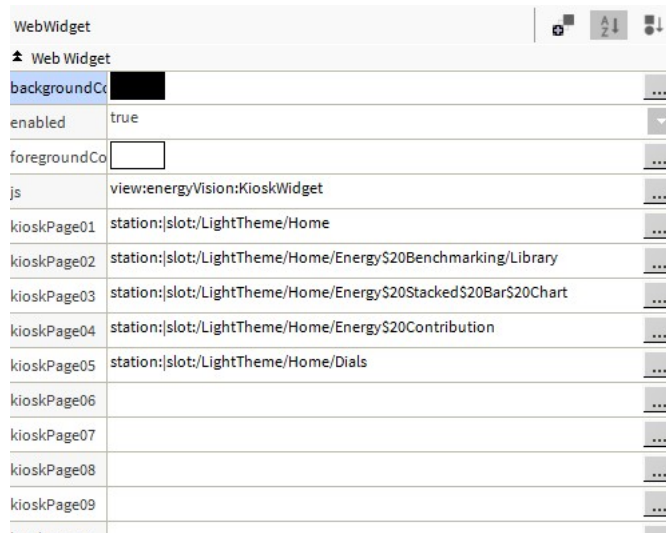
Kiosk Mode

The Kiosk Mode is a full-page widget that allows predefined pages to the 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

Step 1.   In the station, create a new folder for the **Kiosk** Mode.

Step 2.   On the Kiosk Mode folder, create a new view.

Step 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.

Step 4.   Open the **N4 Energy Manager** palette.

Step 5.   Drag & drop the **Kiosk** widget onto the page.

Step 6.   Resize the widget to the full width & height of the page.

Step 7.   Double click on the component to access the property sheet.

Step 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.

Step 9.   In the property sheet, ensure other settings are accurately set up. For example, ensure that the timer field (measured in seconds) correct.

Step 10.   Click **OK**.

Properties

WebWidget				
▲ Web Widget				
backgroundC	████████			...
enabled	true			▼
foregroundC				...
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				

Fig. 13 – 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.

Note: *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.*

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 writable** discussed above.

How to Engineer the Gauges & Dials

Step 1.   On the **Px Page wiresheet** where the Gauge / Dial is being placed, place a **Numeric Writeable**.

Step 2.   **Link** the **Numeric Writeable** to the desired output of the aggregator.

Step 3.   The **Numeric Writeable** should now be displaying data from the aggregator.

Step 4.   Go back to the **Px Page** where the Gauge / Dial is placed.

Step 5.   Double Click on the Gauge / Dial to open the **Property Sheet.**

Step 6.   Populate the customisable fields (as explained above).

Step 7.   In the **Ord** field, click **Null**.

Step 8.   An ord selection box will now appear.

Step 9.   Click the **drop-down arrow** next to the folder.

Step 10. Select **Component Chooser.**

Step 11. Navigate to the **Numeric Writeable** that has just been to the aggregator. Select it.

Step 12. Click 3x **Ok** prompts.

Step 13. The Gauge / Dial will now be displaying the data being pulled through from the aggregator via the numeric writeable.

Note: *Gauges & Dials support transparent background. User can select **Transparent** color to achieve this.*

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 is possible to see when a value is reaching pre-defined limits.

Properties

Fig. 14 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 which is unchangable.

- **ThresholdColourLow** – The colour of the low threshold value segments which is unchangable.

- **ThresholdColourMedium** – The colour of the medium threshold value segments which is unchangable.
- **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.
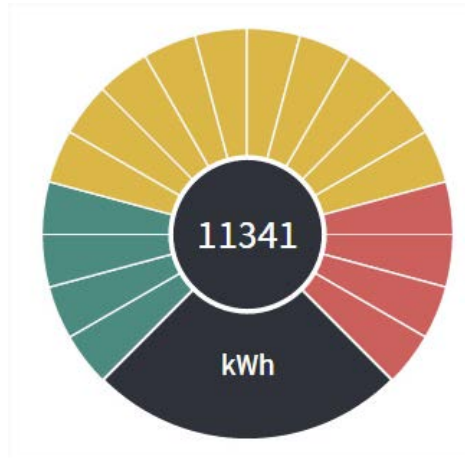
Fig. 15 Example Segment Dial

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.
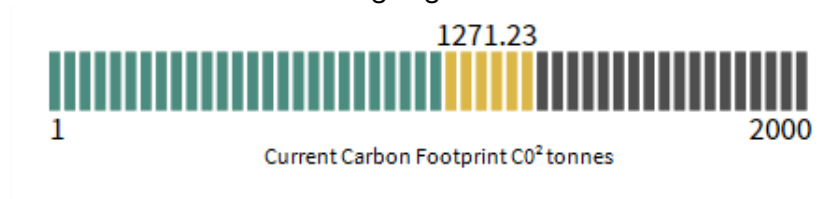
Fig. 16 Example Bar Gauge

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 Gauges 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 colours of 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.
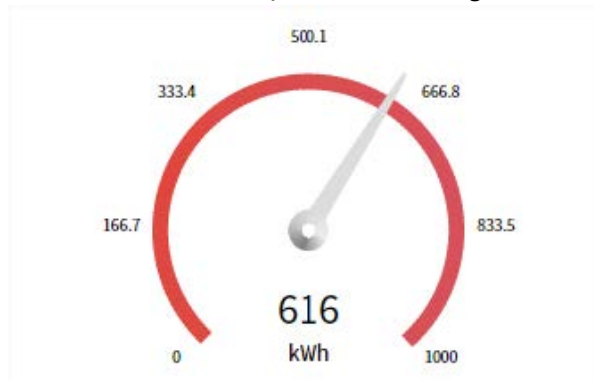
Fig. 17 Example Needle Gauge

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).
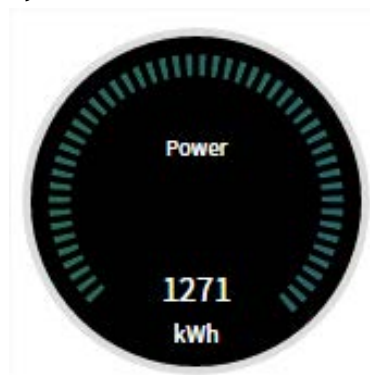
Fig. 18 Example Led Dial

CSV Import

The CSV Import function enables your historic meter data to be imported into **N4 Energy Manager** to manipulate the data into functional graphs and charts.

The CSV importer allows you to:

- Import data from CSV files into a new Niagara history
- Merge data from CSV files with an existing history
- Run CSV imports on a schedule periodically.

The CSV importer does not support:

- Creating a history by importing data from CSV files and then later attaching it to the history extension.

As a workaround, a user can enable the history extension first and then import the data from a CSV file.

Steps to setup csv importer and import CSV file:

Precondition:

1. Ensure the time zone on the CSV Importer component matches time zone on Niagara platform.
2. Ensure the time format on the csv Importer component matches the time format on the csv file.

Steps:

Step 1.   Navigate to config and create a **New Folder** called **CSV import**.

Step 2.   From the palette, search for 'n4EnergyManager' and expand **Aggregator folder.**

Step 3.   Add **CSV to Numeric History Importer** component to the CSV import folder created in step 1.

Step 4.   Navigate to files and create a new folder called CSV.

Step 5.   Copy the CSV file to import to the csv folder in step 4.

Step 6.   Navigate **config** > **CSV import** and double click on CSV to **Numeric History Importer**.

The property sheet page for the component should be open as shown.

Fig. 19 Example Property Sheet

Step 7.   Select the file from the PC -> use **File Ord Chooser** from the drop-down menu:

a. Set **Time Format** to match the time format on the CSV import file.

b. Set **timeZone** to match the **timeZone** on the Niagara platform.

c. Click on **Save** to save the changes.

d. Right click – **Actions** – execute.

e. The CSV file should be imported successfully, and the import data can be found under the following path. Station/History/parent/child **EG: (EnergyManager actual running station)/History/ET TEST/ OUTSIDE_TEMP.**

How to Run CSV Imports Periodically

A link between a Niagara Trigger Schedule and the import action must be created.

Steps:

Step 1.   From **Palette** –> **Schedule**, add **TriggerSchedule** to folder containing csv history import component.

Step 2.   Link Trigger from **TriggerSchedule** to Execute (Csv History Importer).

Step 3.   Double click on the **TriggerSchedule** and add trigger event.
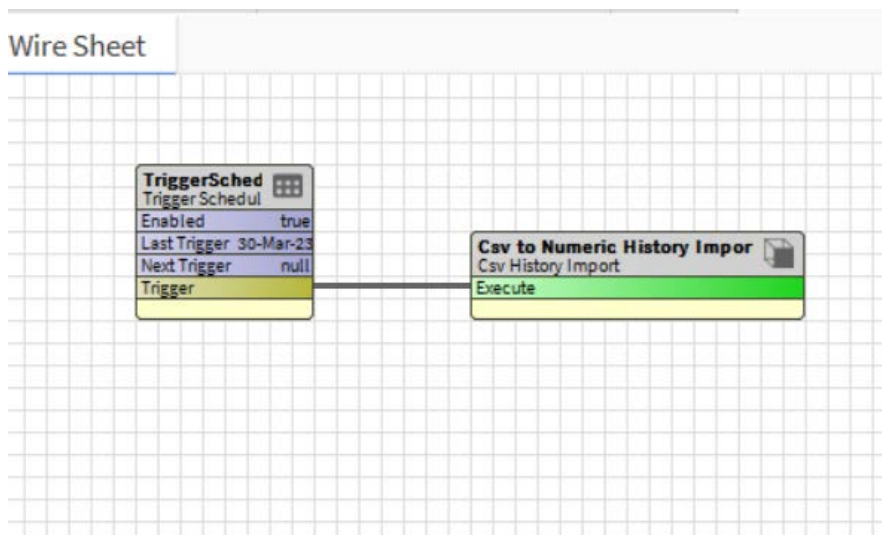
Fig. 20 Example Trigger Schedule for CSV History Import

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.

Note: *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.

How to Engineer the Menu

Step 1.   Create a folder in the **Files** folder called **Menu.**

Step 2.   Open the **Menu** folder, right-click & select **New -> TextFile.txt.**

Step 3.   Name that **TextFile.txt** -> (InsertName)**.menu**.

Step 4.   Below is an example of the demonstration's menu structure.

Step 5.   Edit the menu & menu structure depending on project requirements.

Step 6.   Save the newly edited menu structure.

Step 7.   Open up the **Px Page** on which the menu will be placed.

Step 8.   Drag & drop the menu widget from the **N4 Energy Manager Palette** onto the **Px Page**.

Step 9.   Double-click the **menu widget** on the **Px Page**.

Step 10.   Click on the **ord** field.

Step 11.   A pop-up will appear. Click on the **folder**.

Step 12.   Navigate to .**menu** file.

Step 13.   Click **Open**.

Step 14.   Click **Ok**.
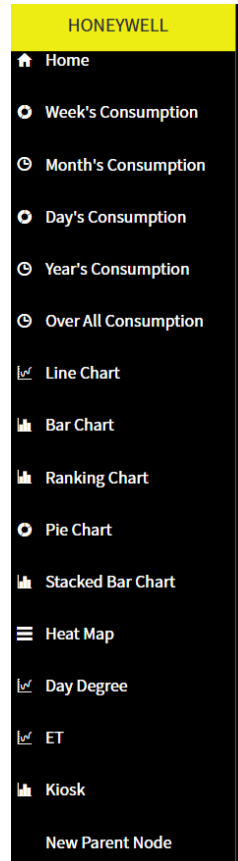
Fig. 1 Example Menu

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.

Note: *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.*

Note: *The Menu Builder will create the necessary code to enable to 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

Step 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.

Step 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).

Step 3. With the Px page in edit mode, drag & drop the Menu Builder widget onto the Px page.

Step 4. The widget will now display **Please add an ord to the menu file**.

Step 5. Double click on the widget to open the property sheet.

Step 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.

Step 7. Using the **drop–down** arrow located next to the **folder icon**, select **File Ord Chooser**.

Step 8. In the File Ord Chooser pop-up, navigate to menu file:

    a. Select the file & open.

Step 9. Click **Ok**.

Step 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.
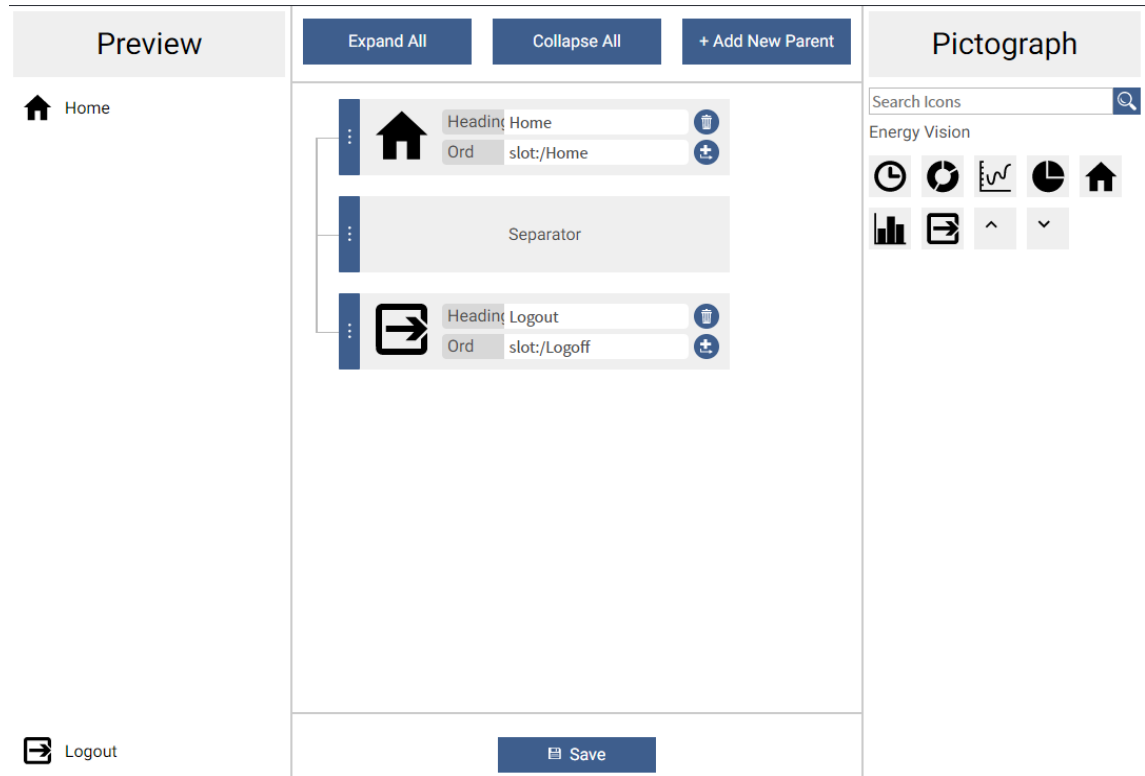
Fig. 2 Menu Builder with a blank .menu file

- **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 the 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 at 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 reorganize 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.

Tree Menu

The Tree Menu can be used for navigation within your station, between defined Px Pages.

Note: *The Tree 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:

- **ItemHoverColour**– The colour for menu item when Hovered.
- **ItemSelectedColour** – The colour of the item once selected.
- **MenuFontSize** – The Font size of each item.
- **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 menu Widgets. Instead of specifying the .menu file directly in the widget settings, the user need to select a Menu Config Component instead.
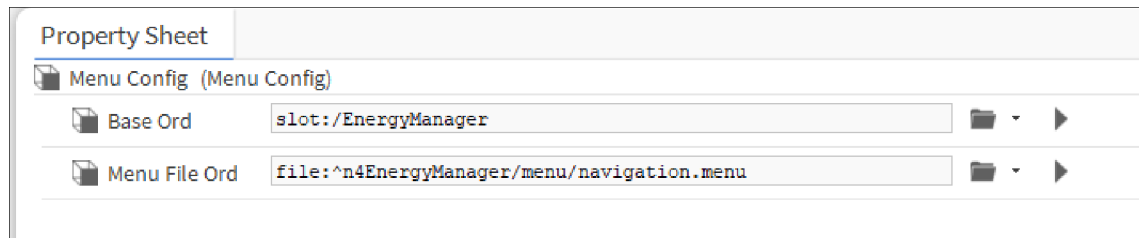
Fig. 3 Example Menu Config Component

The Menu config component consists of .menu file ord and a component ord "Base Ord". The paths to individual px pages configured by ords in the .menu file will resolve relative to the "Base Ord" and not to the correspondent parent ords as in the case of other menu widgets.

Setting Up Tree Menu:

1. Configuring Menu File:

   • Create a folder named "root".

   • Open the "root" folder, Right–click and select "New -> TextFile.txt".

   • Name the file "TextFile.txt" as "<menuName>.menu".

   • Edit the file based on project requirements. All the Ord's can be relativised to Base ord.

2. Configuring Menu Config Component:

   • Drag the Menu Config component from the N4 Energy Manager palette under menu folder onto the wire sheet.

   • Open the menu config, Specify the Base Ord from which Ord's are configured in the .menu file.

   • For the second input Menu File Ord, navigate and select the .menu file and save it.

3. Setting up Menu into PX page:

   • Open the Px page where the menu will be placed.

   • Drag and drop the Tree Menu Widget from the **N4 Energy Manager** Palette onto the Px.

   • Double-click the Tree Menu Widget on the Px page.

   • Click on the **Ord field**, a popup will appear.

   • Click on the **dropdown** > **Component Chooser**.

   • Navigate and select the **Menu Config Component**.

   • Click "**OK**", Save the Configuration.
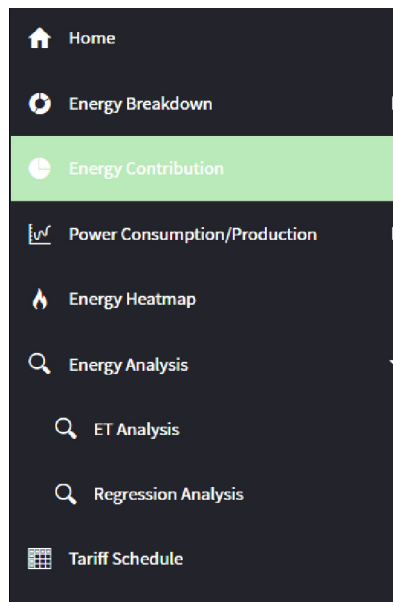
Fig. 4 Example Tree Menu

Note: *The Subtree Sync will work only in Handheld User profile, without the nav tree in the browser.*

10 DATA QUALITY

Users can now view the integrity of the data displayed within charts via a 'Data Quality' icon placed at 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.
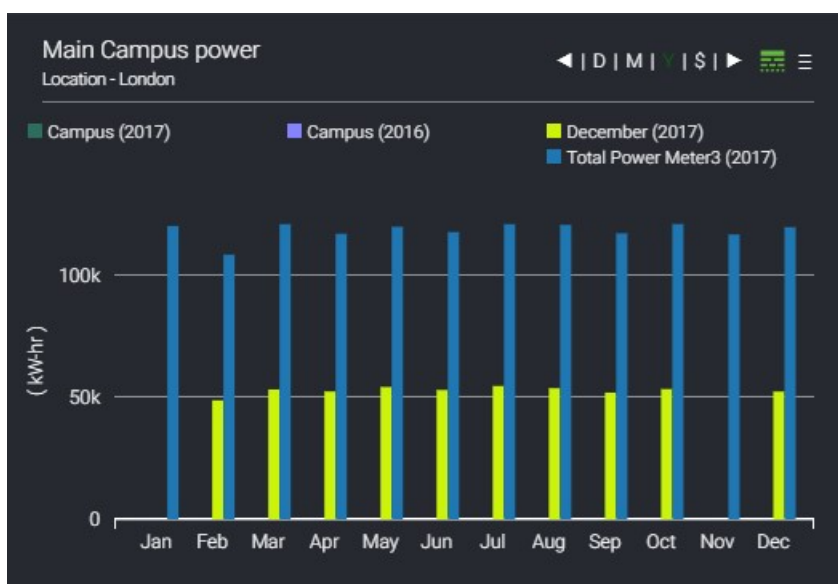
Fig. 1 Example Data Quality Icon

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:

100%	95%	80%

Fig. 2 Example Data Quality Colour Scale

Note: Data Quality can only be calculated where the Meters are linked to **Interval** histories. Change of Value histories will not calculate a Data Quality Value and will remain Grey.

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.
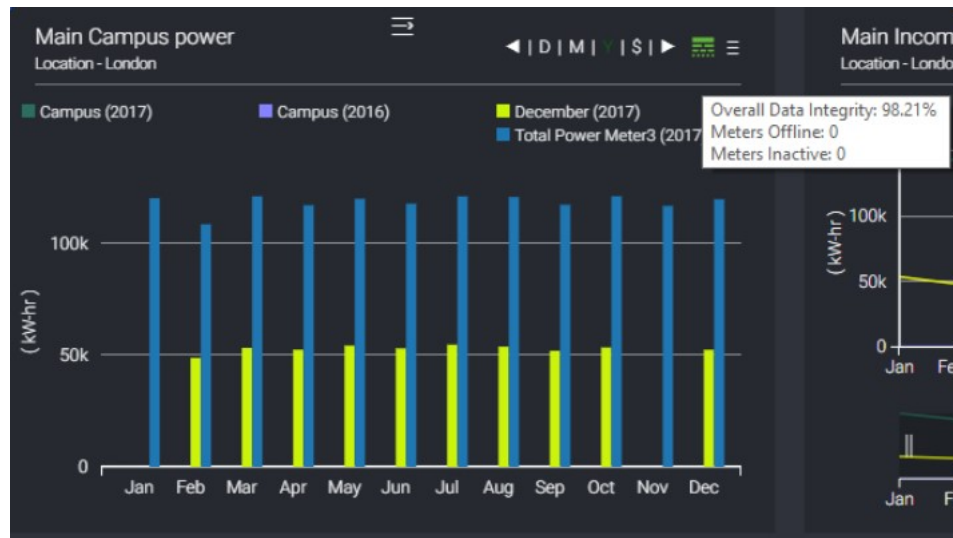
Fig. 3 Example Data Quality Hover

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:
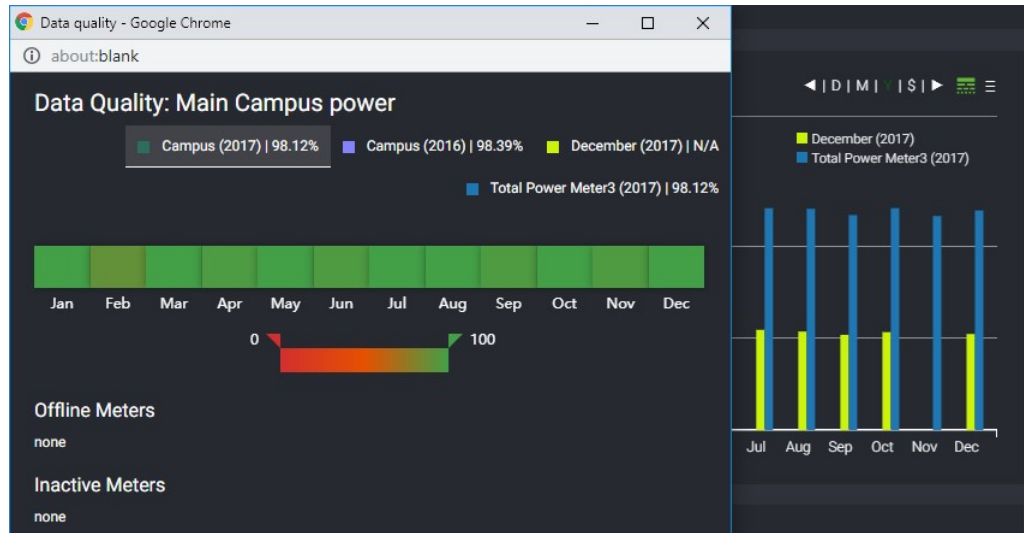
Fig. 4 Example Data Integrity Pop Up

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.
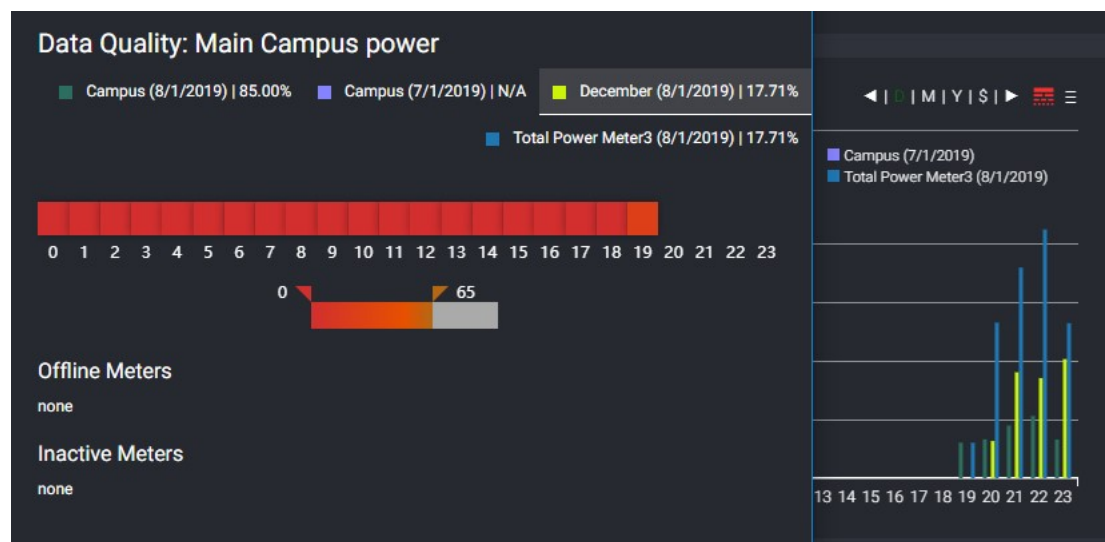
Fig. 5 Adjustable Slider Bar

In addition to this, inactive or offline meters are also displayed.
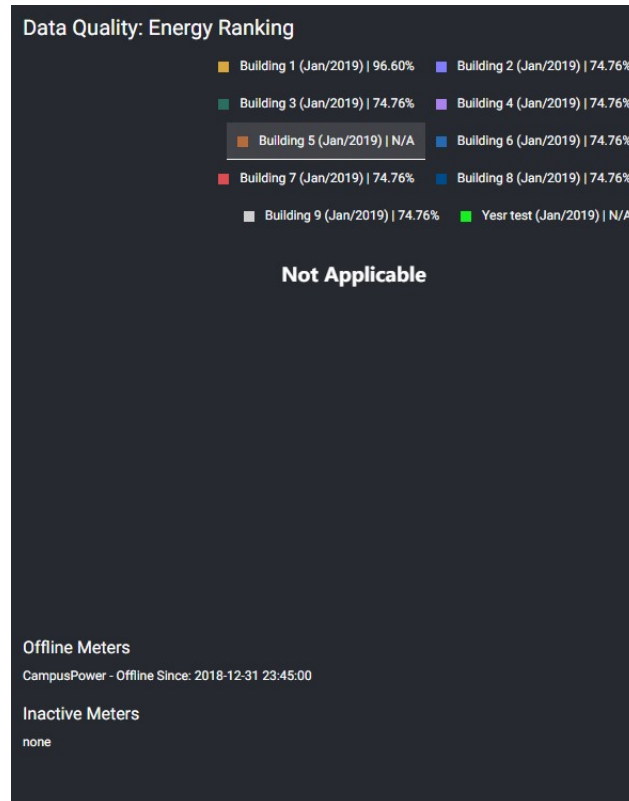
Fig. 6 Display Of Inactive/offline Meters

Note: *Data Quality can only be calculated where the Meters are linked to Interval histories. Change of Value histories will not calculate a Data Quality Value and will remain Grey.*

Data-Quality Alarms

The aggregators can be setup to raise alarms when a meter is detected as offline or the data integrity falls below 80%. The alarm status is evaluated every time an aggregator calculates.

An alarm is raised if any of the following conditions are fulfilled:

- Data integrity value is less than a threshold.
- If a meter is currently offline – no reading within the offline threshold.
- If a meter is inactive – meter values within the inactive threshold have not changed.

The offline and inactive thresholds can be set globally at a service level or individually at a meter level. By default, these thresholds are set to 1 hour in the **Data Quality Settings** and individual meter thresholds are inherited from the **Data**

Quality Service (see figure). When inherited, the status of the **Amount** property is set to "null". If user wants to overwrite the threshold, the **null** flag should be removed.

Like the thresholds, the alarms feature can be controlled at a service level and at an individual aggregator level. All alarms can be turned off globally or alarms from individual aggregators can be disabled using the "Data Quality Alarms" section in the aggregator property sheet.

A global inhibition period can be applied to pause the alarm generation on station start up for a certain time period. This help's to avoid a flood of alarms on station start-up.

Fig. 7   Example Of The Alarm Service Dq Settings

Fig. 8   Example Aggregator Alarm Setting

In order to handle special cases (e.g., having a heating-/cooling aggregator) that not reading data over a period of time, it is possible to enable / disable the data quality via a datapoint.

In order to do so, it is required to add this attribute via "Composite Editor" to the Aggregator.

Steps needs to be taken:

Step 1.   Expose the enabled slot on the aggregator using the composite **editorLink**.

Step 2.   Link the enabled slot to a **Boolean** writable using the wiresheet view.

Step 3. Add additional wiresheet logic to enable/disable data quality alarms dynamically.
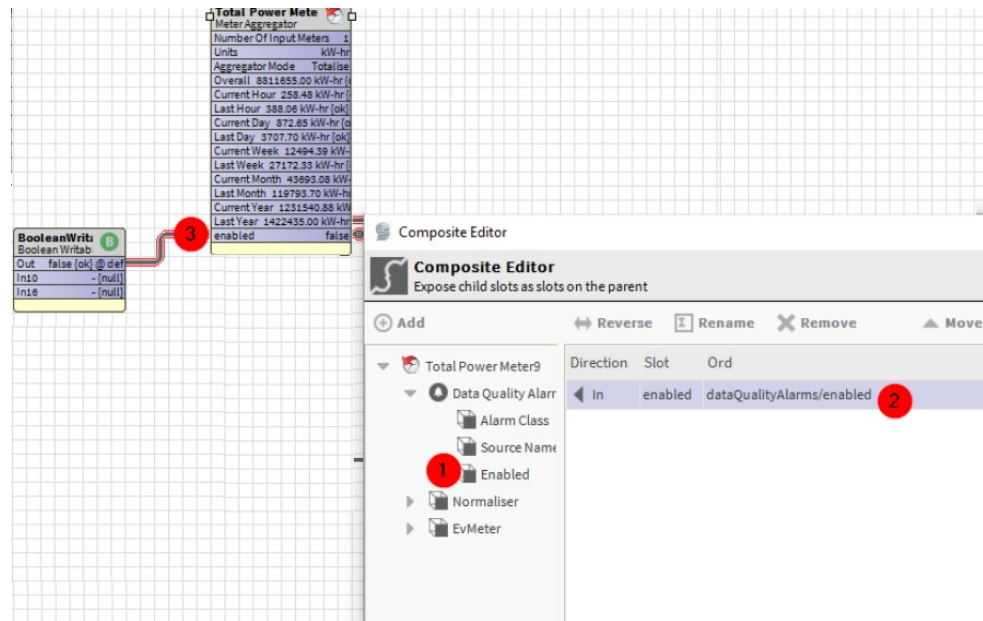
Fig. 9 Data Quality Alarm Enabling Customization

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N4 ENERGY MANAGER MIGRATION PATHWAYS

Summary – Energy Vision and Energy Manager Versions

The original Energy Vision software was created for Niagara AX. There were several versions. After the release of Niagara 4, Energy Vision was migrated under the same name to run in N4. As with any station being upgraded from Niagara AX to Niagara 4 the station must be migrated using a tool provided by Tridium themselves. Once this has been performed the Energy Vision software will require manual re-engineering in order run correctly in Niagara 4. This user guide focuses on N4 Energy Manager, so if you are considering upgrading a Niagara AX Energy Vision station to Niagara 4, please contact Honeywell tech support team so that we can advise on the best way forward.

- A later major update saw the software renamed from Energy Vision to N4 Energy Manager. This began in the earlier versions of Niagara 4. For migrating from Energy Vision to N4 Energy Manager one should use the migration tool (see Upgrade Process 1 – Energy Vision -> N4 Energy Manager) and migrate px files (see Upgrade Process 2 – N4 Energy Manager (below v3.3.1) -> Latest Release).

- **N4 Energy Manager version 3.3.1** (2021-04-15) introduced charting preferences – allowing users to store custom chart configurations in the browser. Upgrading from earlier versions than 3.3.1 requires a migration of all PX files engineered prior to this release. The migration is performed using the **"migrate Px files"** action in the **N4 Energy Manager** service. Please see Upgrade Process 2 – N4 Energy Manager (below v3.3.1) -> Latest Release.

- Modern versions of **N4 Energy Manager (3.3.1+)** do not require any migration. Only stations built before 3.3.1 will need a PX migration. However, if a user applies the migration tool to a more recent release it will not have any negative impact on the station. Moving from the previous release to the latest release can be done by simply updating the **N4 Energy Manager** modules and starting the station again. No further work is required.

Table 2 summarizes the actions needed for migration depending on the source version of the product. Energy Vision is abbreviated as "EV", and N4 Energy Manager is abbreviated as "EM".

Table 1 Different Migration Paths

Source Version	Use Migration Tool	Migrate PX Files
EV any version	Yes	Yes
EM version < 3.3.1	No	Yes
EM version ≥ 3.3.1	No	No

Upgrade Process 1 – Energy Vision -> N4 Energy Manager

This process uses the bundled migration tool to convert Niagara 4 stations using **Energy Vision** 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 (included in latest software bundle).

- 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 (see figure Example of Opening 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.
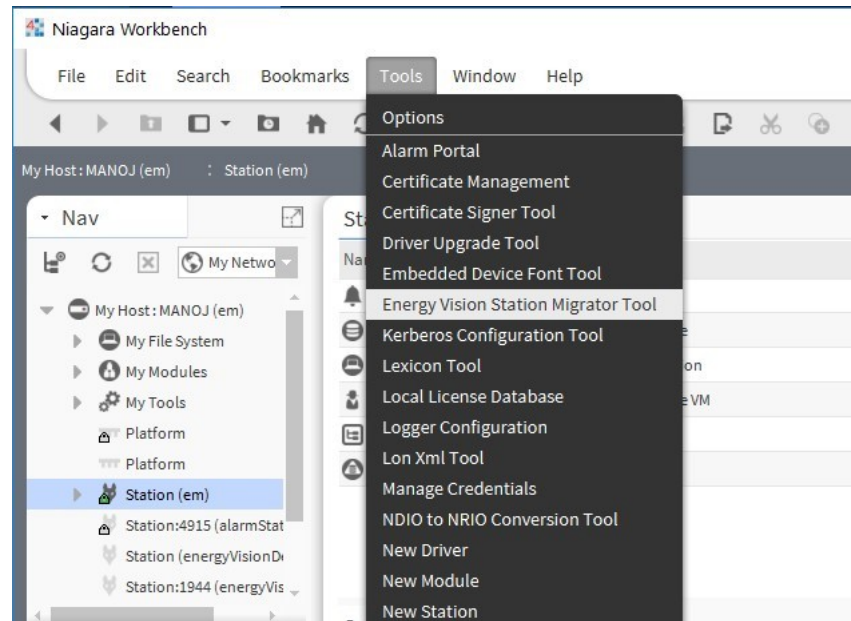
Fig. 1 Example of Opening Migration Tool

The migration tool has the following properties (see figure Migration Tool):

- **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 migra-tion, a new station with user-specified **Output Station Name** would be created under **Output Station Home** folder. On successful migration, a log detailing the migrated components is created in the Niagara User Home (see figure Example of a Successful Migration)
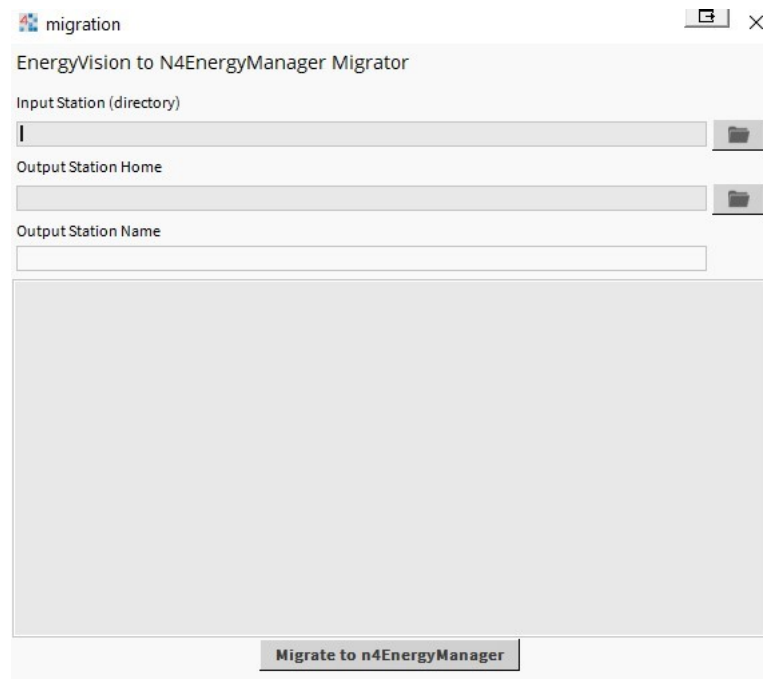
Fig. 2 Migration Tool

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
  - energyVisionResources-[rt-ux].jar
  - energyVisionReports.jar

- Ensure correct N4EnergyManager modules are installed.

- Start the station using the application director and perform tests on the station to ensure its normal operation.
  - Test if histories have been migrated over.
  - Tests if *.px have been migrated and are accessible.
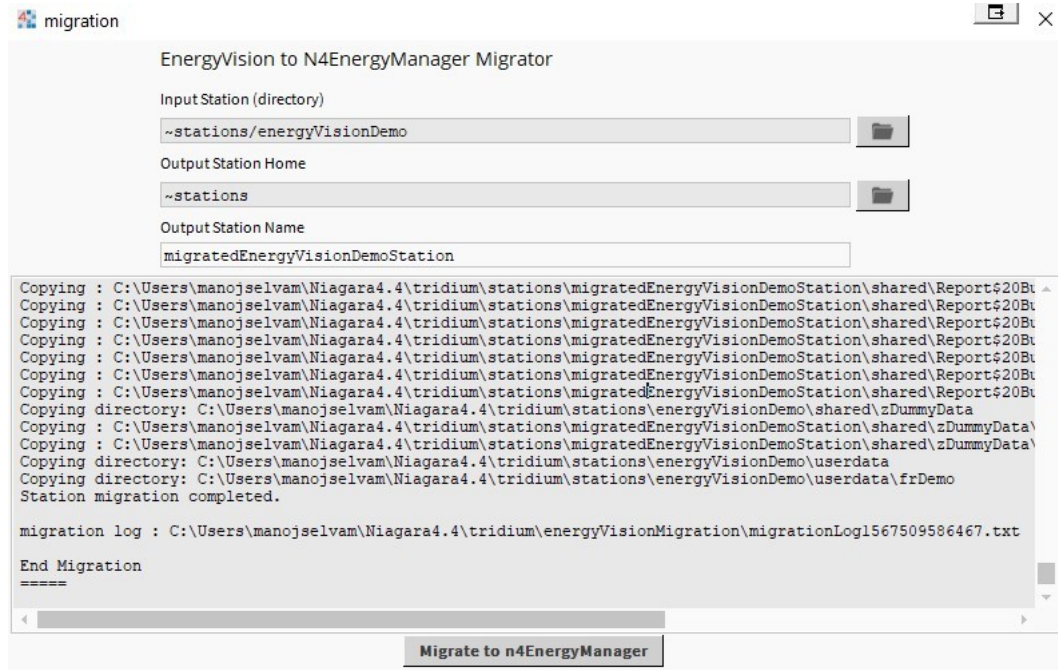
Fig. 3 Example of a Successful Migration

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

Upgrade Process 2 – N4 Energy Manager (below v3.3.1) -› Latest Release

Starting from **N4 Energy Manager version 3.3.1**, users are able to store custom chart configurations in the browser.

To upgrade from earlier versions of N4 Energy Manager, a migration of all previously engineered px files is required. To achieve this, one can invoke the "**migrate Px files**" action in the **N4 Energy Manager Service** (see figure Migrate PX Files Action of N4 Energy Manager Service)

Fig. 4 Migrate PX Files Action of N4 Energy Manager Service

ACTIVATING THE 60 MINUTE PRO TRIAL

To activate pro features for a 60 minute period:

Step 1. Run a work bench with **N4 Energy Manager** core license'.

Step 2. Navigate **Config** > **Services** > **N4 Energy Manager** Service.

The page below should be displayed with N4 Energy Manager Core (Free).

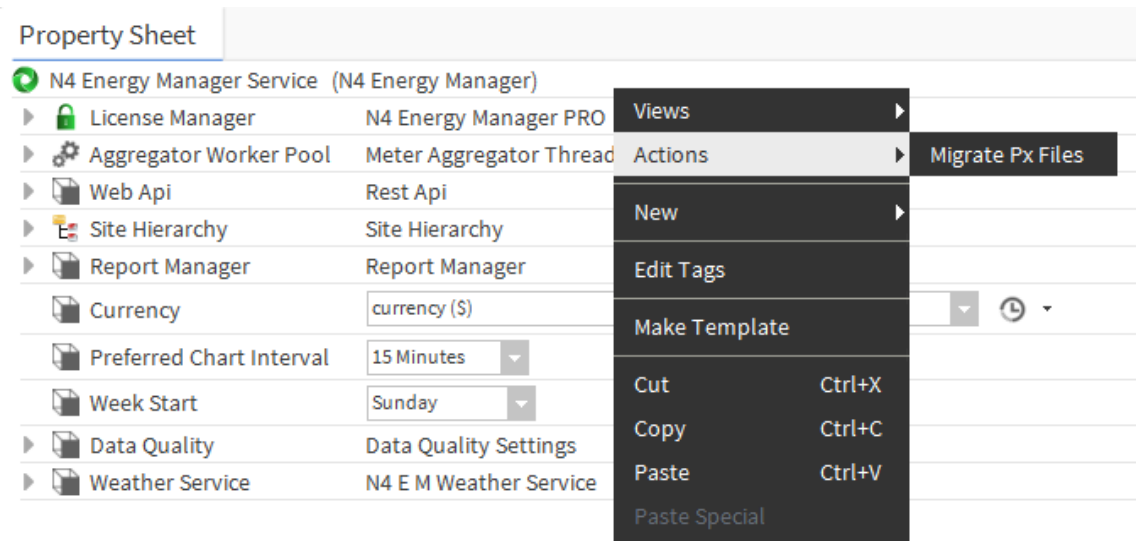| Property Sheet	
🔒 License Manager (License Manager)	
📄 License Tier	Core
📄 License Status	N4 Energy Manager Core (FREE)
📄 Maintenance Status	No Maintenance
📄 Active Features	--- N4 Energy Manager license pack --- [name=Line Chart, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Bar Chart, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Pie Chart, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Ranking Chart, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Stacked Bar Chart, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Heatmap, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Dials, active=true, expiration=never, attributes={}] [name=Regression Analysis, active=true, expiration=never, attributes={png=true, pdf=true, csv=false}] [name=Kiosk Mode, active=true, expiration=never, attributes={limit=3}]
📄 Locale	en_GB
📄 Version	3.3.1
📄 Commit Hash	cb25af187

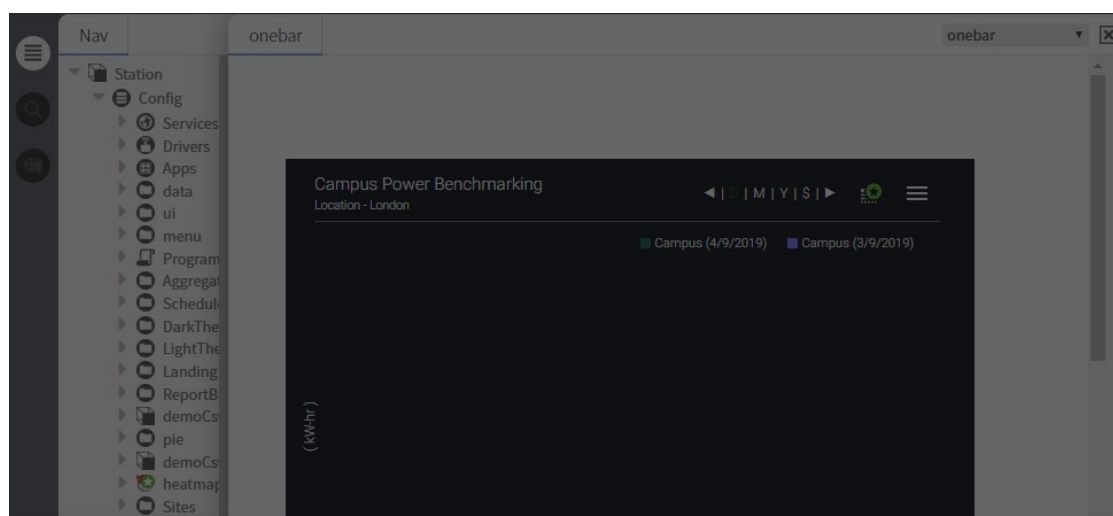**Fig. 1   Example Property Sheet – Core License**

Step 3. Right click on **License Manager** and select **Action** > **Enable Trial**.

60 minutes trial for Pro features should be activated as shown below.

Property Sheet	
🔒 License Manager (License Manager)	
📄 License Tier	Pro
📄 License Status	Time Limited Demo - 59 minutes remaining
📄 Maintenance Status	No Maintenance
📄 Active Features	--- N4 Energy Manager license pack --- [name=Line Chart, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Bar Chart, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Pie Chart, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Ranking Chart, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Stacked Bar Chart, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Heatmap, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Dials, active=true, expiration=2021-06-22, attributes={}] [name=Regression Analysis, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}] [name=Et Analysis, active=true, expiration=2021-06-22, attributes={png=true, pdf=true, csv=true}]
📄 Locale	en_GB
📄 Version	3.3.1
📄 Commit Hash	cb25af187

Fig. 2 Example Property Sheet – 60 Min Pro Trial

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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.

Fig. 1   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.

Fig. 2 Example Of A User Who Has Accepted The Privacy Consent

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

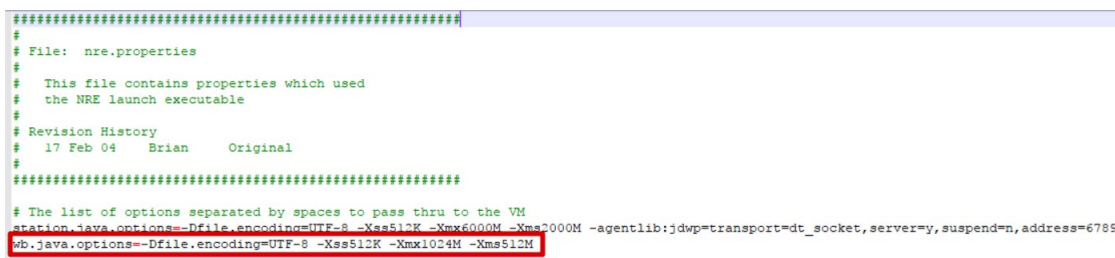**Fig. 3 Option To Reset User Consent**

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 -Xms2000M -agentlib:jdwp=transport=dt_socket,server=y,suspend=n,address=6789
wb.java.options=-Dfile.encoding=UTF-8 -Xss512K -Xmx1024M -Xms512M
```

Fig. 1 nre.properties

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.

Note: *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. E.g- 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.

Accepting TLS Certificate

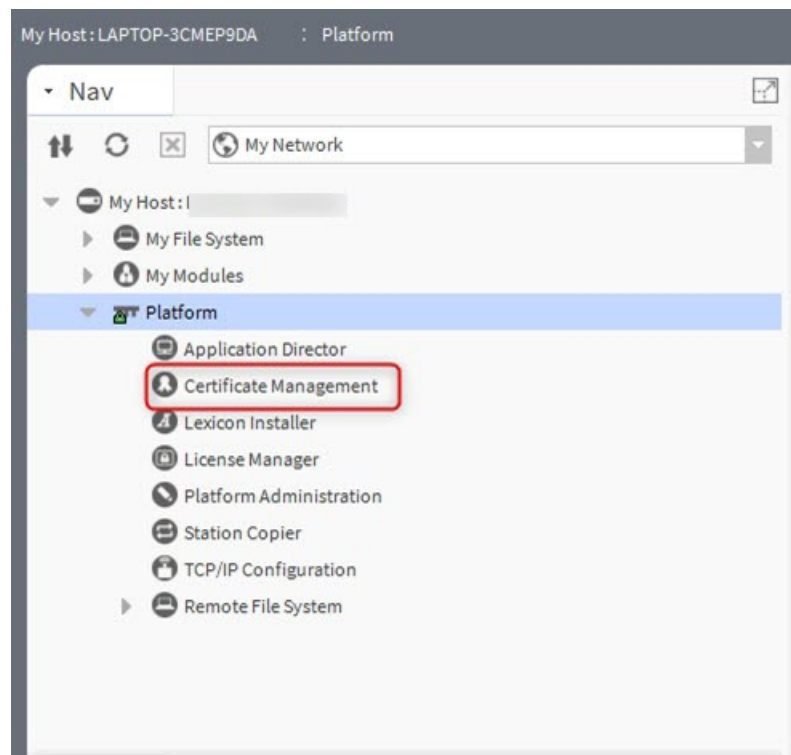Within workbench open the relevant platform and look for 'certificate management'.

Fig. 2 Niagara Workbench

Step 1.   Navigate to the **Allowed Hosts** tab.

Step 2.   Search for **localhost** and left mouse click to highlight it.

Step 3.   Select the **Approve** button.

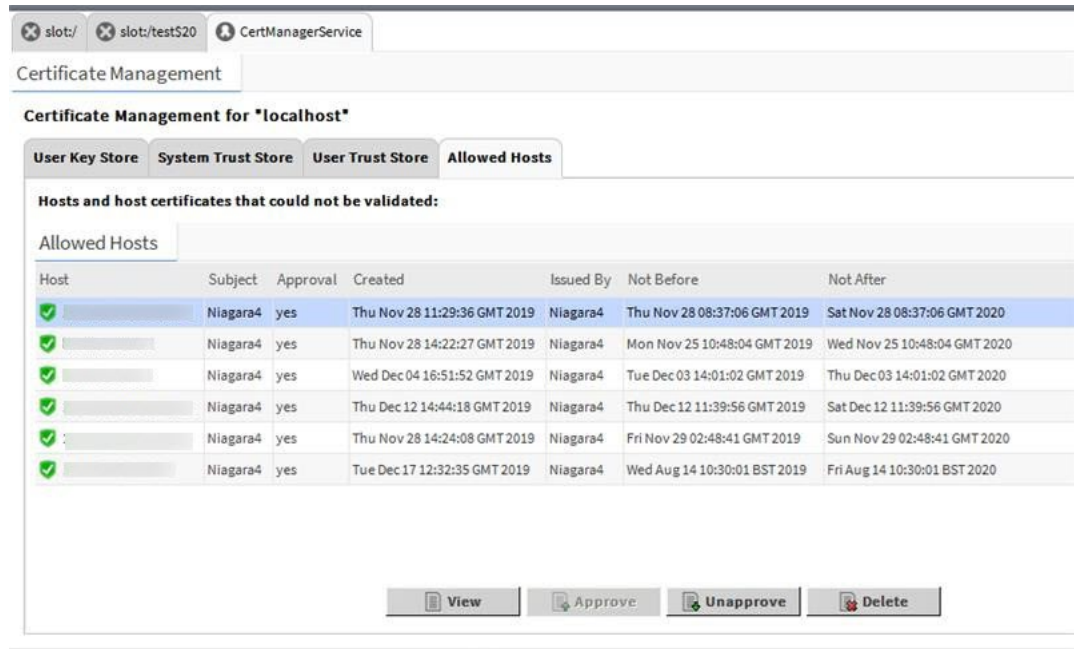Step 4. After you have completed this you should see the below.

Fig. 3 Certificate Management

What is the difference between Energyvision and N4 Energy Manager?

Energyvision has now been rebranded to **N4 Energy Manager.** The key difference being the introduction of a free version (core) and a paid-for version (pro) and the latest new features. Customers wishing to buy Energyvision will now purchase **N4 Energy Manager.**

Can I still engineer a project using Energyvision?

This is possible if you already have an Energyvision installation up to Niagara N4.2. However new customers wishing to use Niagara v4.4 or higher will only be able to purchase **N4 Energy Manager.**

What's the difference between N4 Energy Manager Core and N4 Energy Manager Pro licenses?

The pro version has all the well-known Energyvision features, as well as the latest new features that are not available in core such as:

1. **(Pro) Data Integrity –** Users can see a % integrity score for the data in charts and drill down to identify offline and inactive meters.

2. **(Pro) Energy Temperature curve –** Users can see the effect variations in outside air temperature has on a building's energy consumption.

3. **Advanced reporting / Tenant Billing –** automatically create monthly bills or reports from templates and generate pdf documents for email or print.

N4 Energy Manager Core is limited to 3 histories, Menu is limited to 10 Menu Items, there is no automated PDF reporting and Kiosk mode is limited to 3 pages only.

I already have Energyvision in Niagara 4, how do I upgrade to N4 Energy Manager Pro?

To purchase a Pro license please contact your N4 Energy Manager Contact or Provider.

Use the provided migration tool to upgrade Energyvision in Niagara 4 to N4 Energy Manager. The migration tool works with all versions of Energyvision in Niagara 4 and is included in your distribution. Please note that an AX to N4 migration is a manual process that will require your project to be re-engineered, the **Energy vision** to **N4 Energy Manager** migration tool is an N4 to N4 only tool.

I'm interested in evaluating the N4 Energy Manager Pro features before I decide to buy, can I do this before I purchase?

Yes, new customers using N4 Energy Manager on a Core license can activate a 60 min demo of the pro features. During this 60 minute period, data is randomised but features are fully functional. Users wishing to retain the Pro features after 60 minutes will either need to restart their station and activate another 60 min demo, or purchase a Pro license.

Are there any limitations to running N4 Energy Manager on a JACE?

Yes, the Automated PDF reporting and excel reporting functionality is only available on a supervisor installation.

I'm interested in receiving N4 Energy Manager Training, are there any courses?

Yes, training is available, to arrange this please contact your N4 Energy Manager Contact or Provider.

To use N4 Energy Manager pro do I need a one-time license only or is there an annual renewal process?

Pro licenses are a perpetual license, no annual subscription is required.

I've upgraded my N4 Energy Manager modules and now some of the features have stopped working.

Upgrading of modules is a manual process so it is important to check that all of the modules have been copied correctly as part of the upgrade process.

When I run PDF Reports, I see that some pages are left blank, how do I fix this?

When a PDF report contains a high number of pages the report can sometimes be generated before the report data is ready. It is possible to configure a reporting property to extend the time period before a report is generated. Doing this will enable all of the correct data to be displayed.

I want to use the new external database feature of Niagara 4.11 to store histories, can Energy Manager support this?

Starting from N4 Energy Manager v3.5.0, this feature is supported, see Adding Histories from Remote Databases.

The weather service's "Add Weather Station" action does not find any location.

There might be an issue with the TLS configuration or firewall settings of the network. If the issue persists, please contact your N4 Energy Manager Contact or Provider for investigation.