

**Reference: Frequently Asked Questions (FAQ) TenneT Industrial ValueFlex Tool
Version November 8 - 2022*****Applicability of the tool:******1) For what sector can I use this tool?***

For (relatively) large industrial processes, including their storage facilities.

2) In which cases should I use the tool?

The tool enables you to get a first impression on revenues (cost savings) you could find on the various electricity markets.

3) Can I use the tool to unlock flex in my electric car fleet?

No, but it should be possible to - relatively easily - use the basic building blocks, but the questions asked now are tailored towards application in the industry.

4) Which flexibility markets are covered by the tool?

- The Day Ahead and the Intra Day market for upfront procurement of electricity (where you benefit from price differences over time).
- The FCR, aFRR and mFRR markets as balancing markets (where you get paid for your support to stabilize of the network by adjusting your electricity consumption when called upon)

5) Where can I find more information about the various electricity markets?

For the Day-Ahead and Intra-Day market, see: <https://www.tennet.eu/market-types>

For the balancing markets, see: <https://www.tennet.eu/balancing-markets>

6) Can I use the tool to estimate revenues from redispatch / congestion management?

No.

7) Can we also use the tool if we have limited power to flex with (on the balancing markets)?

Yes. The minimum threshold depends on the market and is for example 1 MW for the FCR in the Netherlands and in Germany. However, you can use a balancing service provider if your flexible power consumption would be insufficient. For that reason, the tool doesn't have a minimum cut-off value for flexible power available.

8) What geographies are covered by the tool?

The Netherlands and Germany. You can choose Dutch, German and English as languages in the tool.

9) I am not located in the Netherlands or Germany, can I nevertheless use the tool?

Yes, but simulating industrial plants outside these countries will be challenging as the tool only covers Dutch and German electricity / flexibility market data, network tariffs, taxes and subsidy schemes.

Getting the tool ready for use:*1) What do I need to do before I can start with the tool?*

You need to download the Excel file (.xlsm), and download and install the R-tool (.exe). For the latter, refer to the specific instruction on this website.

2) The installation of the R-tool doesn't work for me. What should I do?

Contact your organization's ICT. You will find an illustrative email you can send to them on this website.

Understanding and working with the tool:*1) How do I know which case to use?*

Look into the "Home" worksheet of the Excel file (this is the 3rd screen, after the disclaimer and the "Sector&Energy Prices" sheet and read the case descriptions and – recommended! – look at the visuals representing each of the 7 cases.

2) Can I define my own cases in the tool?

No, but the tool includes a lot of cases which allow for quite some flexibility.

3) What kind of information do I need to fill in the tool?

You don't really need much understanding of the details of the various electricity / flexibility markets, but you do need to know your current electricity price and how you expect that to evolve in the future. You need to know your industrial process, and its possibilities and limitations, including its flexibility and storage capacity.

You can start filling the tool with the characteristics of your process right away. However, you will need to answer some specific questions related to your electricity contract with your DSO/TSO, which might be data you will need to request internally. The same goes for process specific data.

4) The tool uses an R-optimizer; what is that, and do I need knowledge of R?

R is software that we use to optimize for the Day Ahead market and Intra Day market. You just need to upload your case (which you specify in Excel) to the R-tool, run it, and the R-tool will deliver you an Excel file with the results of your case. You don't need to know more about R.

5) I see the tool uses an optimization approach for the Day Ahead and the Intra Day; what does that mean?

This means that the tool finds tries to optimize your electricity (and fuel) demand in such a way that the total costs are minimized over time. The Tool does so with perfect foresight, meaning that its already knows what the future electricity prices are going to be. The tool finds an optimum solution, in which it does not violate any constraints (storage, ramping, etc) and minimized total costs (electricity costs, taxes, network tariffs, opportunity costs, subsidy, etc). The tool optimizes over a period of 28 days (Day Ahead) or 7 days (Intra Day) and extrapolates the results to a year (for the batch cases optimization is over 1 day for DA as well as ID).

6) I get warnings in red in Excel: What should I do?

You should take these red warnings seriously. They flag that you have provided input that doesn't add up; for example you have specified that your plant produces more product than is physically possible based on its operating hours, maximum electricity use and electricity use per ton of

product. The R-tool would, obviously, not be able to come up with an answer, and you would not understand what would be happening. Thus: Always deal with red warnings in Excel to ensure that your input adds up.

7) Which information is pre-populated in the tool?

The tool pre-populates some information related to your specific process or for example to your location. Some pre-populated data are: Operating hours, efficiencies, electricity usage per ton of product produced, flexibility constraints, battery characteristics, subsidy levels, network tariff costs.

8) How does the tool deal with procuring electricity on the Day Ahead and on the Intra Day market?

The set-up of the tool aims at delivering results that you can interpret relatively easily and that shows a result based on a clear difference between a clear reference case and a clear flexing case. In case the tool would combine procuring electricity on both the Day Ahead and the Intra Day markets, its result would partially be attributed towards the procurement strategy and partially towards the flexing. We have chosen not to do that in the tool. Nevertheless, in real life, a strategy combining procuring electricity on the DA and ID market could make sense. And potentially co-optimising with also the balancing markets could yield more revenue.

9) Can I apply the tool to only part of my plants' electricity consumption?

Just keep that part of your plant in mind when filling in the tool. The electricity consumption in other parts of your plant might still be relevant for your network tariff costs (including volume discount) and electricity tax. Therefore, you can specify this separately, which the tool then assumes to be constant (apart from the battery case).

10) How can I deal with the currently high prices in the tool?

You can tweak the electricity prices to simulate prices that represent current, or future, prices better and enter the natural gas price (as a constant) in the tool.. Note that the price sets included in the tool have been determined prior to Russia's invasion into the Ukraine. Note that the price assumptions for the various markets impact results (and the markets on which most money can be made) significantly.

11) Where do I find more information / guidance on the functionality of the tool?

The tool offers a detailed explanation of its 7 cases in the "home" worksheet. Further, user guidance is given at many places, to help the user understand what input to provide, and sometimes its consequences.

Results of the tool:

1) The results of the tool have shown me that there is interesting potential to flex; what next step would you recommend?

The tool offers a first exploration / estimate of the potential, based on many assumptions and simplifications. Before investing in flex potential, you should do a much more detailed assessment, tweaked towards the specifics of your plant, and including combining the various electricity markets.

2) *The tool shows I can make revenues on multiple markets. How can I choose between these?*
A much more detailed assessment should establish which market(s) to focus on. You could for example assess procuring part of your electricity needs on the Day Ahead market and part on the Intra Day market, while also still acting on the balancing markets. Note that the price assumptions for the various markets impact results (and the markets on which most money can be made) significantly.

3) *I cannot interpret the results in the "Summary" result-sheet. What can I do to better understand the results?*

You can dive into the more detailed results by clicking on the buttons in the output file's "Home" worksheet. This will bring you to a worksheet with the details of the optimization, where you can analyse the results timestep by timestep.

Troubleshooting:

1) *The R-optimizer doesn't work: What should I do?*

Check first whether you made mistakes in your Excel input (leading to specifying input that is physically impossible). The tool warns you for many of these mistakes with red warning texts next to your inputs, in the input sheets that you have used (always the "Sector&Energy Prices sheet, and also the sheet(s) specific for the case at hand). If that doesn't work you can simplify the case by:

- Preventing the optimizer to shut down equipment by specifying a very high price for cost of a shutdown event. This is relevant for the Heat Generation and the Continuous case.
- Reducing the number of batches / steps in the batch case
- Reducing the total amount of hours in your load shifting case
- Removing the ramping constraints (changing this to 0 mins to go from up-down and down-up), relevant in the Continuous, Heat Generation, Mass&Energy Storage and the Load Shift case.

2) *The R-optimizer appears to be stuck: What should I do?*

In some situations, the R-optimizer takes very long to optimize, so it could still be working towards a solution. However, if after a very long time, the optimizer still does not give a result you might want to re-visit / change your inputs based on the simplifications listed in the question above. In order to do this you need to close the R-optimizer and possibly also the "R for windows"-process in the task manager before re-starting the optimizer.

3) *I have questions about the tool, who can I ask?*

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4) *I think I found a mistake, what should I do?*

Report these to TenneT (see previous question)

5) *Are there plans to develop the tool for other geographies?*

Not at the moment, but feel free to make a suggestion.