

e!Sankey

Hints for using the Live Link to Microsoft Excel

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1. Introduction	4
2. Named Cells for Live Links	4
3. Formulas for Calculating the Flow Values	6
4. Copying Excel Files or Worksheets	7
New Worksheet:	7
Switch to Other Excel File:.....	8
5. Excel worksheet for Live Links	10
Value Assignment using HLOOKUP function	11
Value assignment using INDEX function	13
Value assignment using INDIRECT function:.....	16
6. e!Sankey SDK for Integration and Automation	18

1. Introduction

Using the e!Sankey Live Link to Microsoft Excel you can keep your Sankey diagram up to date automatically, instead of changing values manually, e.g. for monthly reports. Thus the Live Link not only reduces the workload, but also helps you to avoid transcription errors.

The Live Link feature is explained in the e!Sankey user manual in chapter 11. This document provides additional hints how you can set up your Excel sheets and use functions in Excel to improve the usage of the Live Link.

2. Named Cells for Live Links

To protect your set Live Links against subsequent changes (e.g. newly inserted lines or rows) we recommend define names for the cells that you intend to link to. Instead of a reference to an absolute address (e.g. B2), the link then refers to the name of the cell (e.g. material A). Please note that it is essential to name the cells before you set the Live Links to e!Sankey.

Within Microsoft Excel there are two ways for naming cells: Either name a cell right after selecting it in the name box at the top left (see below, left screenshot). Or you can open the name manager through the context menu of a cell ("Define Name...") or via the tab "Formulas" (see below, right screenshot).

The cell names must be unique, i.e. the same name can not be used for more than one cell. They must not contain any spaces and are case-insensitive. By default, the name manager will suggest the text located in the cell to the left (if it contains a text).

Hint: In newer Excel versions you can use the command "Create from Selection" to assign a series of names.

For more details on names see <https://support.office.com/en-us/article/define-and-use-names-in-formulas-4d0f13ac-53b7-422e-afd2-abd7ff379c64>

	A	B
1	Energy consumption 2017	
2		
3		
4	Year	2017
5	Natural Gas TOTAL	3700
6	NG_steam_generator	2500
7	NG_oven	1200
8	Heat TOTAL	2700
9	H_oven	1700
10	H_halls	1000
11	Power Supply TOTAL	3200
12	P_pumps	1400
13	P_halls	1100
14	P_admin building	700
15	Energy TOTAL	9600

	A	B
1	Energy consumption 2017	
2		
3		
4	Year	2017
5	Natural Gas TOTAL	3700
6	NG_steam_generator	2500
7	NG_oven	1200
8	Heat TOTAL	2700
9	H_oven	1700
10	H_halls	1000
11	Power Supply TOTAL	3200
12	P_pumps	1400
13	P_halls	1100
14	P_admin building	700
15	Energy TOTAL	9600

New Name dialog box:
Name: Energy_TOTAL
Scope: Workbook
Refers to: =LiveLinks!\$B\$15

3. Formulas for Calculating the Flow Values

Using the Live Link you can not only update flow values in a Sankey diagram but also assign the result of an Excel formula.

These can be simple everyday formulas like e.g. sums or differences, but they can also be more advanced (e.g. sums, differences, IF-function, VLOOKUP), as will be pointed out in the following chapters.

When opening a Sankey diagram file that contains Live Links, or when explicitly updating the Live Links in an open diagram file (command "Update Live Links") then the formulas will be assessed, and the resulting values are used as flow quantity.

The image shows two overlapping windows. On the left is Microsoft Excel with a spreadsheet titled 'Energy consumption 2017'. The formula bar shows '=B5+B8+B11'. The spreadsheet data is as follows:

Year	2017
Natural Gas TOTAL	3700
NG_steam_generator	2500
NG_oven	1200
Heat TOTAL	2700
H_oven	1700
H_halls	1000
Power Supply TOTAL	3200
P_pumps	1400
P_halls	1100
P_admin building	700
Energy TOTAL	9600

On the right is the e!Sankey calc software window titled 'EnergyConsumption - e!Sankey calc'. It shows a Sankey diagram titled 'Energy consu' with a legend for Energy TOTAL (grey), Natural Gas (green), Heat (red), and Power Supply (yellow). The diagram shows a flow from 'Energy Total' to a node with a value of 9,600 kWh. The Properties panel shows the arrow's source as 'Energy Total' and destination as 'Energy Total'. The Flows table at the bottom is:

Entryname	LL	Quantity	Unit	Color
Energy TOTAL	←	9600	k	█

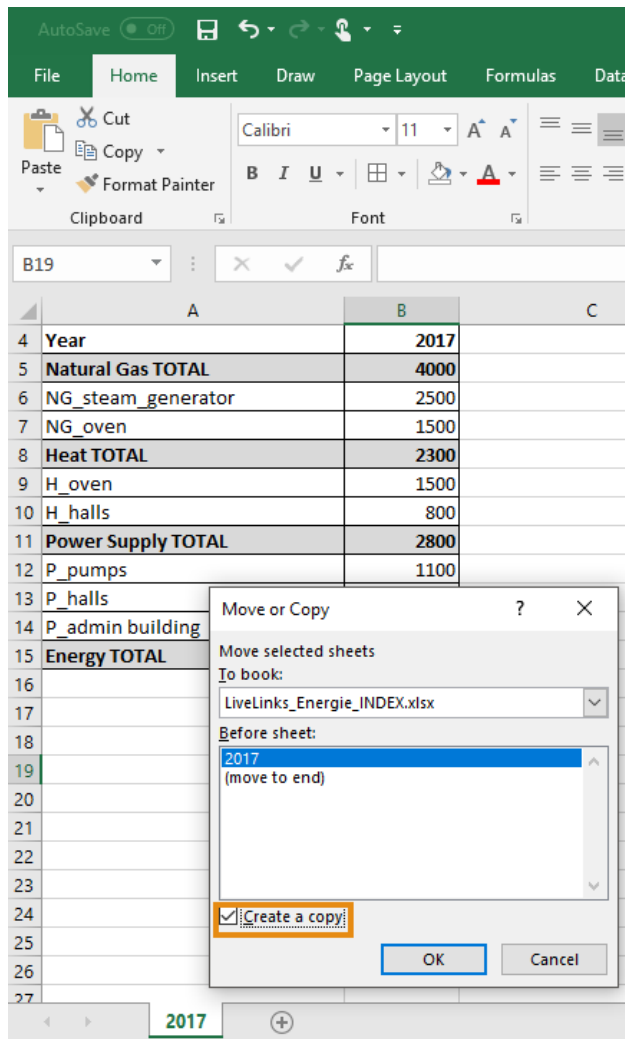
4. Copying Excel Files or Worksheets

Should you not have created a separate worksheet just for using as a target for the Live Link reference, but don't wish to overwrite the existing data when you get new values, there are several options how to tackle this:

New Worksheet:

In the Excel file copy the existing worksheet, in order to keep/backup the existing data. Once this has been done the original worksheet can be overwritten with new data. The Live Link references remain unchanged.

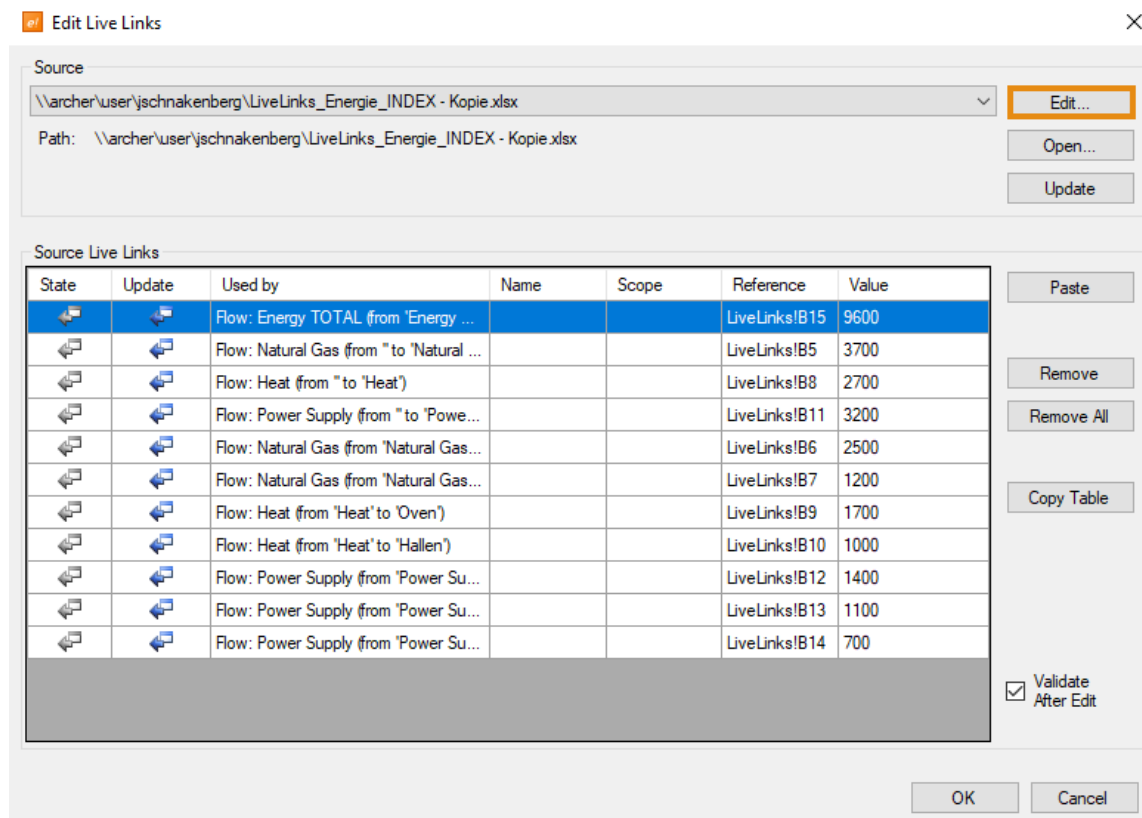
Should you wish to rename a worksheet but keep the Live Link references, make sure that e!Sankey with the diagram file that has the Live Links is open while you rename the worksheet in Excel. e!Sankey will "listen" to any changes made in Excel and thus will note the name change, updating the references with the new worksheet name.



Switch to Other Excel File:

Alternatively to the above, you can copy the whole Excel file, give it a new name, and then change the path for the Live Links data source to the new file. Since the worksheet has the same structure the cell addresses are identical, The Live Link references can remain intact, and data from the new (copied) file will be read.

To change the source file path, go to Menu Edit in e!Sankey and open the 'Edit Live Links' dialog. Use the button "Edit..." to browse for the new (copied) file.



Live Link to Values and Handling Special Characters

The Live Link reference will always read the numerical value found in the linked cell in the Excel worksheet. This doesn't necessarily have to be the value you see in the cell, since there might be a formatting or formatting on the cell.

For example, you might see a value with several decimal digits linked as flow value, but in the Excel cell it might be shown rounded to two decimal digits. A similar matter is with values that are formatted in Excel to show percentages: while in Excel a value might show as "10%", the actual value transferred via Live Link could be "0.1".

To only transfer the rounded values, and not the actual value with all decimal digits, you might want to use the function *ROUND(number;num_digits)* to set the decimal digits for the Live Link.

To transfer values formatted as percentages via Live Link to a text element in e!Sankey it is best to create a new cell for the value, which is formatted for numeric values. This new cell then relates to the other (percent formatted) cell and multiplies with the factor 100. To additionally show the percentage sign concatenate it as text (using &" %"). You may want use the ROUND function as above to truncate to the desired number of decimal digits.

	A	B	C	D
1	Energy Consumption			
2				
3				
4			percentage	percentage round.
5	Natural Gas TOTAL	4000	43.956%	44 %
6	NG_steam_generator	2500	27.473%	27.5 %
7	NG_oven	1500	16.484%	16.5 %
8	Heat TOTAL	2300	25.275%	25.3 %
9	H_oven	1500	16.484%	16.5 %
10	H_halls	800	8.791%	8.8 %
11	Power Supply TOTAL	2800	30.769%	30.8 %
12	P_pumps	1100	12.088%	12.1 %
13	P_halls	900	9.890%	9.9 %
14	P_admin building	800	8.791%	8.8 %
15	Energy TOTAL	9100	100.000%	100 %

Note that e!Sankey has various ways to display percentages in flow content labels, that might be an alternative to calculating the values in Excel and displaying them in e!Sankey using a Live Link reference. For more details on percentage values, please see the e!Sankey User Manual chapter 5.

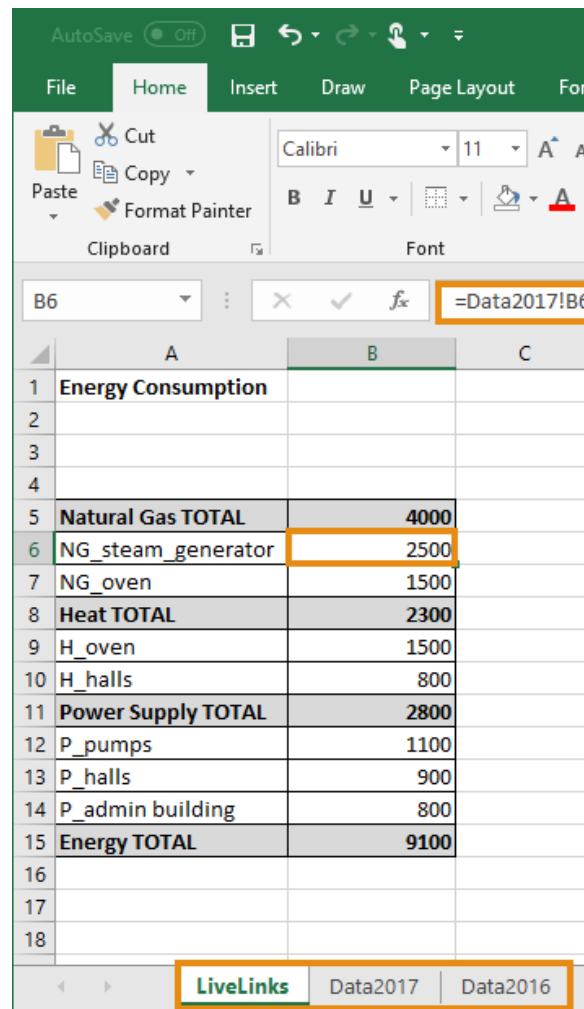
Also note that e!Sankey has its own number formatting and rounding, separate for each unit type. This will affect the values shown in the flow content label.

5. Excel worksheet for Live Links

In order to keep your data gathering for Live Links well-structured and clear, we recommend that you create a separate worksheet just for setting the Live Links to e!Sankey. The cells on that special transfer sheet then reference to the cells containing the actual values, which are on other sheets, or even in other Excel files.

Doing so you will help you to keep a good overview and it will make your Live Links more resistant to changes.

Thus, for instance, you can create different worksheets for each year of energy consumption (see sheets "Data2016", "Data2017" in figure below), while the values on the "Live Link" sheet is fed via references to the values for a specific year. Should values on the data sheets change, the value on the "Live Link" page will be adjusted accordingly. When data for a new year is available, older data can be kept, and doesn't have to be overwritten.



	A	B	C
1	Energy Consumption		
2			
3			
4			
5	Natural Gas TOTAL	4000	
6	NG_steam_generator	2500	
7	NG_oven	1500	
8	Heat TOTAL	2300	
9	H_oven	1500	
10	H_halls	800	
11	Power Supply TOTAL	2800	
12	P_pumps	1100	
13	P_halls	900	
14	P_admin building	800	
15	Energy TOTAL	9100	
16			
17			
18			

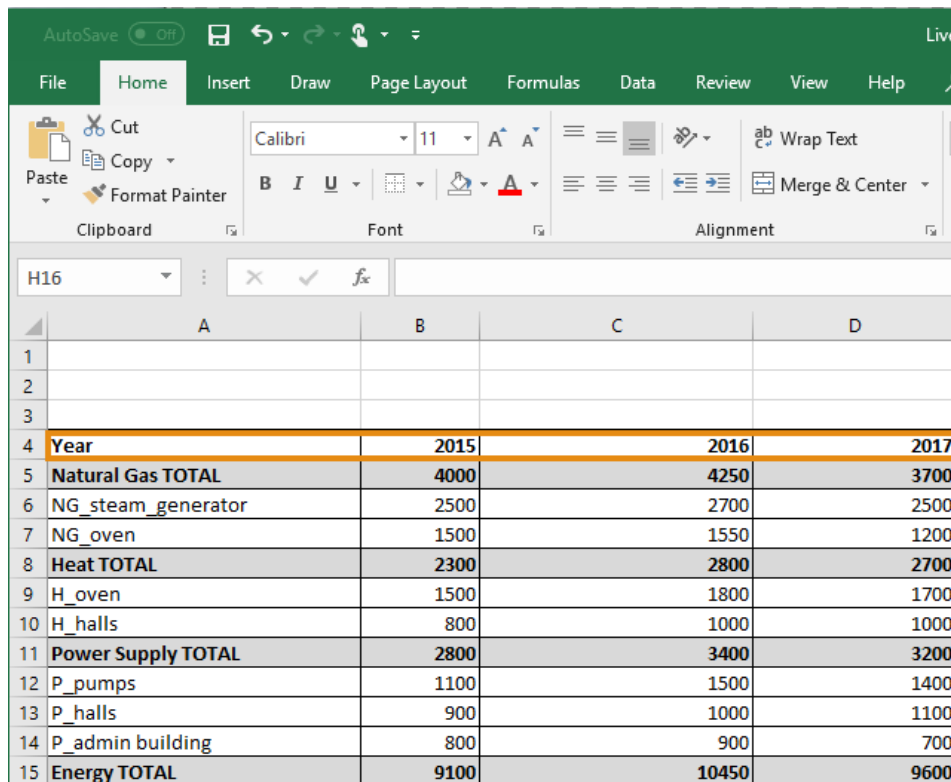
Value Assignment using HLOOKUP function

When the different datasets (e.g. for the years 2015, 2016 and 2017) are written in one common worksheet, it may be advisable to use the HLOOKUP (resp. the VLOOKUP) to transfer values to the cells on the "Live Link" data transfer sheet, from where they are referenced by e!Sankey.

The following method may seem to be somewhat complex, but it is ideal to display different values depending on a selection.

Step 1: data matrix

As mentioned above your different datasets should be written within one table. In the following example you find the different consumers at the lines, the different years at the columns. Surely this could be the other way around, then you need the VLOOKUP function in step 2 instead of HLOOKUP.



	A	B	C	D
1				
2				
3				
4	Year	2015	2016	2017
5	Natural Gas TOTAL	4000	4250	3700
6	NG_steam_generator	2500	2700	2500
7	NG_oven	1500	1550	1200
8	Heat TOTAL	2300	2800	2700
9	H_oven	1500	1800	1700
10	H_halls	800	1000	1000
11	Power Supply TOTAL	2800	3400	3200
12	P_pumps	1100	1500	1400
13	P_halls	900	1000	1100
14	P_admin building	800	900	700
15	Energy TOTAL	9100	10450	9600

Step 2: reading data using HLOOKUP

Now you can create a new worksheet for linking values to e!Sankey. Therefore you need to write the HLOOKUP command into the linked cells. The lookup value should be the selected year, the table array is the data matrix including all values and the row index is the ordinal number of the respective consumer. Now you can choose a certain year at the according cell and the proper values will be displayed. By you can also create a dropdown menu for the year selection.

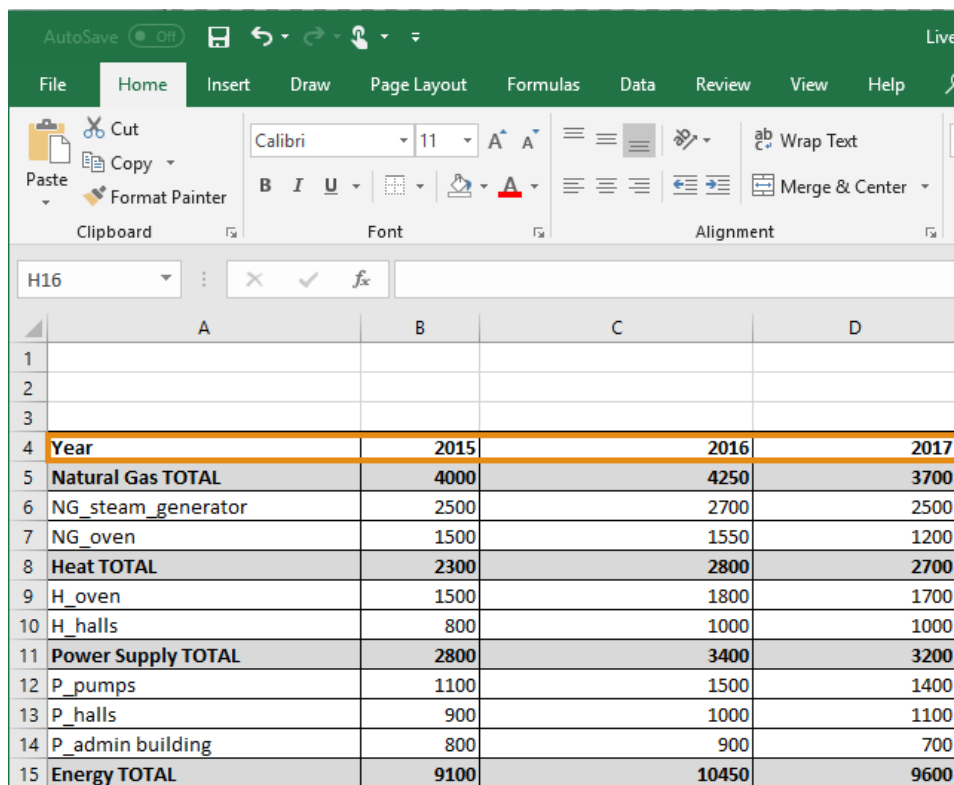
	A	B	C
1	Energy Consumption 2017		
2			
3			
4	Year	2017 -> DropDown for Year Selection	
5	Natural Gas TOTAL	3700	
6	NG_steam_generator	2500	
7	NG_oven	1200	
8	Heat TOTAL	2700 -> HLOOKUP(\$B\$4,Data!\$B\$4:\$D\$15,5,FALSE)	
9	H_oven	1700	
10	H_halls	1000	
11	Power Supply TOTAL	3200	
12	P_pumps	1400	
13	P_halls	1100	
14	P_admin building	700	
15	Energy TOTAL	9600	
16			
17			
18			

Value assignment using INDEX function

For the same initial situation, the INDEX function can be used. This method includes another third step compared to the HLOOKUP, however it is appropriate for data sorted by columns as well by rows.

Step 1: data matrix

For this example, the same data matrix has been chosen as within the HLOOKUP sample.



	A	B	C	D
1				
2				
3				
4	Year	2015	2016	2017
5	Natural Gas TOTAL	4000	4250	3700
6	NG_steam_generator	2500	2700	2500
7	NG_oven	1500	1550	1200
8	Heat TOTAL	2300	2800	2700
9	H_oven	1500	1800	1700
10	H_halls	800	1000	1000
11	Power Supply TOTAL	2800	3400	3200
12	P_pumps	1100	1500	1400
13	P_halls	900	1000	1100
14	P_admin building	800	900	700
15	Energy TOTAL	9100	10450	9600

Step 2: year assignment

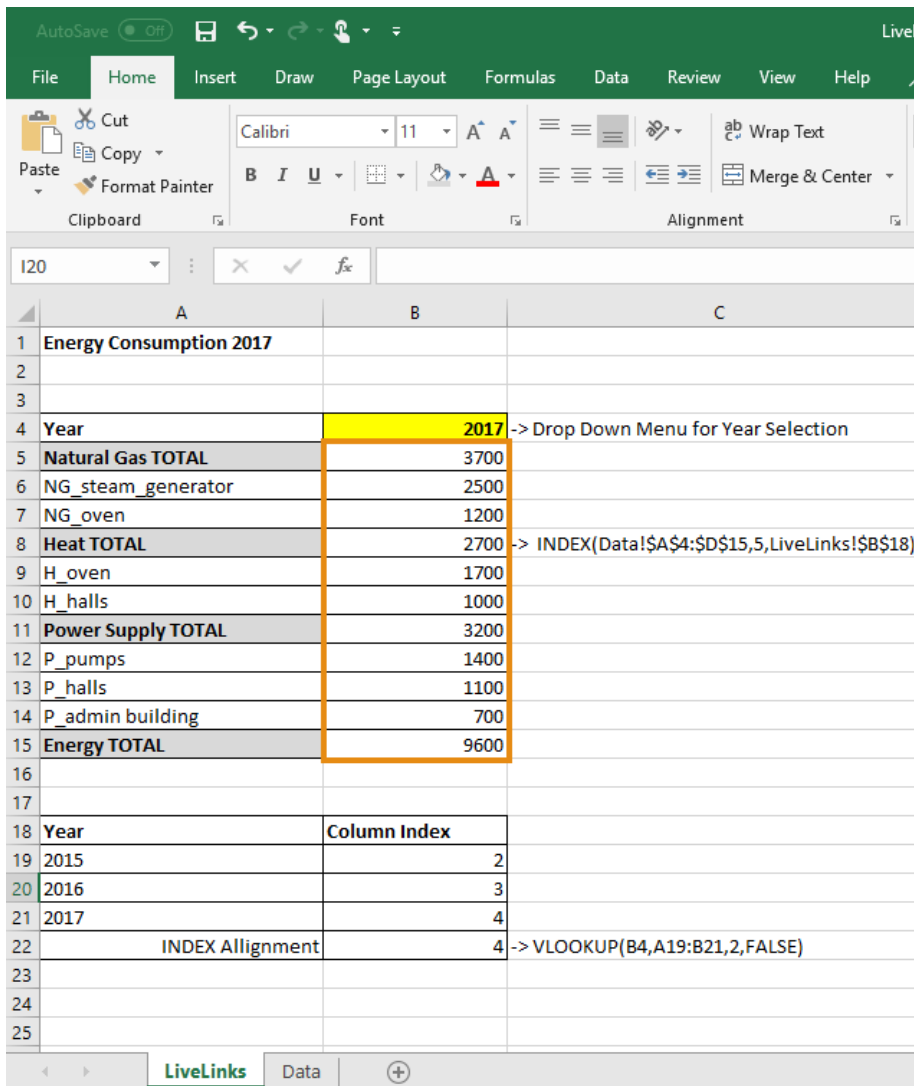
For the INDEX command used in step 3 the place of the column (and row) is an essential parameter. Therefore you need another table assigning the column number to the according year. This assignment can be done using the VLOOKUP.

	A	B	C
1	Energy Consumption 2017		
2			
3			
4	Year	2017	-> Drop Down Menu for Year Selection
5	Natural Gas TOTAL	3700	
6	NG_steam_generator	2500	
7	NG_oven	1200	
8	Heat TOTAL	2700	
9	H_oven	1700	
10	H_halls	1000	
11	Power Supply TOTAL	3200	
12	P_pumps	1400	
13	P_halls	1100	
14	P_admin building	700	
15	Energy TOTAL	9600	
16			
17			
18	Year	Column Index	
19	2015	2	
20	2016	3	
21	2017	4	
22	INDEX Alignment	4	-> VLOOKUP(B4,A19:B21,2,FALSE)

Step 3: reading data using the INDEX command:

All necessary settings and data are available to read out the several values using the INDEX command. The INDEX command should be written into the cells linked to e!Sankey. The array should be the data matrix, the row number is the ordinal number of the respective consumer. As column number you choose the cell which assign the year to a certain column index.

Now you can choose a certain year at the according cell and the proper values will be displayed. By you can also create a dropdown menu for the year selection.



Value assignment using INDIRECT function:

When your data is not allocated within one single table, but in different worksheets, both approaches, LOOKUP nor INDEX, are not capable to transfer the different datasets into one worksheet. In this case you need to assign the values through the INDIRECT function.

Please note, that INDIRECT is a volatile command. So it will be executed every time when something is changed within the Excel file. Therefore it could lead to performance issues, especially within more complex Excel files. You can disable the automatic execution of the command temporarily (Formula > Calculation options > manual).

Step 1: data matrix

When the data is allocated in different worksheets, you should make sure, that the names of these worksheets should be simple and unique, they will be used later on.

Furthermore, all worksheets need to have the same table structure.

	A	B
3		
4	Year	2017
5	Natural Gas TOTAL	3700
6	NG_steam_generator	2500
7	NG_oven	1200
8	Heat TOTAL	2700
9	H_oven	1700
10	H_halls	1000
11	Power Supply TOTAL	3200
12	P_pumps	1400
13	P_halls	1100
14	P_admin building	700
15	Energy TOTAL	9600
16		
17		

	A	B
3		
4	Year	2016
5	Natural Gas TOTAL	4250
6	NG_steam_generator	2700
7	NG_oven	1550
8	Heat TOTAL	2800
9	H_oven	1800
10	H_halls	1000
11	Power Supply TOTAL	3400
12	P_pumps	1500
13	P_halls	1000
14	P_admin building	900
15	Energy TOTAL	10450
16		
17		

Step 2: reading data using the INDIRECT command:

Now you can use the INDIRECT command in order to assign the different datasets to the worksheet "Live Links" from which they are referenced to e!Sankey.

The INDIRECT command is made up from the name of the worksheet and reference to the cell address on this worksheet.

With the entries in the dropdown list for the year we are determining the worksheet name. The cell address is made up from a string for the column and concatenated with the function ROW() which returns the row number.

In this example the command looks like this:

```
=INDIRECT ("'"&$B$4 &"'"!B"&ROW (); TRUE)
```

translated for row 5 as e.g. =INDIRECT ('2017'!B5; TRUE)

The optional parameter TRUE indicates that the preceding cell address is to be interpreted an absolute cell address in A1 format.

	A	B	C
1	Energy Consumption 2017		
2			
3			
4	Year	2017	-> Drop Down for Year Selection
5	Natural Gas TOTAL	3700	
6	NG_steam_generator	2500	
7	NG_oven	1200	
8	Heat TOTAL	2700	-> INDIRECT("'"&\$B\$4 &"'"!B"&ROW (); TRUE)
9	H_oven	1700	
10	H_halls	1000	
11	Power Supply TOTAL	3200	
12	P_pumps	1400	
13	P_halls	1100	
14	P_admin building	700	
15	Energy TOTAL	9600	
16			
17			

6. e!Sankey SDK for Integration and Automation

If you wish to integrate Sankey diagrams into your own solution, or if you are thinking about automating the process of Sankey diagram generation, a software development kit (SDK) version of e!Sankey is available. It allows for automatic updating of Sankey diagrams from a data source, and for setting up Sankey diagrams using XML files.

The e!Sankey SDK can be used to integrate Sankey diagrams into other applications e.g. energy management software, plant control applications, or Manufacturing Execution System (MES).

Further information can be found at <https://www.ifu.com/en/e-sankey/automation-integration/>

The e!Sankey Software Development Kit (SDK) has a comprehensive documentation and contains code snippets and sample files for the implementation of an integrated solution. We are also available to implement an automated Sankey diagram solution for you upon request.

Please contact sales@e-sankey.com should you be interested in a customized solution. Please inquire about licenses at sales@e-sankey.com should you be interested in the SDK package.

We hope that the collection of hints on using the e!Sankey Live Link in connection with Excel functions will help you make your Sankey diagram updates more dynamic.

Should you have question or comments on Excel Live Links in e!Sankey please feel free to contact us. We can provide the .sankey and linked XLSX files to you upon request.

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