



SmartEnerx Dashboards User guide

Release 1.0

Dashboard Training & Documentation

July 2020

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Introduction

This document is a user guide for the SmartEnerx tool that the user can follow to use and interact with the application as well as a detailed description of the features and parameters used to build each panel.

Dashboard User Guide

About the tool

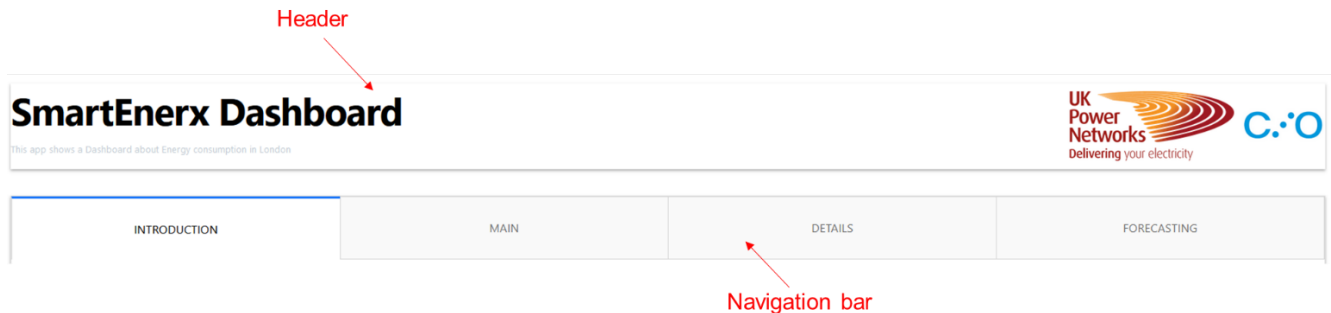
SmartEnerx is a visualization tool designed to provide a graphical representation of the historical daily energy consumption of households in London from November 2011 to February 2014. This application is very flexible and allows the user to display information about various ACORN categories and groups, within a specific period or season of interest.

SmartEnerx integrates a high-accuracy forecasting model that can be used to predict the daily energy consumption of one category and its groups of interest, in a defined forecast horizon. It gives the user the possibility to compare the performance of different models by changing the values of the most relevant hyperparameters.

Overview of the application and layout

This section gives a brief description of the Overview and Application Layout

Header and top navigation bar




The application header includes the corresponding title, its main purpose, and the main institutions related to its development.

The navigation tabs below the header can be used to navigate across the different tabs or panels of the application, changing the content area and its corresponding filters.

SmartEnerx is composed of four panels: the introduction to the tool, the main dashboard panel, a panel with specific details of the household energy consumption by the ACORN group, and the forecasting panel.

Introduction tab

The introduction tab includes a brief description of the content and functionalities of each tab.

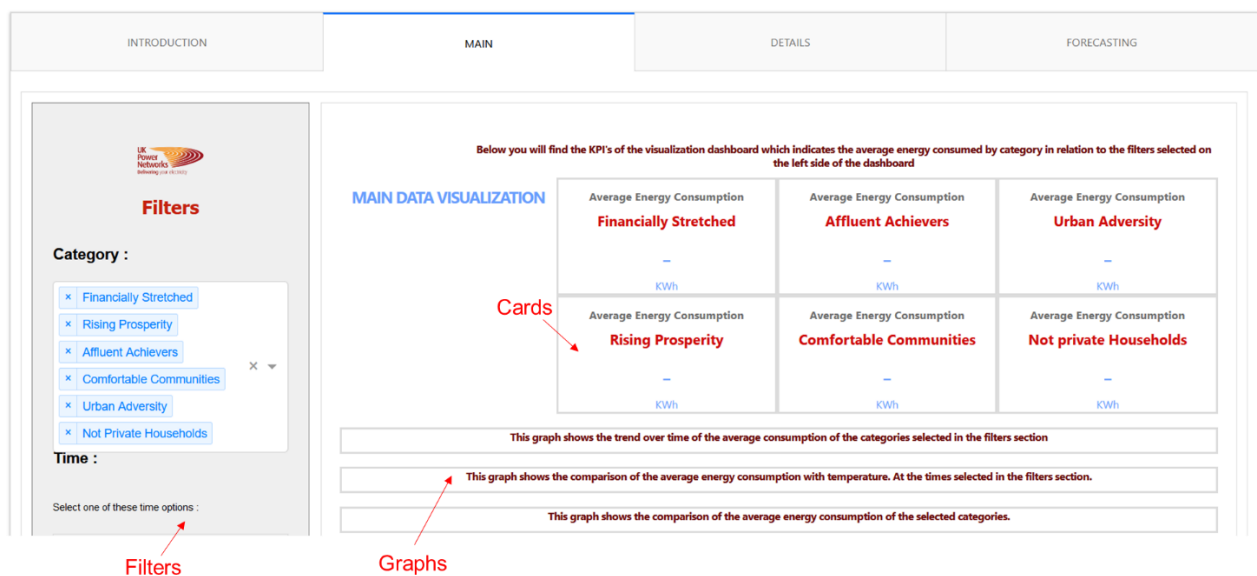
INTRODUCTION	MAIN	DETAILS	FORECASTING
<div><p>This app is composed in 3 sections:</p><p>MAIN</p><p>DETAILS</p><p>FORECASTING</p></div>		<h3>Dashborad Details</h3> <p>In the first tab, you will find different figures and charts that shows the historical behaviour of households energy consumption by ACORN category. All charts could be filter by season or by time period. Just select the category, season, or time period you want to see, and click on "Process". All charts will updated automatically. At the top, you will find KPIs with the mean energy consumption per category. Scrolling down, you can see the historical data of daily energy demand of the selected category. If you selected more than one category, they will be displayed here in different colors. And, a chart with the relationship between temperature and daily energy consumption per category, which shows as the temperature decreases, the energy consumption increases. Nevertheless, regardless of temperature, the largest consumers of energy are the affluent achievers.</p> <p>On this tab shows two graphs detailing the energy consumption of the groups in the selected category. It can be displayed by season of the year or by a specific date range to carry out the respective analysis.</p> <p>Here, you could adjust and create a forecast model in order to obtain a prediction of the daily energy consumption for your category and group of interest, considering in advance the effect of metereological variables on consumption. Just indicate the number of periods in future that you want to predict, the category of interest, adjust the hyperparameters and that's all, you will have a forecast of the households energy consumption. At the top will be the forecast time serie for the ACORN category, as well as a graphic with the behaviours of the historical tendency and sesonality. At the bottom, there will be the same information for each selected group. If you have selected more than one group, each will be displayed in a different color.</p>	

This tab is loaded by default by the application to give the user a piece of additional information on how to use it and what to expect from each tab.

Main Tab

On the main tab, there are three main elements:

1. Filters: this allows the user to display the information by the categories and period of interest.
2. Cards: display the most important Key Performance Indicators (KPIs) of the household energy consumption by category.
3. Graphs: display the filtered information in three graphs
 - a. Trend over time of the daily average consumption of the selected categories.
 - b. Comparison of the average daily energy consumption with the mean temperature.
 - c. Comparison of the mean daily energy consumption between the selected categories on the period.



Filter options

This image provides a detailed view of the filter options. The 'Category' section shows the same six tags as the main dashboard. The 'Time' section includes a radio button for 'Seasons' (selected) and a radio button for 'Date'. Below the radio buttons is a dropdown menu with four options: 'Spring', 'Summer', 'Autumn', and 'Winter'. At the bottom, there is a date range selector with '01/01/2013' and '03/20/2014' separated by a right arrow, and a 'PROCESS' button at the very bottom. Red arrows point from the labels 'Category' and 'Time' to their respective sections.

The filter options are divided into two main elements:

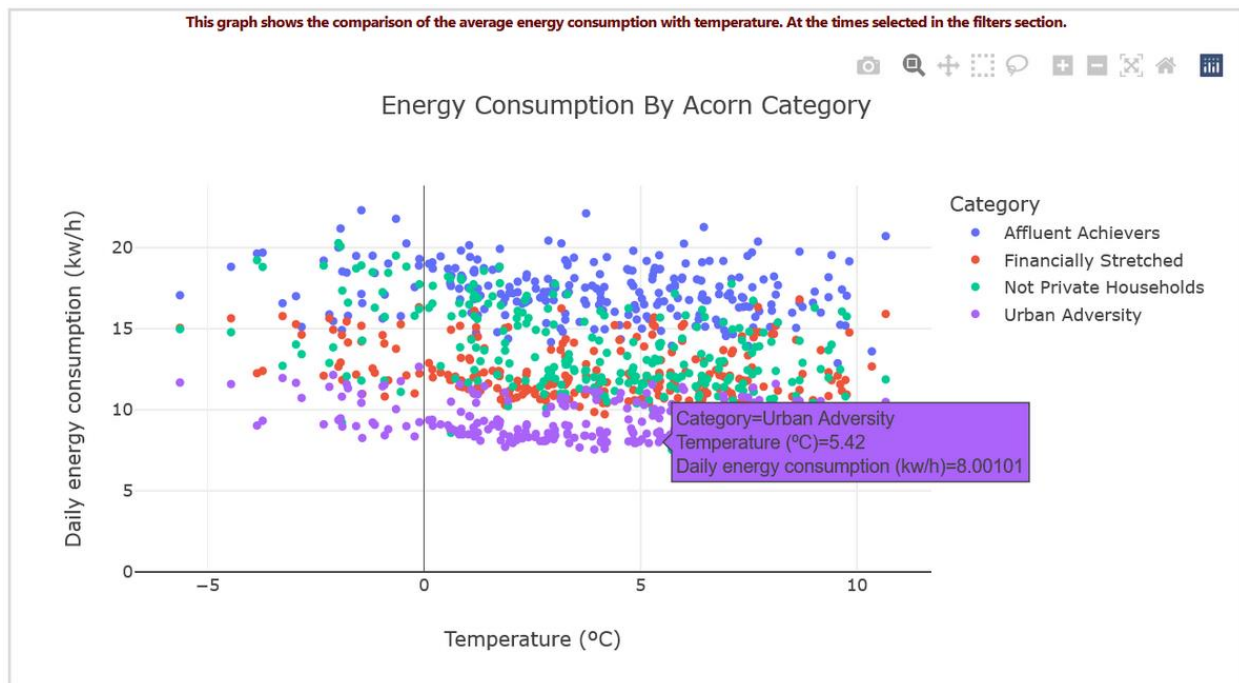
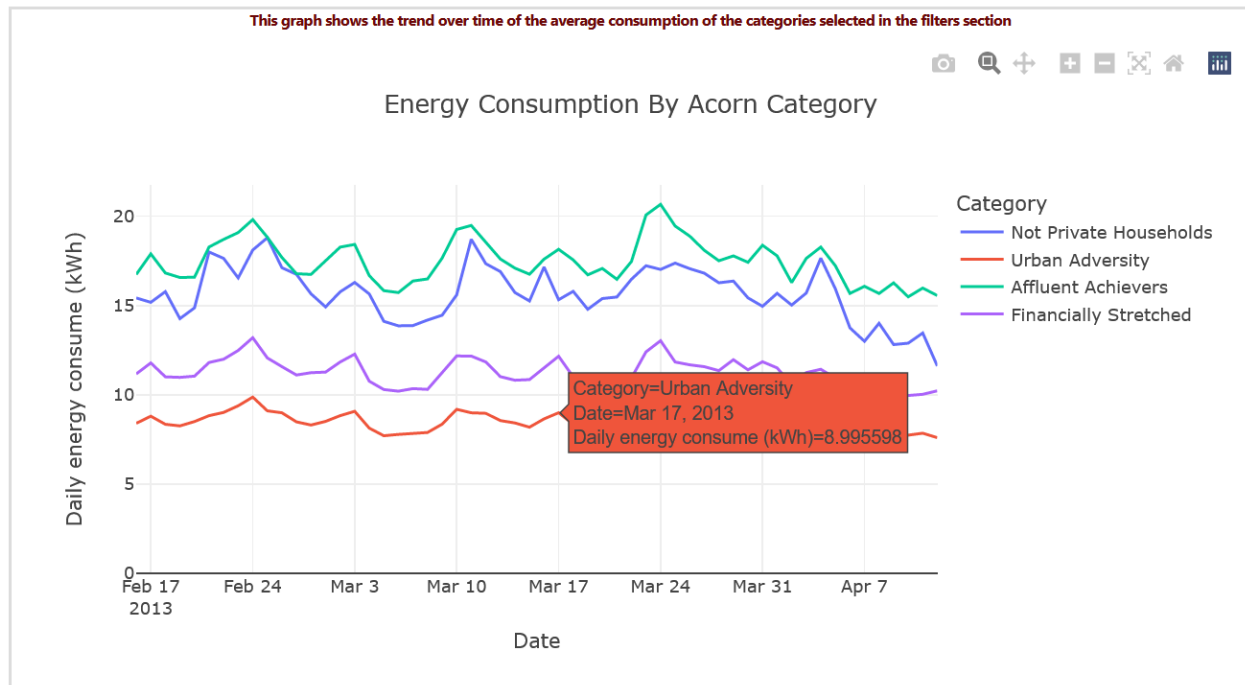
1. Category: where the user selects the categories of interest
2. Time: which can be filtered by season or by date.
 - a. By season the user is allowed to select the corresponding seasons of interest.
 - b. By date, a calendar picker is displayed, and the user can select between two specific dates.

The screenshot shows the 'Filters' section of the UK Power Networks website. Under the 'Category' heading, several tags are visible: 'Financially Stretched', 'Rising Prosperity', 'Affluent Achievers', 'Comfortable Communities', 'Urban Adversity', and 'Not Private Households'. The 'Time' section has two radio buttons: 'Seasons' and 'Date'. The 'Date' option is selected, and a calendar picker is displayed for January, February, March, and April 2013. A red arrow points to the 'Date' radio button with the label 'By date'. Another red arrow points to the calendar grid with the label 'Calendar picker'. At the bottom of the filter panel, a date range is shown: '01/01/2013' to '03/20/2014'. Below this, it says 'You have selected: Start Date: January 01, 2013 | End Date: March 20, 2014'. A blue 'PROCESS' button is at the bottom.

Finally, to show the graphs the application needs user authorization, thus is necessary that the process button is clicked.

This screenshot shows the same 'Filters' interface as the previous one, but with a different date range selected. The 'Date' radio button is still selected. The date range is now '02/16/2013' to '04/12/2013'. Below this, it says 'You have selected: Start Date: February 16, 2013 | End Date: April 12, 2013'. A red hand cursor is pointing at the blue 'PROCESS' button at the bottom.

Some of the output graphs displayed on the tab:



Details Tab

On the detail tab, two graphs are displayed with the detailed behavior of the daily energy consumption by each group. Although the structure is like the main tab, the filters and graphs are different. In this case for each ACORN category, its corresponding groups are available to select.

The screenshot shows the 'DETAILS' tab of the UK Power Networks website. On the left, under the 'Filters' section, the 'Category' is set to 'Affluent Achievers'. Below this, there are radio buttons for 'Affluent Achievers' (selected), 'Comfortable Communities', 'Financially Stretched', 'Urban Adversity', and 'Rising Prosperity'. A red arrow labeled 'Filters' points to the 'Rising Prosperity' option. On the right, there are two text boxes describing the graphs: 'The first graph shows us the difference in daily energy consumption for the groups selected in the filters section.' and 'The second graph indicates the trend over time of energy consumption.' A red arrow labeled 'Graphs' points to the first graph description box.

1. Filters: to select the groups and period of interest.
2. Graphs: display the filtered information in two graphs
 - a. Difference in daily energy consumption of the groups
 - b. Daily trend of the energy consumption by group

This screenshot shows the 'Filters' section with three red annotations: 'Category' pointing to the 'Category:' label, 'Time' pointing to the 'Time:' label, and 'Groups' pointing to the 'Select a group' dropdown menu. The 'Category' section includes radio buttons for 'Affluent Achievers' (selected), 'Comfortable Communities', 'Financially Stretched', 'Urban Adversity', 'Rising Prosperity', and 'Not Private Households'. The 'Time' section has a 'Select one of these time options:' label, with 'Seasons' selected over 'Date'. Below this are buttons for 'Spring', 'Summer', 'Autumn', and 'Winter'. At the bottom, there is a date range selector showing '01/01/2013' to '03/20/2014'. A blue 'PROCESS' button is at the very bottom.

In this case, the user can select between the different groups that belong to each ACORN category.

The time selection works like the previous tab, with the opportunity to select between seasons of interest or specific dates.

UK Power Networks
Delivering your electricity

Filters

Category :

☒ Affluent Achievers ☐ Comfortable Communities ☐ Financially Stretched
☐ Urban Adversity ☐ Rising Property ☐ Not Private Households
☒ Executive Wealth ☒ Mature Money

Time :

Select one of these time options :

☐ Seasons ☒ Date

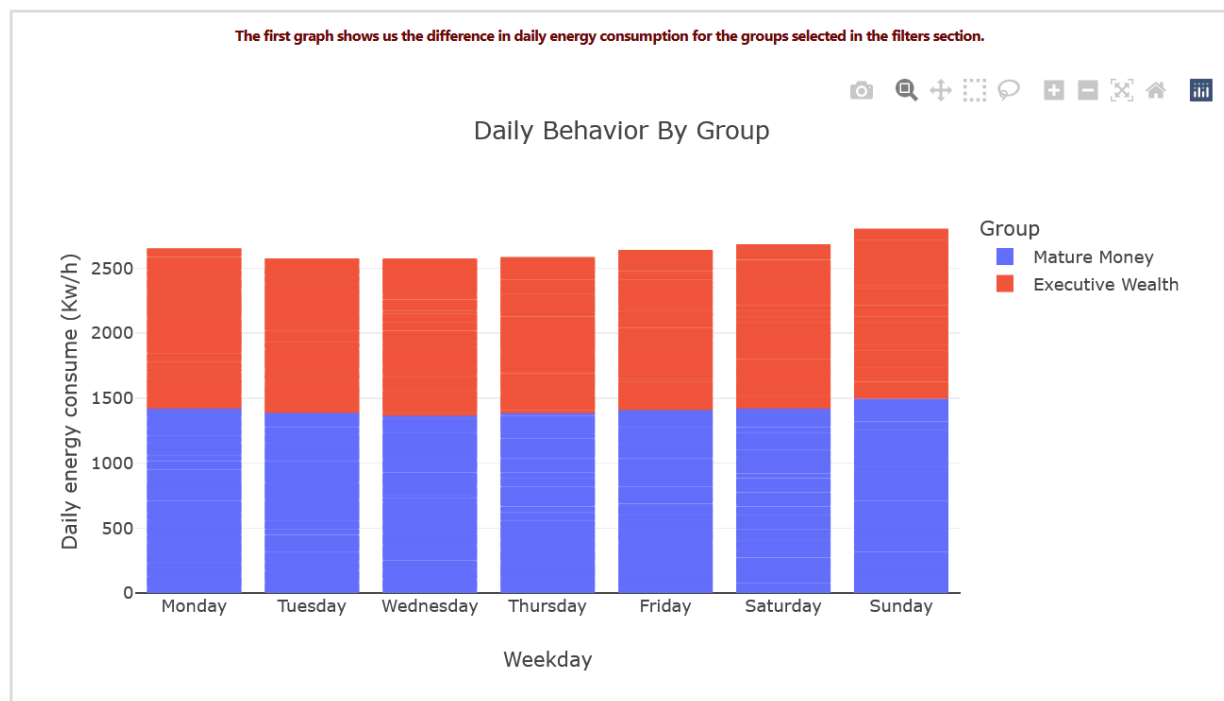
01/01/2013 → 03/20/2014

You have selected: Start Date: January 01, 2013 | End Date: March 20, 2014

PROCESS

Similarly, to the previous tab, it is necessary to click on the process button to display the graphs.

Some of the output graphs displayed on the tab:



Forecast Tab

On the forecast tab, the Prophet time series forecasting model was used to predict the daily energy consumption of the specified ACORN category and the groups of interest.

The historical data with the obtained forecast is displayed for both the selected category and its groups, having selected the custom hyperparameters and the forecast horizon.

The screenshot shows the 'FORECASTING' tab of a web application. At the top, there are four navigation tabs: 'INTRODUCTION', 'MAIN', 'DETAILS', and 'FORECASTING'. Below the tabs, a paragraph explains the Prophet time series forecasting model. A link 'Here' is provided. Below this, a section titled 'Filters' contains a 'Category :' label and two radio buttons: 'Affluent Achievers' (selected) and 'Comfortable Communities'. To the right of the filters, there are two identical placeholder boxes for graphs. Red arrows point from the text 'Category graphs' to the top placeholder and from 'Group graphs' to the bottom placeholder. The placeholder text describes the projection of average energy consumption and the behavior of the trend and seasonality graphs.

On this tab, the Prophet time series forecasting model was used to predict the daily energy consumption of the specified ACORN category and the groups of interest. The documentation of the model with the details of its implementation procedure can be found : [Here](#)

Main hyperparameters can be adjusted to effectively tune the category model, such as the trend and seasonality flexibility. It is also possible to change the forecast horizon and display its outcome with the selected uncertainty level. The displayed forecast of each group is the result of a model fitted with the optimum hyperparameters; these were obtained by applying the grid search method using cross-validation for each group dataset. The high-quality forecast is displayed with its uncertainty interval (error bands) and its corresponding historical data on the time series plot. In addition, the trend and yearly seasonality time components of the forecast of each category and group are included on the tab.

Filters

Category :

☒ Affluent Achievers

☐ Comfortable Communities

Category graphs

Projection of average energy consumption by category selected in the filters section.

Trend graph: Shows the behavior of the trend over time shown in the upper graph.

Seasonality graph: Shows how seasonality is affected over time with respect to the average value of energy consumption shown in the upper graph.

Group graphs

Projection of average energy consumption by category selected in the filters section.

Trend graph: Shows the behavior of the trend over time shown in the upper graph.

Seasonality graph: Shows how seasonality is affected over time with respect to the average value of energy consumption shown in the upper graph.

Filters

1. Filters: allows selecting a category and groups of interest with custom hyperparameters.
2. Graphs: Two types of graphs are displayed, historical data with the forecast and the trend and yearly seasonality time components of the forecast.

The screenshot shows the 'Filters' section of the web application. It includes a 'Category :' label with three radio buttons: 'Affluent Achievers' (selected), 'Comfortable Communities', and 'Financially Stretched'. Below these are three more radio buttons: 'Urban Adversity', 'Rising Property', and 'Not Private Households'. A text input field labeled 'Select a group' is also present. Below the filters, there is a 'Hyperparameter Model :' section with a 'Select the hyperparameter needed :' label. This section contains four sliders: 'Confidence interval' (0 to 95), 'Forecast period (days)' (0 to 180), 'Flexibility of the trend' (0.025 to 0.5), and 'Flexibility of the seasonality' (0.025 to 1.0). A 'PROCESS' button is at the bottom. Red arrows point from the text 'Category' to the category radio buttons, from 'Groups' to the 'Select a group' input field, and from 'Hyperparameters' to the hyperparameter sliders.

Filters

Category :

☒ Affluent Achievers ☐ Comfortable Communities ☐ Financially Stretched

☐ Urban Adversity ☐ Rising Property ☐ Not Private Households

Select a group

Hyperparameter Model :

Select the hyperparameter needed :

Confidence interval: 0 25 50 75 85 95

Forecast period (days): 0 30 60 90 120 150 180

Flexibility of the trend: 0.025 0.1 0.5

Flexibility of the seasonality: 0.025 1.0 10

PROCESS

Category

Groups

Hyperparameters

There are four Hyperparameters that can be adjusted:

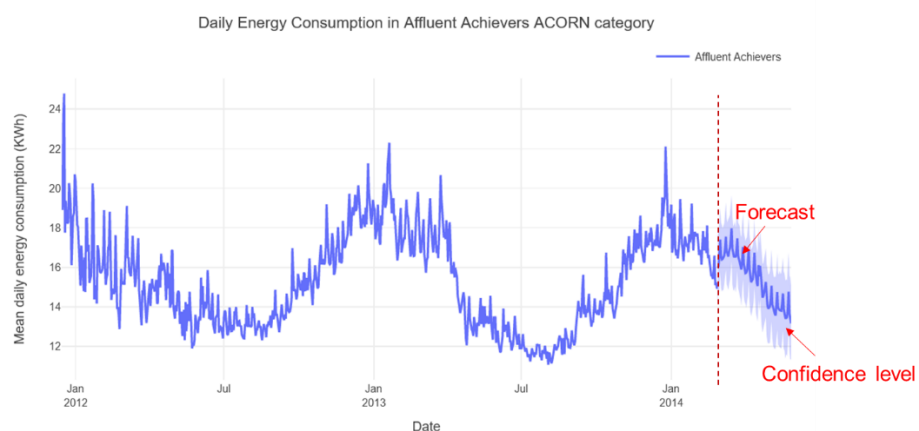
1. Confidence interval: uncertainty range (both for group and category models).
2. Forecast period: days to be forecasted (both for group and category models).
3. Flexibility of the trend: hyperparameter that affects the trend of the category model.
4. Flexibility of the seasonality: hyperparameter that affects the seasonality of the category model.

All the hyperparameters have a predetermined value that is loaded with the application, but the user has a defined range of values in which these hyperparameters can be settled to the category model. **It is important to consider that the forecasts made by the group models had the optimum parameters previously found for each model.**

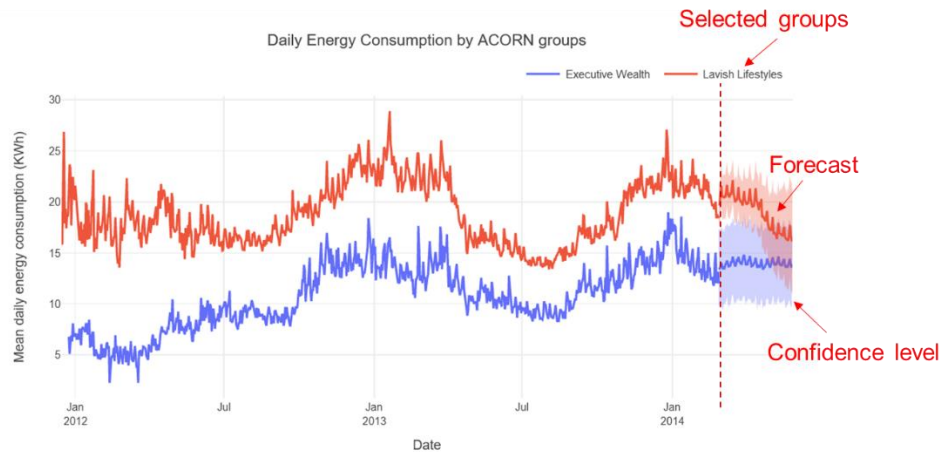
The forecast is displayed right after the end of the historical data, to clearly distinguish the forecasted values the uncertainty range is included in the graph.

Similarly, to the previous tab, it is necessary to click on the process button to display the graphs.

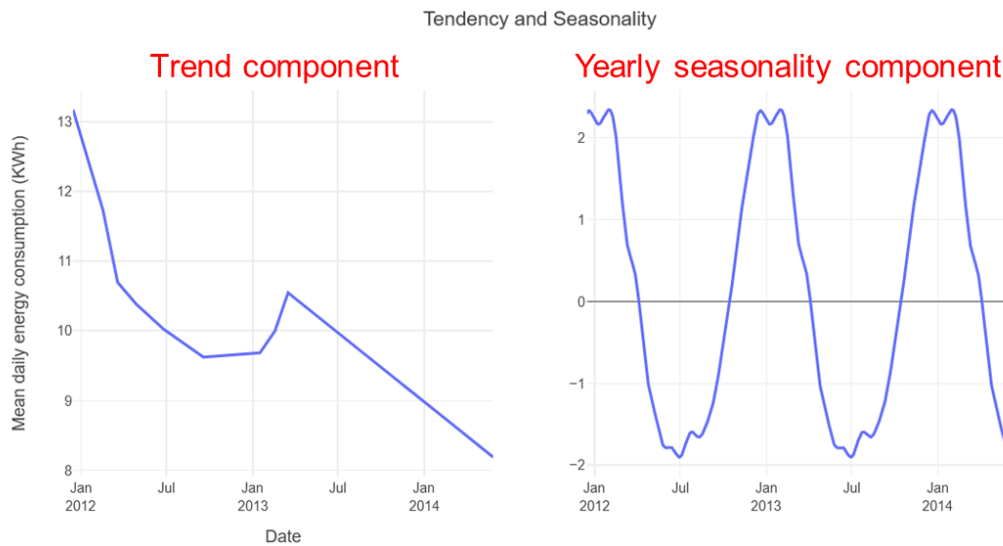
Some of the output graphs displayed on the tab:



The layout of the graph is similar between the category and the groups models. The forecast is displayed with the corresponding uncertainty level.



Also, the time components of the forecast are presented both for the selected category and the groups of interest. Below is presented the graph of the trend and yearly seasonality that will be displayed for the selected category.



Graphs

Since all the graphs are built with plotly graphing library, which has integrated some tools to interact with the visualization, allowing to zoom in it or exporting it in a .png format.

Download plot

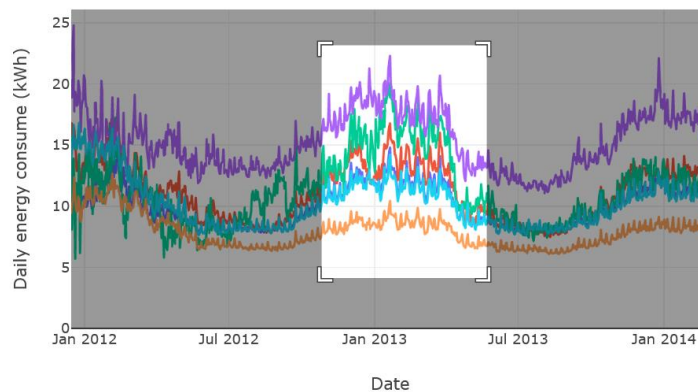


Navigate in the graph

Zoom

For example, it is possible to zoom in a specific region of the graph.

Energy Consumption By Acorn Category



Energy Consumption By Acorn Category

