A holistic framework for Empowering SME's capacity to increase their energy efficiency

Project: **SMEmPower Efficiency**

Deliverable number: **4.3**

Deliverable Name: **Tools to upload energy readings**

Document Properties	
Dissemination level	Public
Lead beneficiary	Aristotle University of Thessaloniki (AUTH)
Prepared by	University of Western Macedonia (UoWM) 21/12/2020
Checked by WP leader	University of Western Macedonia (UoWM) 22/12/2020
Approved by Project Coordinator	30/12/2020
Submission due date	31/12/2020
Actual submission date	31/12/2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847132

Document History

Version	Date	Contributor(s)	Description
1.0	21/12/2020	Stavros Filippidis, Angelos Bouchouras, Georgios Christoforidis	First draft
1.1	22/12/2020	Stavros Filippidis, Georgios Christoforidis	Final draft
1.2	28/12/2020	Dejan Tasić	Reviewed
1.3	29/12/2020	Timea Farkas Levente Czumbil Dan Micu	Reviewed
2	30/12/2020	Stavros Filippidis	Second draft
2.1	30/12/2020	Ioanna Pasiopoulou Grigoris Papagiannis	Final

List of Acronyms

Acronym	Meaning
D	Deliverable
LU	Learning Unit
M.U.	Monetary Units
M&V	Measurement & Verification
M&T	Monitoring & Targeting

Table of contents

Table of figures

Executive summary

This deliverable presents the first part of the SMEmPower online tool, which is under development in the project to motivate SMEs to undergo energy audits and increase their energy efficiency through effective implementations, which will be also measured and verified. The online tool is divided into three parts which are: the data uploader, the M&T and the M&V tools respectively. The data uploader tool allows the user to upload measurements either as files or manually via the user interface which will later be used by the M&T and M&V tools. A part of this deliverable will be used also as guideline document for the users of the tool.

Introduction

SMEmPower will develop and implement a common E&T programme for energy professionals in eight (8) countries. In this programme, the energy professionals will access and use the online energy management M&T and M&V tools that will be developed in the project. This is to be achieved in part through uploading energy utility, production and other related data using a dedicated tool for this reason. These data will be enriched on the system to provide results. The complete online uploading tool can be separated in two parts, i.e. the data uploader and the manual logger respectively. Using the data uploader, the energy professionals can enter their energy readings to a template file, the readings are either taken from their meters or other kind of energy analyzers, their energy supplier's website or their bills; and upload the files to the SMEmPower efficiency tool. Using the manual logger, the SMEs' energy managers can manually add new energy readings using the user interface. They may add their electricity or fossil fuel consumption every month and their associated production. All the aforementioned information is stored correlated to the account already created on the project website. The user has the ability of updating the database on a regular basis and of keeping track of the readings, regarding both consumption and production, continuously.

1. General information

In order to access the tools or any protected material, the energy professionals must register on the website[1] as it has been previously presented in D4.2 "*Web platform and portal release*". By logging in, the user will be able to access all restricted tools that can be found under the Results -> Tools menu at the header of the website. All the online tools, that are also under development in the project are based on the offline excel tools that have been prepared earlier by the UTC and SERVELECT partners. Data entered to the tools is saved to the personal profile of each user and can be accessed and processed later.

1.1. Offline excel tool

The offline excel tool includes all three tools that will be developed online in the project. For this deliverable, only the three sheets that contain the part related to data importation are used.

The first sheet requires the user to input the monthly electricity consumption in MWh or other (de)multiplier and the cost of it in monetary units (M.U.) in a three-column table as depicted below.

[1] https://www.smempower.com

Month - Year	Consumption [MWh]	Cost [M.U.]
Jan/ 2019	4188,44	103347,48
Feb/ 2019	4231,88	103390,12
Mar/ 2016	5337,47	130585,81
Apr/ 2016	4653,74	113676,75
.	.	.

After data input, a table which presents the data in a more friendly way as a wider image is created together with a bar graph which illustrates the consumption of each month:

Update Data	Total Active Electrical Energy Consumption							
Month	2019		2018		2017		2016	
	Amount [MWh]	Cost [M.U.]	Amount [MWh]	Cost [M.U.]	Amount [MWh]	Cost [M.U.]	Amount [MWh]	Cost [M.U.]
January	4.010	125.037	3.869	89.626	4.411	98.542	4.188	103.347
February	3.741	115.608	4.373	101.242	4.198	92.488	4.232	103.390
March	5.355	166.251	5.190	122.508	4.891	109.094	5.337	130.586
April	4.525	140.369	4.915	120.858	4.842	107.443	4.654	113.677
May	4.630	142.572	5.063	124.892	4.433	98.573	4.434	102.094
June	4.662	143.506	5.668	139.549	5.430	116.992	4.579	106.131
July	5.195	155.916	5.582	138.727	5.728	127.002	5.574	129.321
August	5.102	153.736	5.854	147.183	5.683	127.127	4.894	113.442
September	NaN	NaN	4.200	109.407	3.765	83.898	3.484	83.184
October	NaN	NaN	3.662	95.511	3.745	81.589	3.487	81.811
November	NaN	NaN	3.938	102.271	4.363	97.394	3.783	83.444
December	NaN	NaN	4.049	105.765	4.022	90.480	3.833	83.202
Total	**37.220**	**1.142.994**	**56.363**	**1.397.540**	**55.510**	**1.230.623**	**52.480**	**1.233.630**
Average	4.653	142.874	4.697	116.462	4.626	102.552	4.373	102.803

Figure 1: Electrical energy consumption table

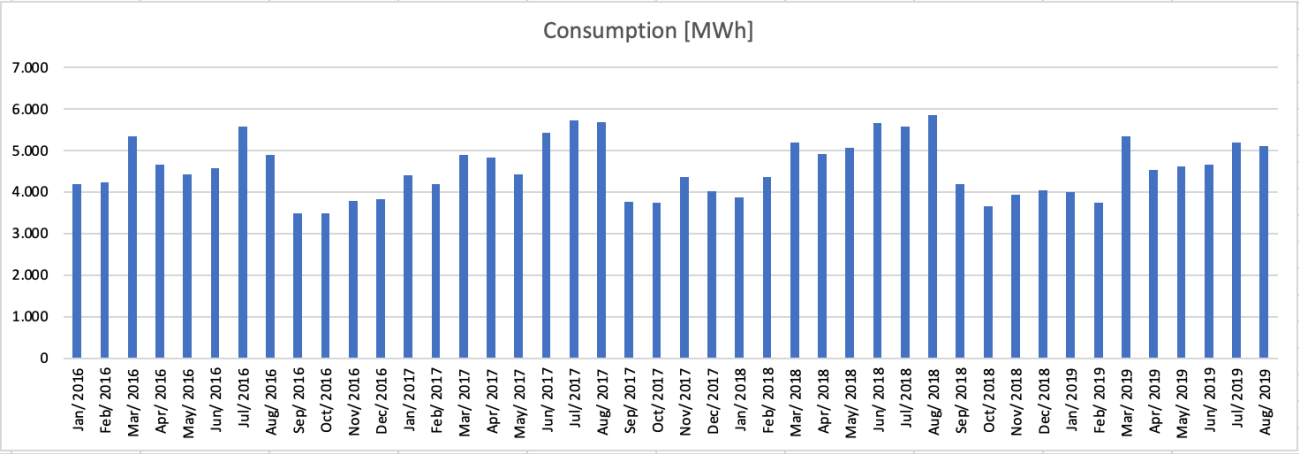

Figure 2: Electrical energy consumption graph

Similarly, the second sheet, which is named “Fossil Energy”, requires the user’s fossil fuel energy consumption and it creates graphical presentation of the data exactly as in the electricity consumption sheet.

In the third sheet, the user must enter the production data. The data that must be added must be aggregated in a single quantity prior entry. After the data input, the users must select a measurement unit. The under-development M&T and M&V tools need at least two consecutive years of data to work properly. After entering the data, a similar graph appears, which depicts the production of each month, for all available years, as shown in the following figures.

Please complete the table below with the monthy production for at least two consecutive years.

Please choose the unit of measurement for the production. [pieces]

Producție realizată											
Month	Quantity [pieces] 2009	Quantity [pieces] 2010	Quantity [pieces] 2011	Quantity [pieces] 2012	Quantity [pieces] 2013	Quantity [pieces] 2014	Quantity [pieces] 2015	Quantity [pieces] 2016	Quantity [pieces] 2017	Quantity [pieces] 2018	Quantity [pieces] 2019
January									2	4	5
February									5	5	7
March									5	5	7
April									6	5	8
May									5	5	8
June									7	5	7
July									8	5	6
August									9	5	6
September									8	5	6
October									8	5	8
November									9	5	9
December									4	5	6
TOTAL	0	0	0	0	0	0	0	0	76	59	83

Figure 3: Production table

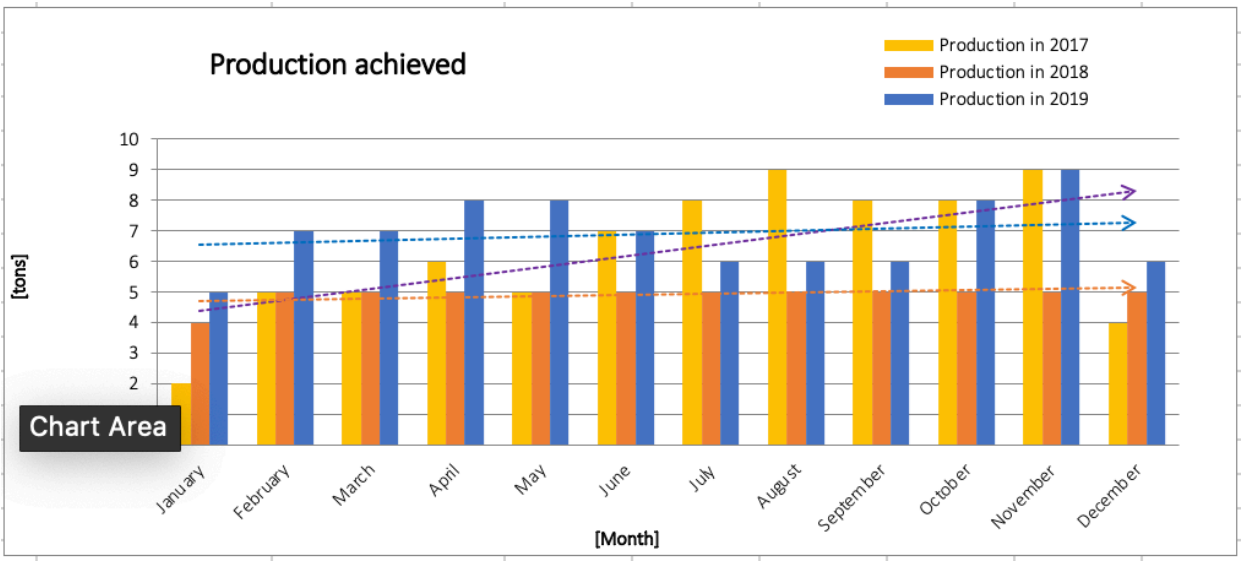

Figure 4: Production graph

2. Online tools interface

By selecting the “Tools” button in the “Results” tab, the user will be redirected to the tools page, which contains three different tabs.

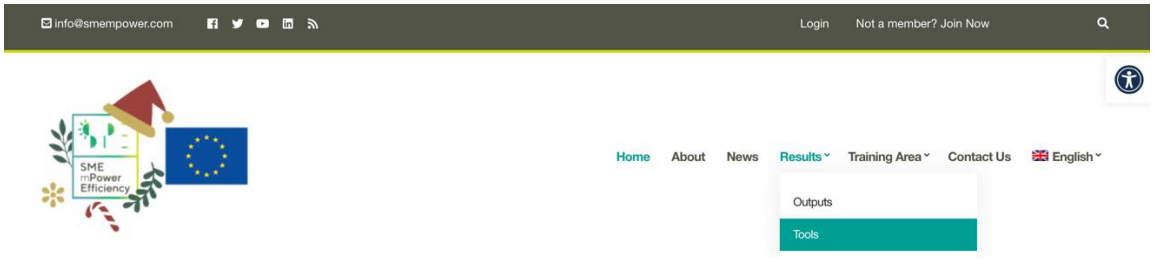

Figure 5: Tools button

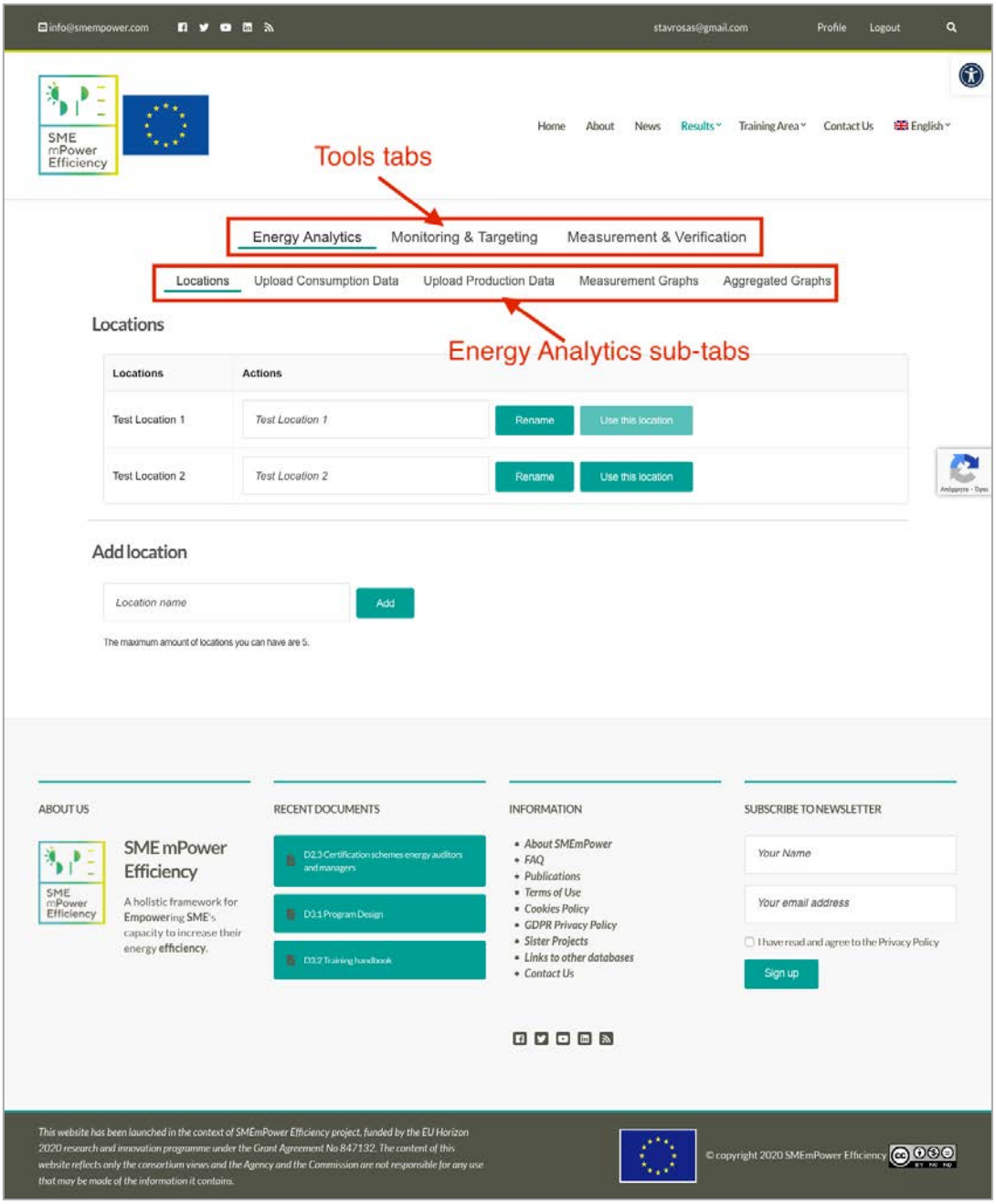

Figure 6: Tools page

The Tools tabs include 3 selections that are “Energy Analytics”, “Monitoring & targeting” and “Monitoring & Verification” respectively, which are the three tools that will be developed in the project. In the “Energy Analytics” tab, which is essentially the energy uploading tool, the users will be able to upload and visualize their data. The “Energy Analytics” tab is furthermore divided into four sub-tabs.

The first sub-tab is the “Locations” tab. The “Locations” tab grants the user the ability to set different locations. Each location can include different data. This feature is useful for the users, as it enables them to run studies for locations that do not share the same energy consumption or production. The

user may enter up to 5 different locations manually and rename the already configured locations. They may also set a location as a default, using the “Use this location” button, as depicted below.

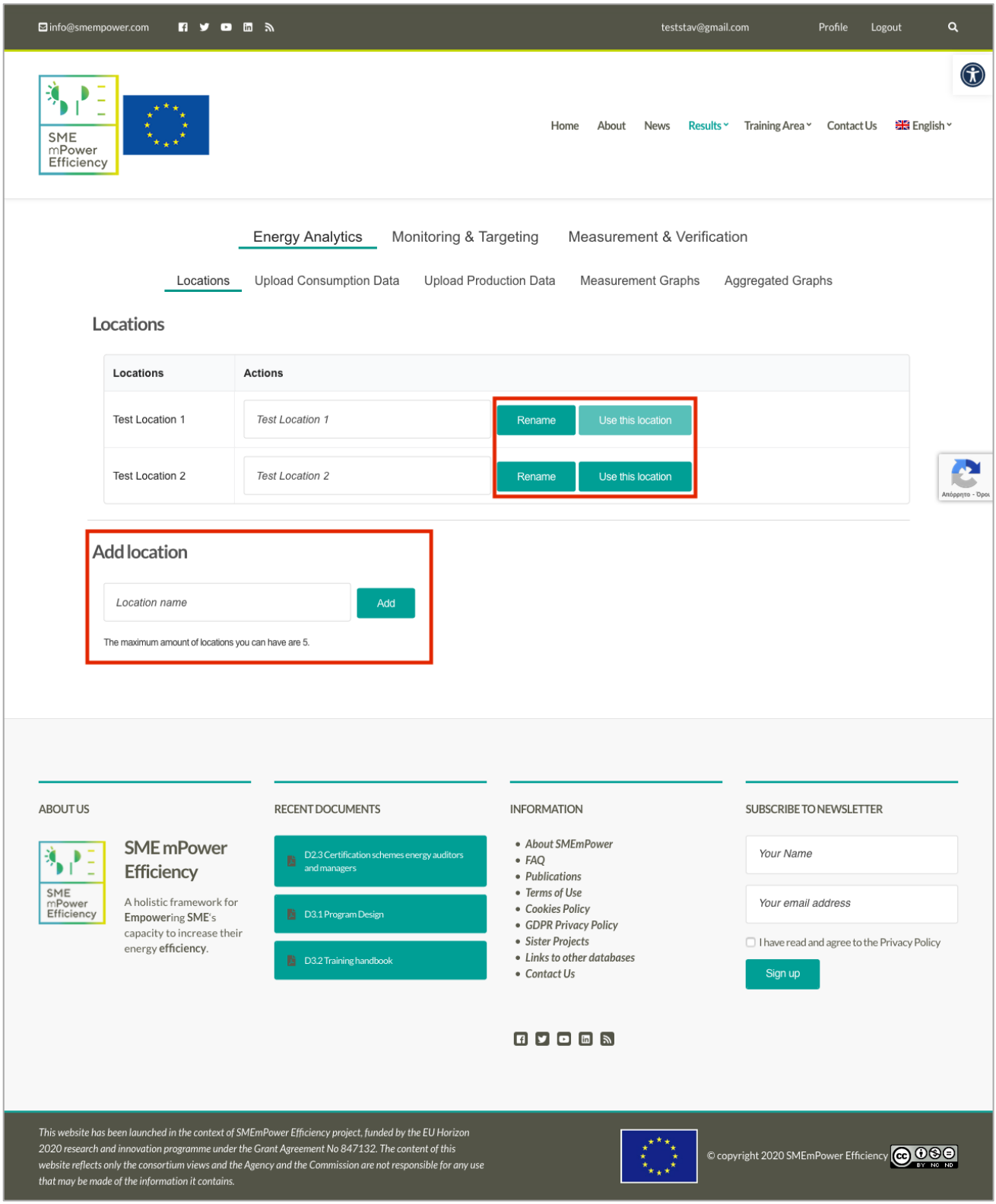

Figure 7: Locations sub-tab

The second sub-tab is named “Upload Consumption Data”. As the name suggests, in this sub-tab, the user will upload the electricity and fossil fuel consumption data and their costs. After selecting the sub-tab, at the top of the page, a table depicts the previously uploaded measurements where available. Below the table, there is the data uploader, which enables the user to download a template file, in .csv or .xlsx format, to fill in his measurements and upload it to the tool. Below the data uploader, the manual data logger appears. In this area, the user may select a location, the date, the consumption type (electricity or fossil) and the value of the consumption with its costs and submit the data manually. Already imported data may be changed using the manual data logger as well.

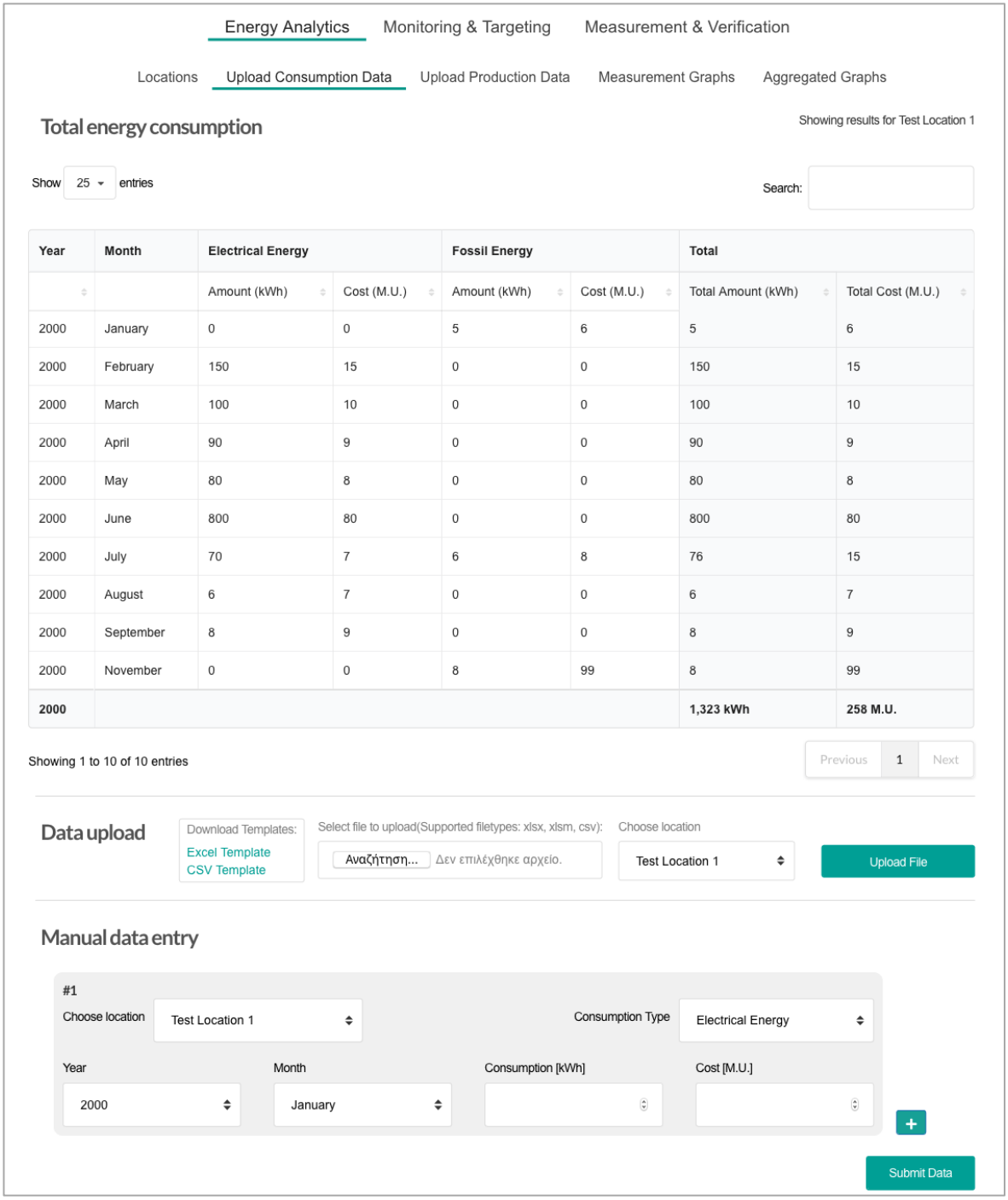

Figure 8: Upload consumption data sub-tab

The third sub-tab is called “Upload Production Data”. This sub-tab is similar to the second one, but instead of consumption data, the users upload their production data. Production data currently have no measurement unit. This is due to the fact that SMEs produce a plethora of different goods, thus, these goods need to be aggregated in some equivalent single unit to be used in the M&T and M&V tools. The aggregation process will be demonstrated during the courses and will be uploaded as a pdf guide on the portal. The user will have to aggregate the production offline and then upload the values to the online tools.

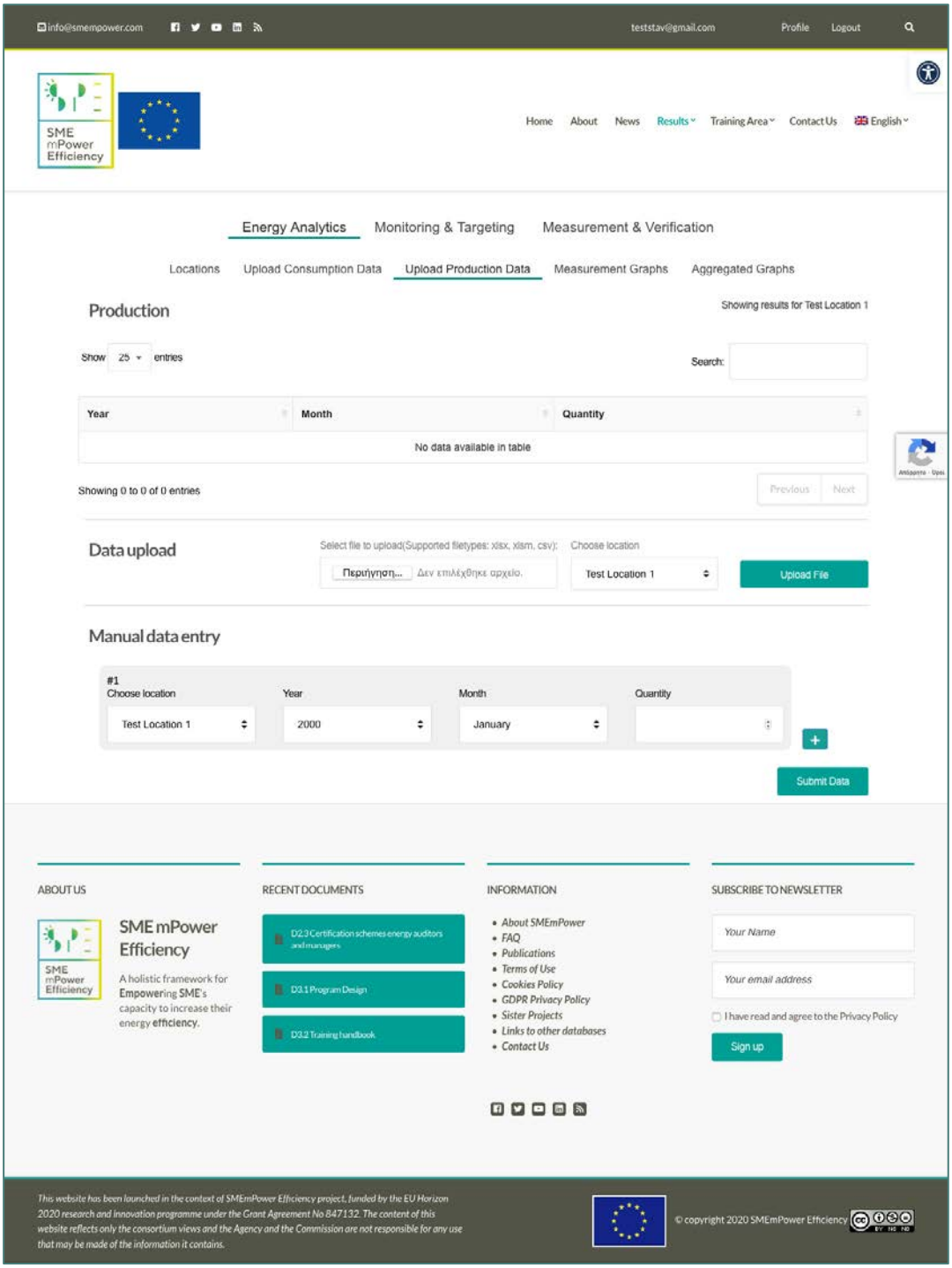

Figure 9: Upload production data sub-tab

In the fourth sub-tab, which is called “Measurement Graphs”, the electricity, the fossil fuels, the consumption and the energy cost readings of the user are visualized separately for each individual month that the user has uploaded. Additionally, if the user has entered data for a full year, the seasonal average is presented in a four-bar chart.

Figure 10: Measurement graphs sub-tab

In the final sub-tab, which is called “Aggregated Graphs”, the readings that the user has uploaded previously for their production and consumption, are summed by year and are presented in graph bars, similarly to the ones presented in the previous “Measurement Graphs” sub-tab. This sub-tab requires at least 2 years of consecutive data to present any results.

3. Uploading tools guide

- After logging in, navigate to the “Results” menu and select “Tools”:

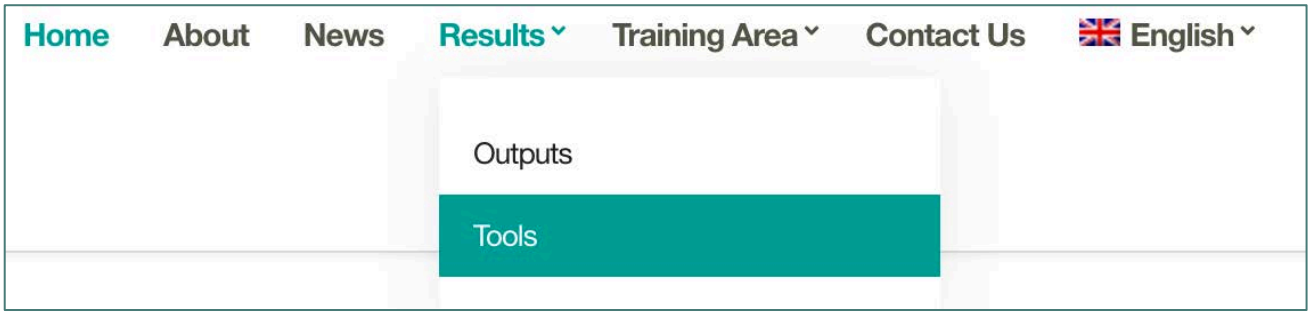

Figure 11: Results > Tools menu

- Type a location and name and click “Add”

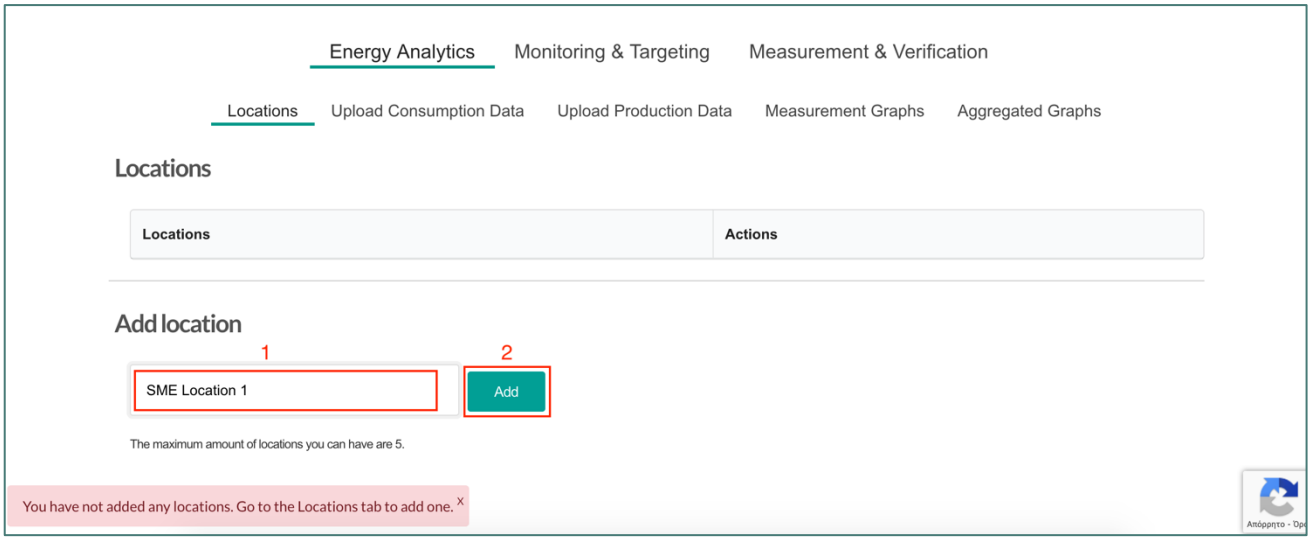

Figure 12: Adding a location using the locations tab

- The location is now stored and should be visible.

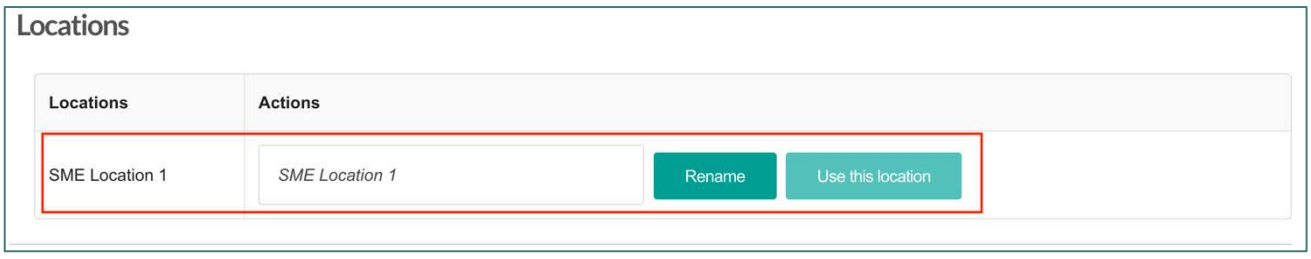

Figure 13: Test location

- Select the second sub-tab “Upload Consumption Data”. Either using the data uploader or the manual logger, add the available electrical and/or fossil fuel energy consumption data.

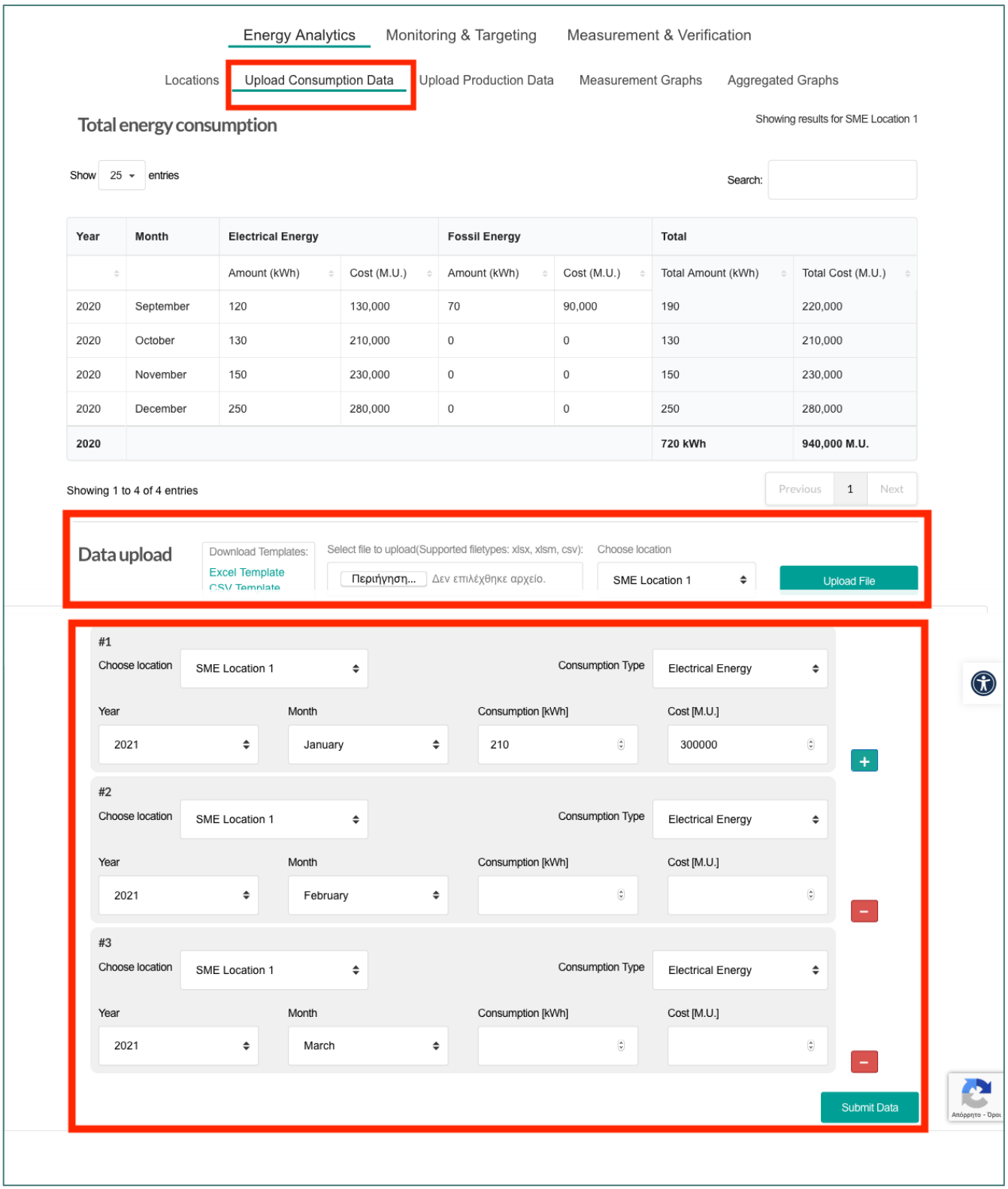

Figure 14: Adding consumption data

- Select the third sub-tab “Upload Production Data”. Either using the data uploader or the manual logger, add the available aggregated production data.

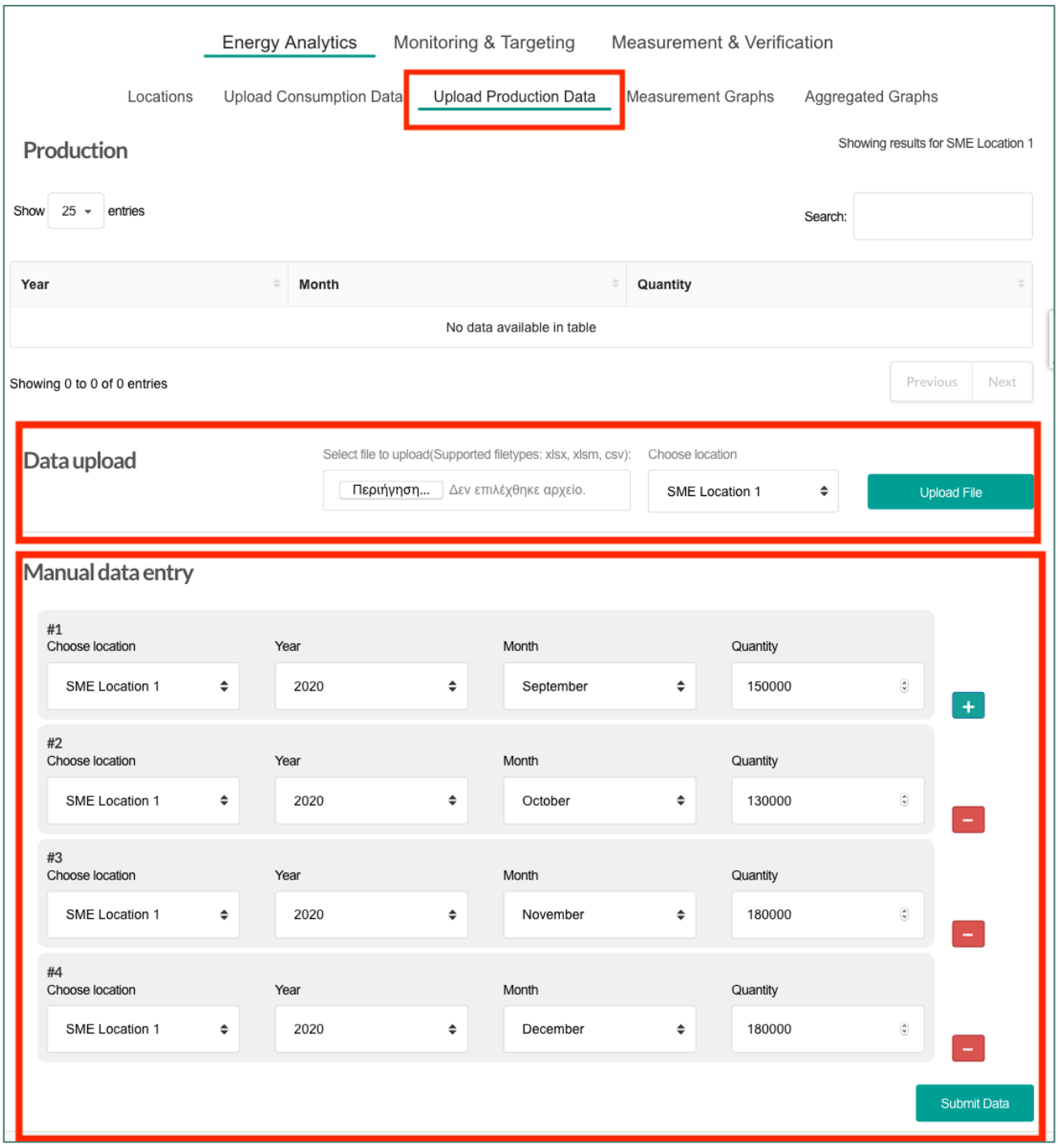

Figure 15: Adding production data

- To visualize the data, navigate to the “Measurement Graphs” and “Aggregated Graphs” sub-tabs.

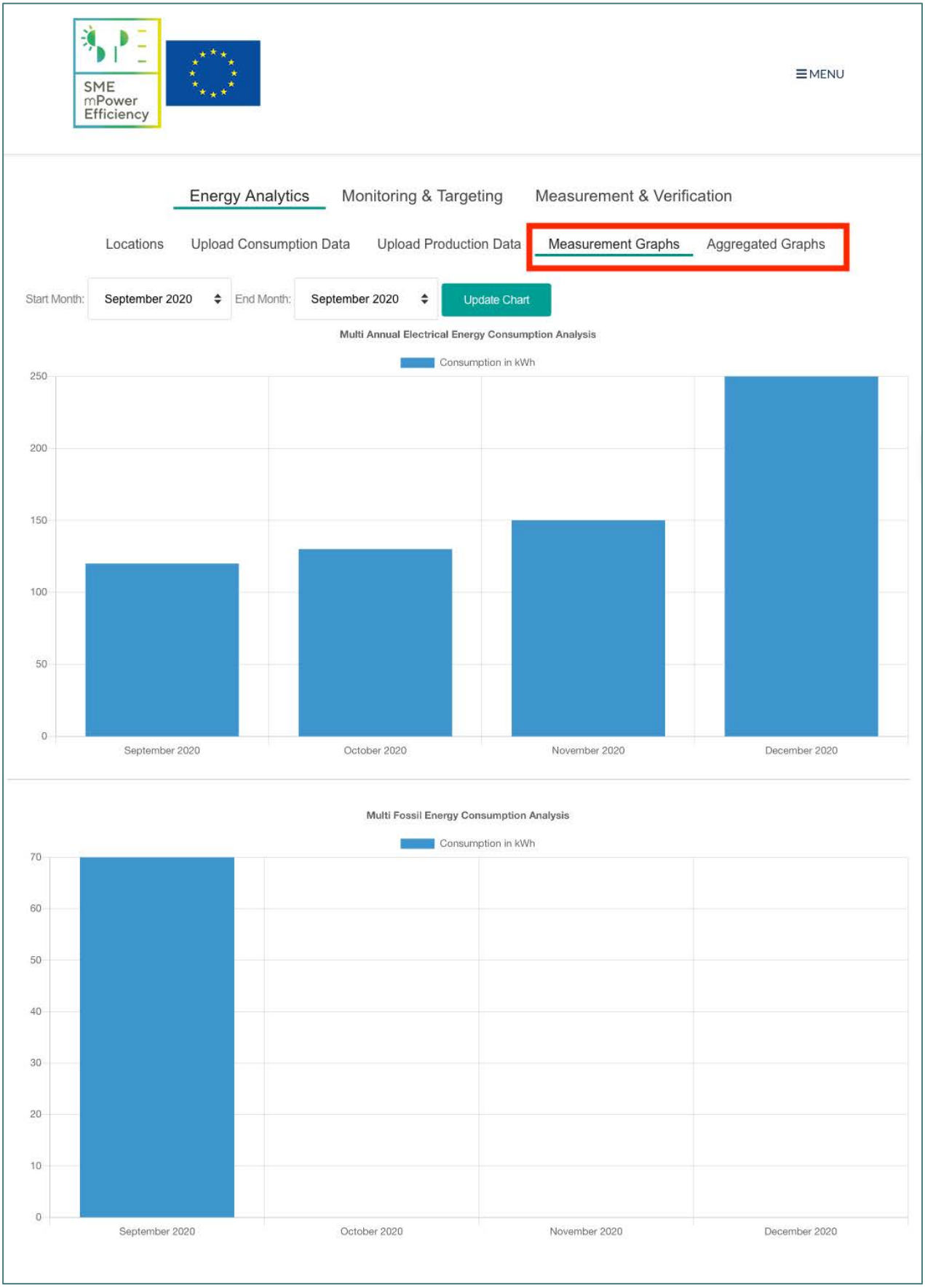

Figure 16: Visualizing data

4. Conclusions and further actions

This deliverable presents the first part of the SMEmPower energy analytics tool, which consists of three individual parts which will be developed and used in the project. The first part of the tool is developed for uploading and saving the user personal energy related measurements to the online database. Additionally, it allows the user to visualize the uploaded energy data using charts, keep track of the measurements and have an historical overview of both the consumption and production trends through time.

The tools will be updated, after receiving feedback during the SMEmPower E&T courses, which are now ongoing in the first edition in most of the consortium partner countries, by using real data from the selected SMEs pilot sites.