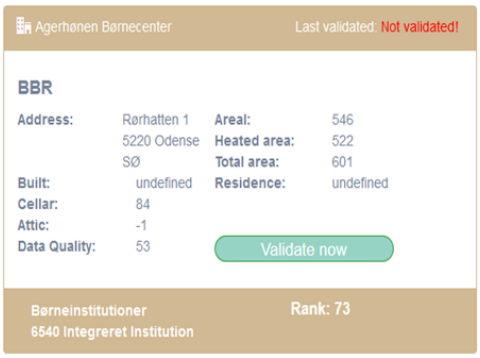
Implementation of the website

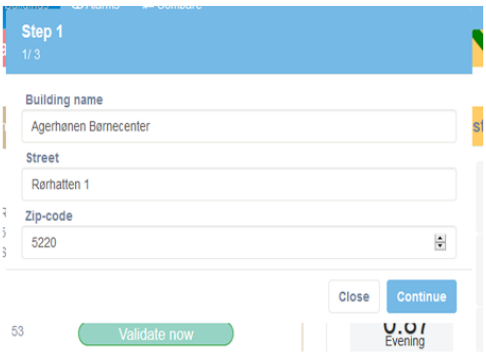
System and data maintenance

As mentioned in import and integration with Energy Key in the Design and Implementation section, the system have collected data about buildings and stored them mainly into the tables: Buildings, BuildingsSubype and BBR. In order for the website to retrieve the data, the view W_lookup_buildings have been created. This view joins all tables having information about a building and thereby unifying a standard way to retrieve these.

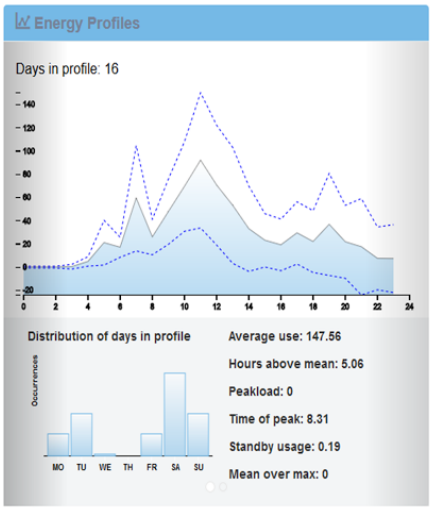
The main display of these informations have been put into a responsive template panel, which is currently used on the page for viewing a building, see figure **a)** on the following page. The requirement section, stated the importance of allowing managers and/or building owners to update and validate these informations, but also to restrict other visitors from doing so. Therefore, the system have implemented a functionality to signup and login. When a user is logged in the the panel displays a button which initiates a manual validation procedure, where it is possible to update the information, see figure **b)** on the following page. The validation procedure, have been cropped into three quick steps, with a back and continue button. When the validation is done the database and view of the building is updated with the information. In addition, the last validated field is updated with a timestamp of the time of validation. Further is a entry in the database sat, containing the user id, making it possible to backtrack who made the validation and when.


Agerhønen Børnecenter
Last validated: Not validated!
BBR
Address: Rørhatten 1
5220 Odense
SØ
Areal: 546
Heated area: 522
Total area: 601
Built: undefined
Residence: undefined
Cellar: 84
Attic: -1
Data Quality: 53
Validate now
Børneinstitutioner
6540 Integreret Institution
Rank: 73

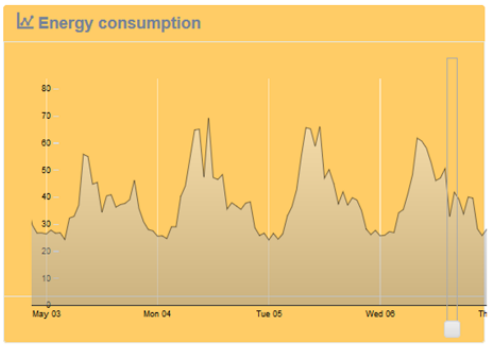
a)


Step 1
1/ 3
Building name
Agerhønen Børnecenter
Street
Rørhatten 1
Zip-code
5220
Close
Continue
53
Validate now
Evening

b)


Energy Profiles
Days in profile: 16
Distribution of days in profile
Occurrences
MO TU WE TH FR SA SU
Average use: 147.56
Hours above mean: 5.06
Peakload: 0
Time of peak: 8.31
Standby usage: 0.19
Mean over max: 0

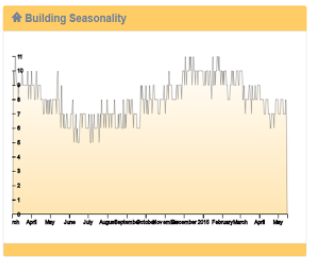
c)


Energy consumption
May 03
Mon 04
Tue 05
Wed 06

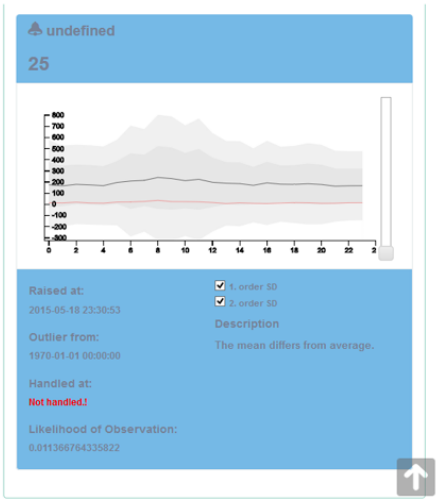
d)


Summerized Statistics
21.69 Average consumption
30.84 Peak consumption
14.64 Minumum consumption
15.81 Nightly consumption
25.04 Morning consumption
24.33 Afternoon consumption
20.1 Evening consumption
0.71 Average/peak ratio
0.68 Minivaverage ratio
1.38 Night/day ratio
10.86 Time of daily max
12.28 Hours above mean
6.85 Number of peaks

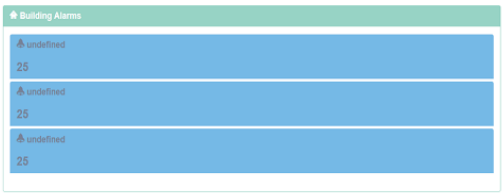
e)


Building Seasonality

f)


undefined
25
Raised at:
2015-05-18 23:30:53
Outlier from:
1970-01-01 00:00:00
Handled at:
Not handled!
Likelihood of Observation:
0.011366764335822
1. order SD
2. order SD
Description
The mean differs from average.

g)


Building Alarms
undefined
25
undefined
25
undefined
25

h)

Visualization of buildings and consumptions.

The raw consumption

In order for the website to obtain the data regarding the raw consumption the W_Consumption table is used. This table contains information regarding the consumption type and the actual consumption stored as a real array. This data type is used, because it fastens the load time considerably compared to sending a number of tens of thousand records over which then has to be converted into a array. When the data is retrieved it is displayed in an interactive panel, which can be scrolled and zoomed on, see figure **d)** on the previous page. This allow the user to manipulate the view to match the user's need.

As the diagram is at its current state, it is uncertainly a bit slow in response to the user interaction, due to the amount of data being processed. This problem can however be fixed by adding functionality for lazy-loading of data. By only loading data interval of a couple of month instead of years of data the processing time can be reduced without the user noticing. Due to the limited time and because this system only is a prove of concept prototype, this feature have been left out of the system.

Energy profiles

The energy profiles data is from the website gathered from the W_Consumption_Profiles table. which contain the hourly mean consumption for this profile, the standard deviation and the distribution of days in the profile. In addition does it contain a list of summarized features for the profile. These information have been filled into the Energy Profiles panel, see figure **C)** on the previous page. This panel is a carousel slider, where the profile displayed changes every now and then. Furthermore, by clicking on either side of the panel one can navigate through the profiles. One profile is displayed with a line diagram showing the mean and further with two dotted lines showing the standard deviation of the mean. In addition, a small bar chart have been added, showing the distribution of days in a given profile. This allow the user to deduce if a profile is the normal usage of non-working days, if he/she can see that most of the days in the profile is weekends. Lastly, in the bottom right of the profile panel the summarized features is listed, to enhance the user to quickly get an overview of a given profile.

Seasonality of a building

Information regarding the seasonality of the a building is from the website gathered from the W_Feature table in the database, and displayed in a line chart diagram, see figure **f)**.

Summarized statistics

The summarized statistic is retrieved from the W_Building_Profiles table and listed in the Summarized Statistics panel, see figure **e)**. These informations is displayed as responsive and interactive tiles. The reason for this, is that these information is of high importance for the building manager, and making them responsive increases the accessibility and makes them easily viewable from other devices and platforms than the personal computer. Further, is the tiles made interactive, because in a further development it have been decided to color indicate them based on their value, to visualize whether or not a given value is "good" or "bad" for a building. In addition, have the tiles been made in a way that inforce one to click on them. When clicked, the idea is to display a helping text in a popup, telling information about the feature and number and why this is important. This feature have along with the color indication been left out of the scope of this project.

Comparing consumptions

Comparison of consumptions[1], have been made into a interactive chart where buildings, types and categories can be compared in numerous ways, see the website. Firstly, one can chose the consumption type (heat, water or electricity) to compare in the header. Secondly, the feature on which the comparison is made can be chosen from the list in the right. Thirdly, one can choose which buildings or building types he/she wants to compare. This is then displayed in a chart in the middle of the page, and in bottom a legend of what is in the chart is displayed. The sidebar containing what to compare have been divided into four hierarchical categories (Types, Categories, Buildings and Similar Buildings). Types, contains a list of all building subtypes, for example Offices, Kindergartens, Schools and so forth. Buildings, contains a list of each individual building, and when chosen its consumption is displayed in a daily mean of a given feature. In addition, when a building have been chosen, the Similar Buildings category is updated with the buildings related to the chosen building(s). In this way, one can easily find and display a related building and compare these

[1] See the figure on the following page.

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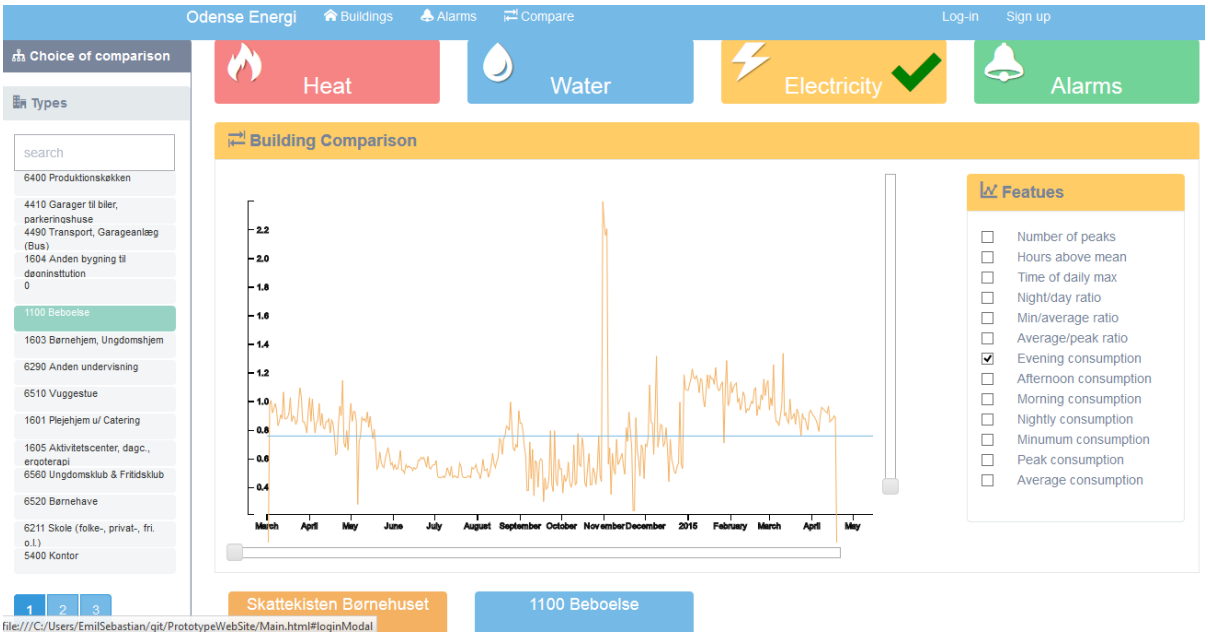
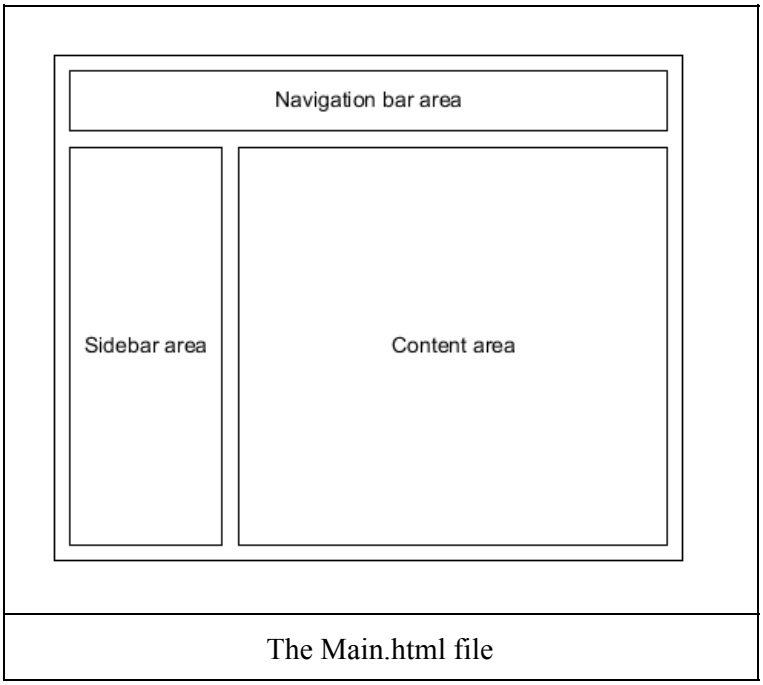


Fault detection, diagnosis and resolution.

As for the visualization of an alarm, a responsive panel have been created. This panel have been placed on the building page, and is reused on on the alarms page, see figure **g)** and **h)**. The only difference here is data given to the panel. On the alarms page the panel contains alarms of the entire system and when viewing a building it does only contain alarms for that building. As mentioned, an alarm contains information of its origin. Firstly, it as a alarm number which refers to feature which sat of the alarm. This number have then also been translated into a description of the cause. Further does the panel contain a graph visualizing the consumption the day it was raised, and the visualizing the closest normal consumption profile of the building on which it was raised. This should give the user a good opportunity to figure out what the probable cause could be. Lastly in the right bottom of the alarm, there have been left out room for the buttons needed to handling an alarm, which as mentioned earlier have been left out of the project scope.

The HTML structure

The figure below shows the structure of the *main* HTML file. This file have been divided into three areas. Further have functionality to been added to establish a session with the backend been added. The idea is that the this structure will remain the same throughout all pages of the website. When navigating from one page to another only the content of the content area changes.

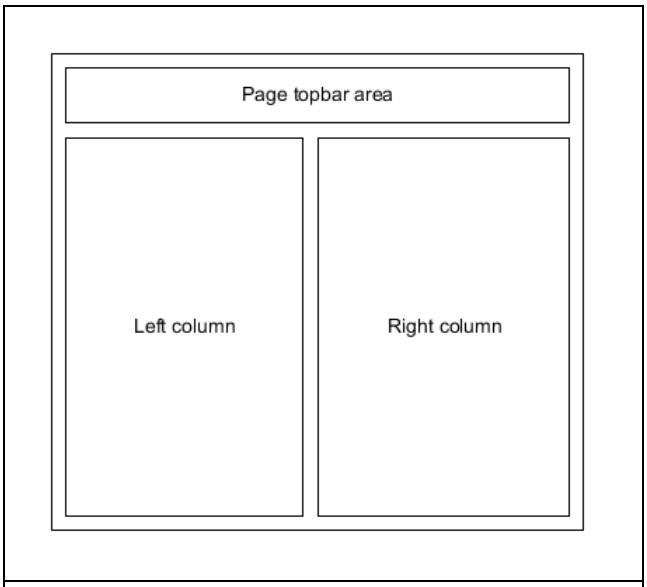


Home page

The home page, only contain a single panel with tabs. This page has a reference to the HomePage.js javascript file, which handles the interaction with this page.

Viewing a building

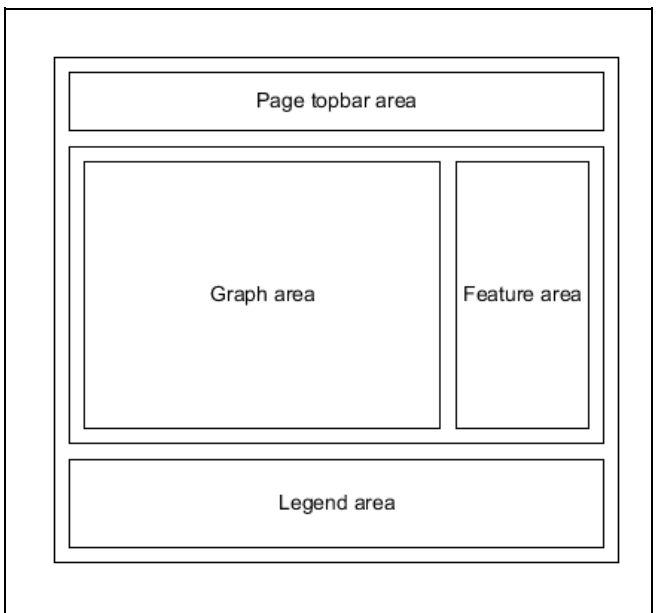
The below diagram show the structure of the html file for viewing a building. This page have been divided into three areas. The top area is intended to the consumption type navigation, at which the user can change which consumption is currently viewed. The additional two areas is columns for the panels displaying information. Lastly, this html file have a reference to the BuildingViewer.js javascript file which handles all interaction with this page.



BuildingViewer.html

Comparing buildings

The below diagram shows the html structure of the comparison page. This page have been divided into three areas. The top area on this page is the same as on the building viewer. The middle area, have further been divided into two areas; one for the graph, and one for the list of features to compare with. The last area is intended for legend items. Lastly, this page have a reference to the Compare.js javascript file. This file handles the creation and interaction with the graph, as well as the control of the interaction with the page.



Compare.html