# BACKGROUND INFORMATION OF THE AUTARKY RATE TOOL

Version 07.2023

| | |
|---|---|
| Title | Background information of the Autarky Rate Tool |
| Deliverable | Amendment to D.T 3.2.3 and D.T3.2.4 |
| Authors | Robert Pratter (PP4), Evelyn Hummer (PP4), Reiterer & Scherling GmbH |
| Status | Update 07.2023 |

## Content

1. Introduction ........ 3

2. Background information ........ 3

2.1. Producer ........ 3

2.1.1. Wind power station ........ 4

2.1.2. Small scale hydropower station ........ 5

2.1.3. PV-system ........ 5

2.2. Storage ........ 6

2.3. Consumer ........ 7

2.4. Economic values (Country) ........ 12

2.4.1. Electricity costs (non-industrial consumer) ........ 12

2.4.2. Electricity costs (industrial consumer) ........ 14

2.4.3. Peak power prices ........ 15

2.4.4. Feed-in remuneration ........ 16

2.4.5. Investment costs ........ 17

2.4.6. Subsidies ........ 17

2.4.7. Amortisation period ........ 18

2.5. Ecological values ........ 18

2.6. Period ........ 19

Appendix ........ 20

# 1. Introduction

In course of the project Store4HUC, the so-called Autarky Rate Tool will be developed. This tool will be a simple but very useful online tool which is available for everyone who is interested in the installation of electrical storage solutions in combination with renewable energy sources. By adding only a few numbers, the user will get an evaluation of the

- technical,
- economical and
- ecological

effects of the chosen system configuration. The main output is of course the autarky rate, which is a figure for the independency of the public grid. If the autarky rate is high, this means, that the user is able to self-supply major parts of his energy demand. As the economical perspective is always a substantial fact for every investment decision, the energy cost savings as well as a rough estimation of the amortisation period are shown too, to give the user an idea if this configuration is economically feasible or not. To evaluate the ecological impact, the $CO_2$ savings, based on the national electricity mix are calculated.

Another major part of the tool is the so-called checklist, which can be created as pdf-file. On the one hand, the idea of the checklist is to give the user a possibility to save the calculation results and, on the other hand, it should serve as a further explanation how to make results understandable. Even if the tool is designed for an ease of use approach, some additional interpretation aid might be helpful especially for non-expert users, which are also addressed by the Autarky Rate Tool. If we take the autarky rate for example, it is probably not clear for everyone what an autarky rate of e.g. 70 % means. Therefore, the checklist does not only show the value of the autarky rate but also provides an explanation what an autarky rate in the particular range means.

The Tool results are valid in general and not only for historical urban buildings. For the users who are planning the integration of a storage in a historical urban centres (HUC), a further page is added, which provides them with additional information and advices from the Store4HUC project. This information will be updated on a regular base with the newest findings from the project.

The tool does of course not replace an individual technical configuration assessment, but it gives a good overview what positive influence the installation of a storage solution in combination with renewable energy sources might have and will possibly motivate more people to consider such installations on their own. The tool is available on: https://store4huc-autarky.4wardenergy.at

# 2. Background information

## 2.1. Producer

To be able to reach a certain degree of autarky, an (renewable) energy source must be available. Nowadays, this source is mostly a photovoltaic system (PV-system), which is installed at the roof of a building or somewhere around (open space system). But also, wind energy stations and small-scale hydropower plants are included in the Autarky Rate Tool. This gives the user a bright variety of different application possibilities.

The inputs for the producers are shown in Table 1. The information about the orientation and the inclination is only necessary if a PV-system is chosen as producer.

**Table 1: User input for the producer**

| | Input type | Options | Unit |
|---|---|---|---|
| Type | Drop down | PV, Wind or Water power | - |
| Peak power | input field | positive number | kW |
| Orientation (PV only) | Drop down | compass direction (S, SW, W, etc.) | - |
| Inclination (PV-only) | input field | number between 0 and 90 | Degree |

### 2.1.1. Wind power station

If a wind power station is chosen, a characteristic production profile is used, which is scaled with the user input of the peak power generation. The data for the profile was measured at a wind power station in Neusiedel am See in Austria in 2018. The course of the power generation for one year is shown in Figure 1. The power generation during summer is a bit lower and also in February, there are some days without wind, but generally there is a good production all year around. In Figure 2, one week is shown in detail. Normally there is a good production during day hours but no/less production in the night. This is of course one wind power station and the situation can be different for other stations at other locations or even for the same station in another year. However, it was considered accurately enough to enable the Autarky Rate Tool to make a good estimation how the autarky rate in combination with a wind power station can look like.

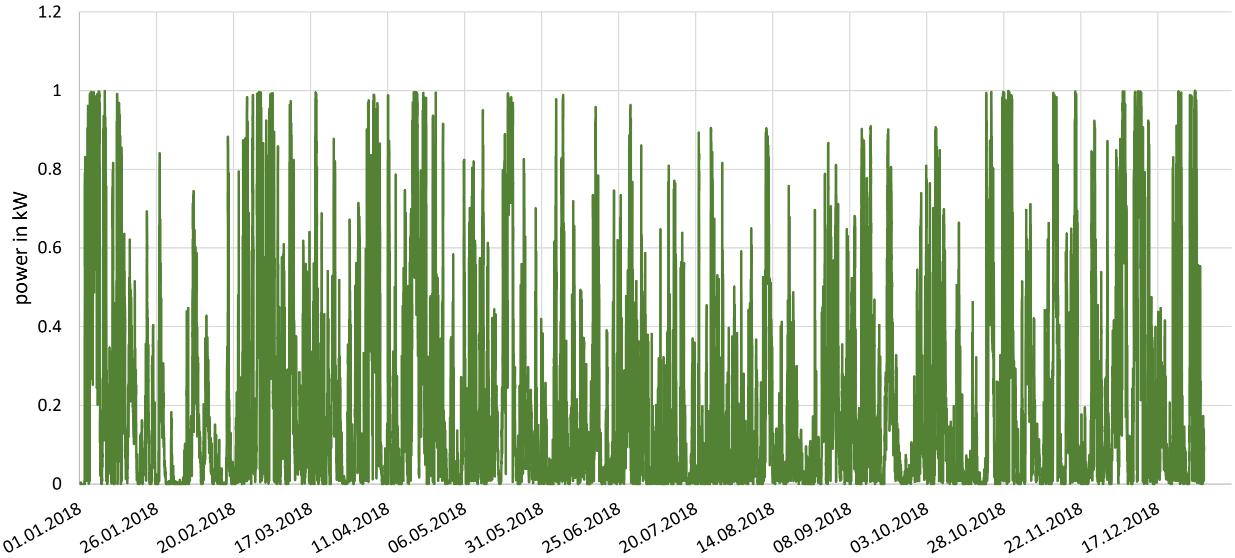


**Figure 1: Production profile for the wind power station for one year**

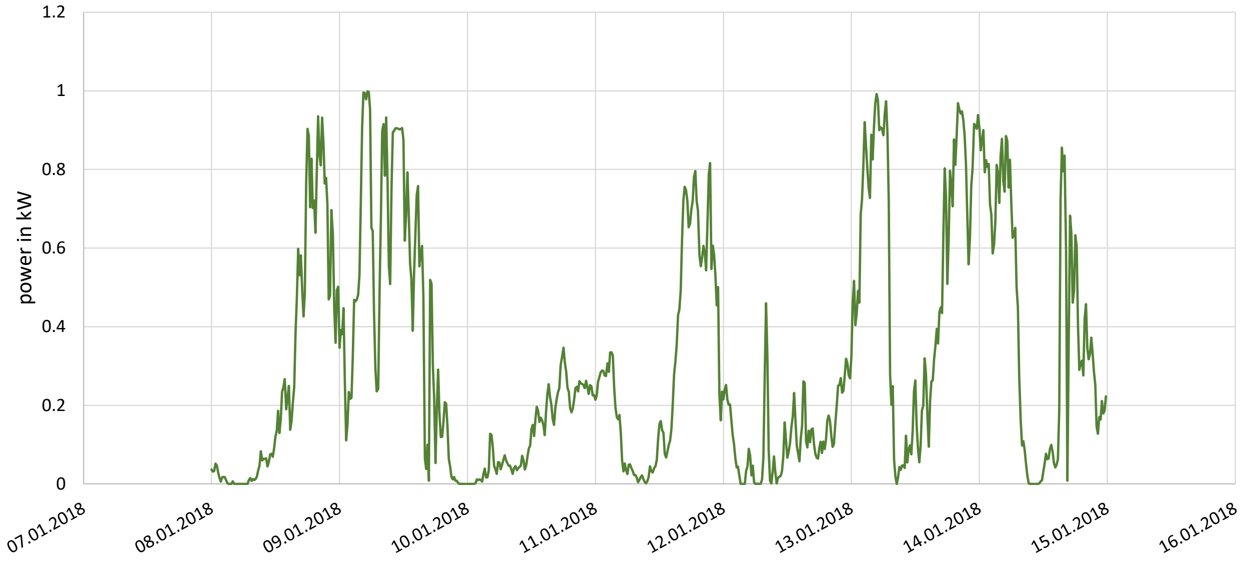


**Figure 2: Production profile for the wind power station for one week**

### 2.1.2. Small scale hydropower station

The same procedure was used for the small-scale hydropower station. A characteristic production profile is used, which is scaled with the user input of the peak power generation. The production profile is shown in Figure 3. The profile is based on measurement data for a smaller hydropower station in Austria. As the measurement data was only available for a short period of time and the data did not show major differences over the year, the same weekly profile was used in the calculation for the whole year.

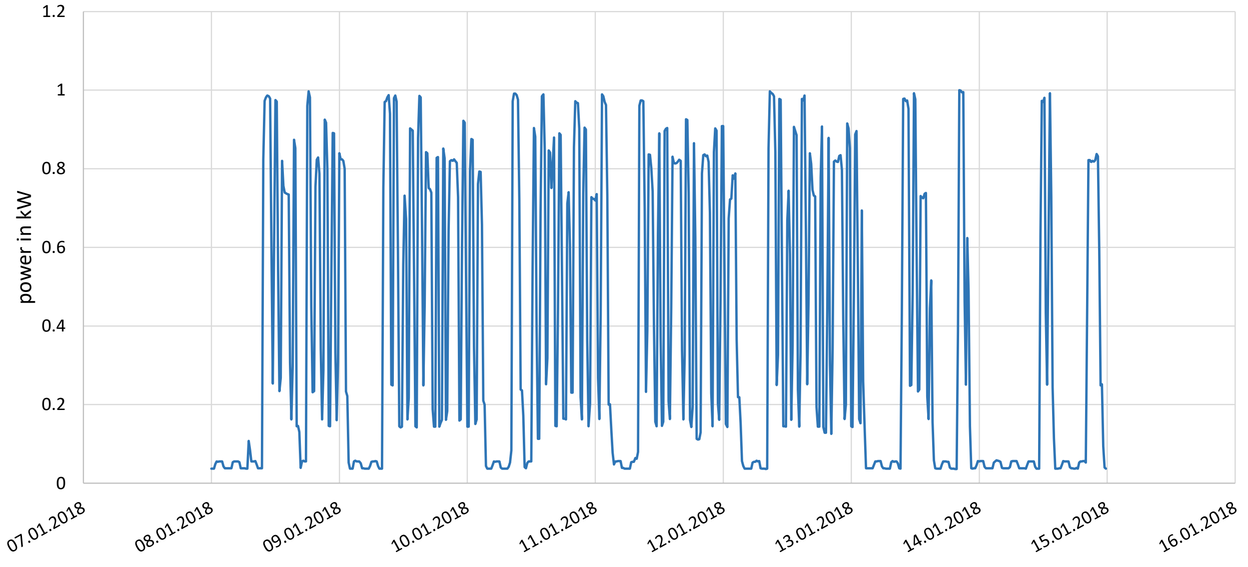


**Figure 3: Production profile for the small-scale hydropower station for one week**

### 2.1.3. PV-system

The calculation of the PV-production is a bit more complex than for the wind or hydropower station. The orientation (compass direction) and the inclination angle can be inserted by the user. With this information the global radiation on the inclined surface can be calculated from the profile of the global radiation on the horizontal surface and the information of the geographical location (course of the sun). If the global radiation on the inclined surface is known, the PV-production can be calculated by using the efficiency factor of a merchantable PV-system. The global radiation which is used for the calculation is shown in Figure 4. This data was measured in Neulengbach in Austria in 2016.

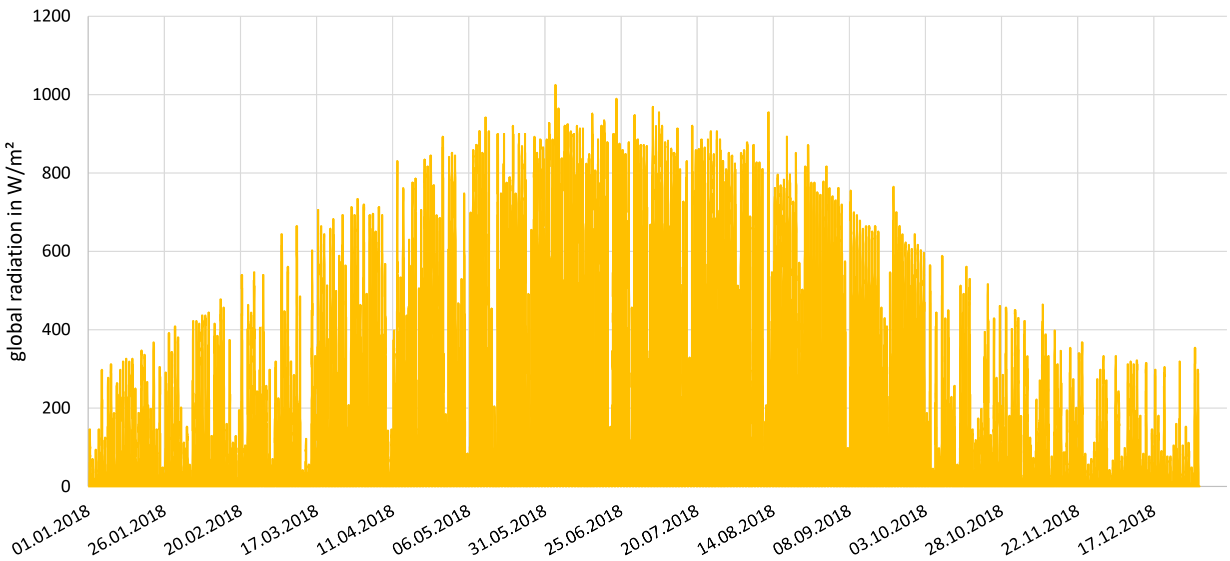


**Figure 4: Profile of the global radiation**

## 2.2. Storage

To specify the electrical storage, the useful capacity and the maximum charging capacity is necessary. These inputs are open to the user. The useful capacity indicates the energy amount of electric energy that can be stored in the storage in kWh. If the storage is full, the energy surplus has to be feed-in into the public grid. The maximum charging capacity indicates the maximum power in kW the storage can be charged and discharged with the electrical storage. If the power of the energy source is higher than the charging capacity, the surplus energy has also to be feed-in into the public grid, even if the storage is not completely charged. If for example, the maximum charging capacity is 2 kW and the RES minus current consumption would give a 3 kW surplus, 1 kW has to be feed-in into the grid. Moreover, this value has a large impact on the storage efficiency. The larger the deviation between the maximum charging capacity and the actual charging capacity, the higher are the storage losses (see also formulas in proceedings of IEA-PVPS)[1].

Note: In course of the project Store4HUC a second tool, which is able to calculate the optimal storage parameters, was developed.

**Table 2: User input for the storage**

| | Input type | Options | Unit |
|---|---|---|---|
| Useful capacity | input field | positive number | kWh |
| Charging capacity | input field | positive number | kW |

[1] https://iea-pvps.org/wp-content/uploads/2020/01/rep2_03.pdf

## 2.3. Consumer

The user is able to choose between different consumption profiles. For example, between different types of households (family household, single household with work, single household for someone who is retired, etc.), some types of industrial consumers or even a slope elevator profile. For each consumer a characteristic consumption profile is used. The household profiles are generated with the so called “Load Profile Generator”[2]. The Load Profile Generator is a modelling tool for residential energy consumption. It performs a full behaviour simulation of the people in a household and uses that to generate load curves. It is possible to choose between a wide range of predefined households or to model an own one.

For the industrial consumers standard profiles are used.[3] The profile of the slope elevator is based on measurement data of the elevator in Cuneo. To scale up the profiles, the user has also to enter the annual consumption or the consumption of the period if a shorter period is chosen.

**Table 3: User input for the consumer specification**

| | Input type | Options | Unit |
|---|---|---|---|
| Type | Drop down | “Single household”, “Family household”, “Industry”, etc. | - |
| Annual consumption | input field | positive number | kWh/period |

A list of all implemented consumer profiles is shown in Table 4. As they are scaled by the user input, the important difference between them is the frequency and the points of time when energy is needed. For example, a household with employed workers consumes energymostly in the morning and in the evening, while a household with retired inhabitants does not show such a characteristic. Especially for the (direct) use of PV-energy this can make a big difference. Therefore, many different consumption profiles are implemented, to be able to cover different use cases.

[2] Pflugradt Noah, Modellierung von Wasser und Energieverbräuchen in Haushalten (Load Profile Generator), Technische Universität Chemnitz, 2016

[3] APCS – Power Clearing & Settlement, Synthetische Lastprofile (online), https://www.apcs.at, 2020

**Table 4: Consumer profiles**

| Profile | Type |
|---|---|
| Single household (working) | non-industrial profile |
| Single household (retiree) | non-industrial profile |
| Double household (1 working, 1 at home) | non-industrial profile |
| Double household (both working) | non-industrial profile |
| Double household (retiree) | non-industrial profile |
| Family household one child | non-industrial profile |
| Family household two children | non-industrial profile |
| Family household three children | non-industrial profile |
| Industry 24h working | industrial profile |
| Industry 8-18 weekdays | industrial profile |
| Shop | industrial profile |
| Agriculture | non-industrial profile |
| Slope Elevator | industrial profile |
| Castle (Bracak Manor) | industrial profile |

In the following figures some of the profiles are displayed in detail to show the differences. The figures of the other profiles can be found in the appendix. In Figure 5, for example, a consumer profile of a single household of someone, who is working during daytime, is shown. In this profile the main consumption peaks occur in the morning and in the evening when the person is at home. During daytime only a smaller amount of energy is needed to cover the base load e.g. for the fridge, the freezer or devices in standby mode. There is a difference between the working days, but the main characteristic of the profile stays the same. The last two days (13.01 and 14.01) are Saturday and Sunday. For these two days the profile shows a different characteristic. On Saturday, for example, there is a high consumption until noon followed by a low consumption for the rest of the day. This could be because the tool assumes that the person leaves at noon and comes back lately. On Sunday, on the other hand, there is a higher consumption during the whole day. It has to be mentioned at this point that the profiles of the weekend are very different during the year depending on if the load profile generator assumes the resident stays at home this weekend or not. The characteristic of the weekday in contrast stays the same for the whole year except of a few weeks when the tool assumes that the resident is on holiday.

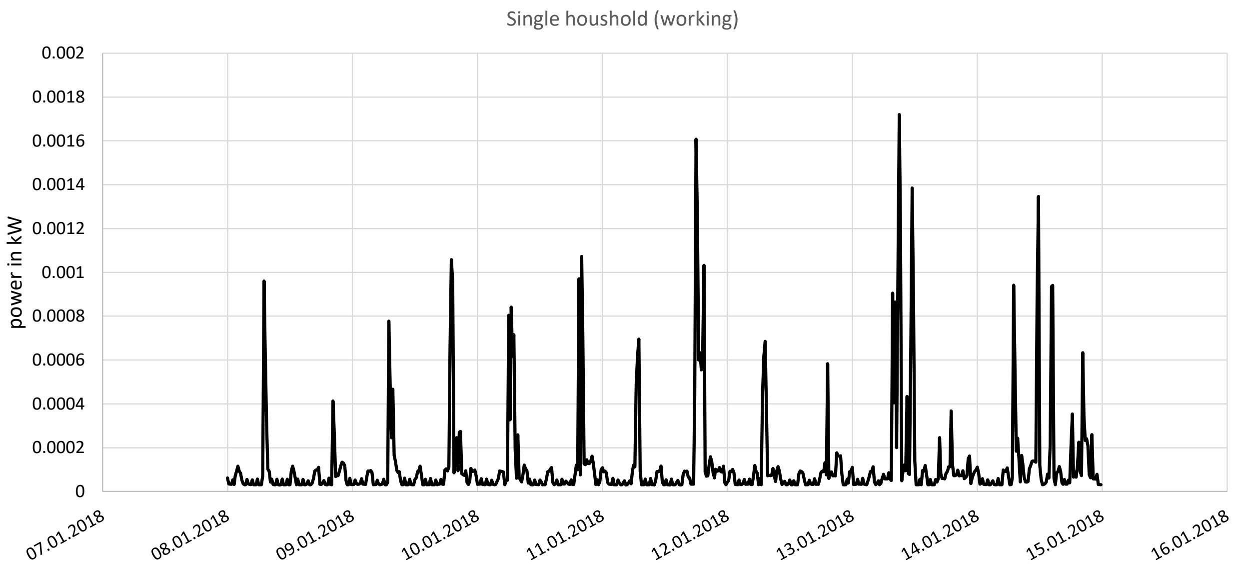


**Figure 5: Consumer profile of a single household of someone who is working**

In contrast to Figure 5 a typical consumption profile of someone who is already retired is shown in Figure 6. In this case there is no big difference between weekdays and the weekends. Moreover, there are also significant peak demands during the day and not only in the morning and in the evening hours.

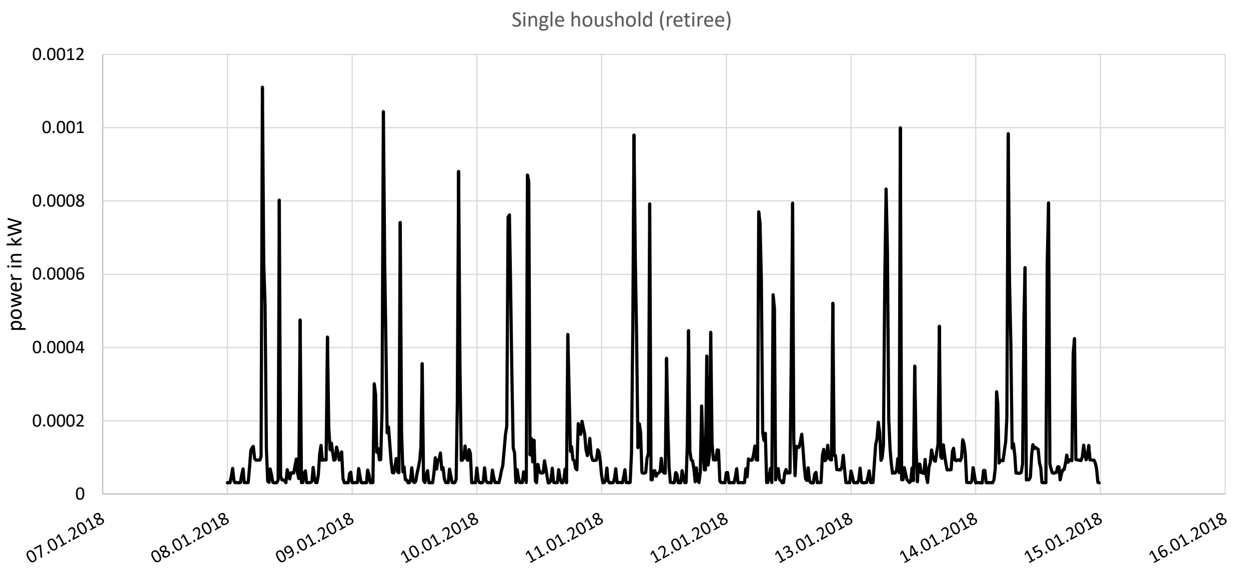


**Figure 6: Consumer profile of a single household of someone who is retired**

Figure 7 shows a typical consumption profile of a family household with three children. In this case there are also significant peak loads during the day and also the ground load is much higher than for a single person household. The reason why the peaks seem lower than in the previously described profiles is because all profiles are scaled to the same energy amount. It can be estimated that a family household with three children will have a higher yearly energy demand than a single household what will result in higher peak loads for this consumption profile after scaling it. On some days there is a higher energy demand than on others, but it is not clearly a weekday/weekend issue here.

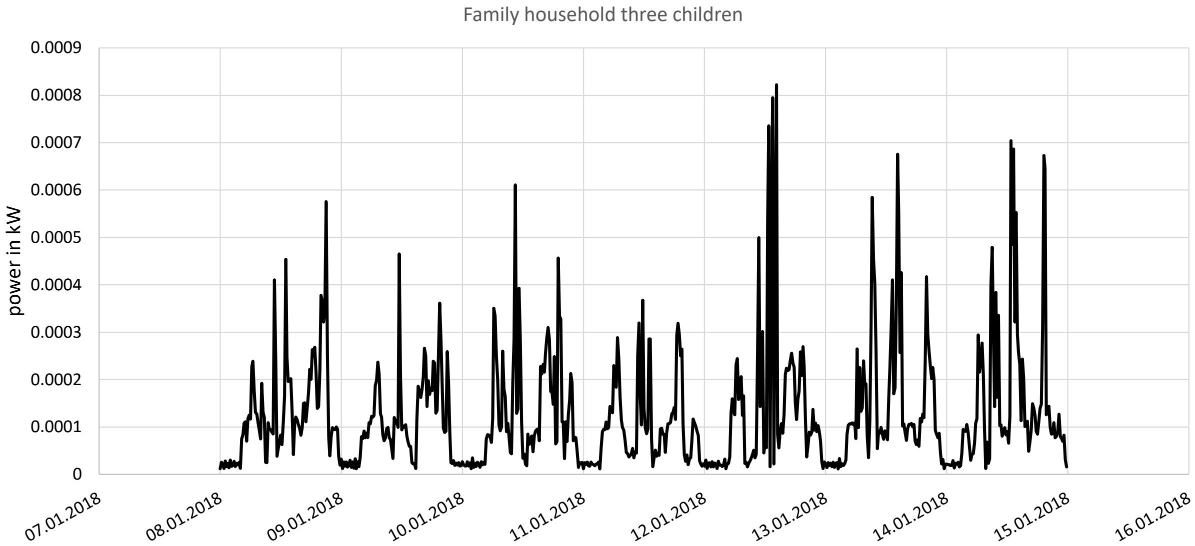


**Figure 7: Consumer profile of a family household with three children**

Figure 8 to Figure 10 show the consumption profiles for industrial consumers. These profiles are standard profiles and every week looks exactly the same. Figure 8 represents a profile for an industrial company which works for 24 hours. That means that there is always a significant energy demand needed. However, the energy demand is assumed to be lower during night times and on Sundays.

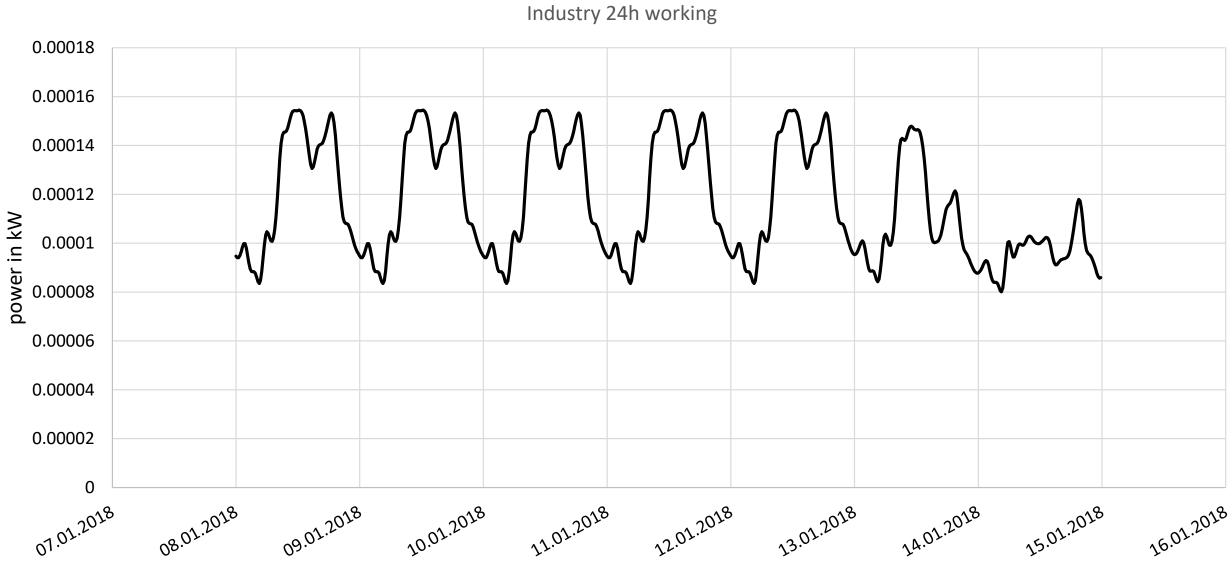


**Figure 8: Consumer profile of an industrial company which is working for 24 hours**

In contrast to that, Figure 9 shows the consumption profile for a typical industrial company with a working time between 8 am and 6 pm. During this time the company has a high energy demand. During night times and on the weekends only smaller load demands occur.

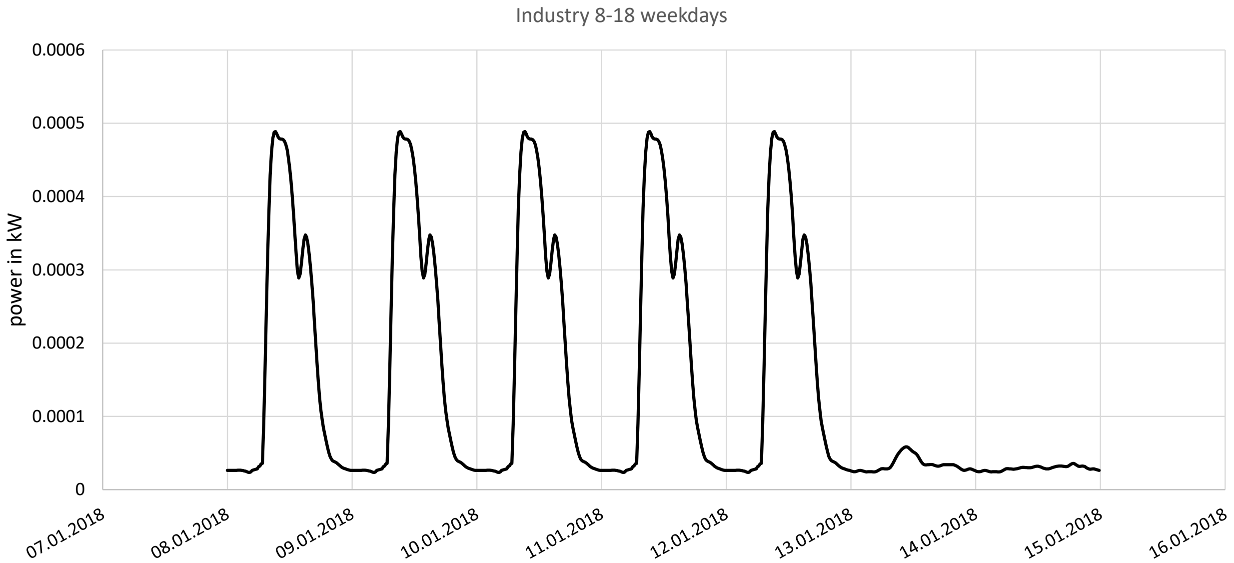


**Figure 9: Consumer profile of an industrial company which is working on weekdays from 8 am until 6 pm**

In Figure 10 a typical consumer profile of a shop is shown. The energy demand is considered the same for all weekdays. The most energy is of course needed during opening hours although lower loads are assumed at lunchtime. On Saturday shorter opening hours are assumed and no lunch break is considered. On Sunday there is only a low energy demand because the shop is closed.

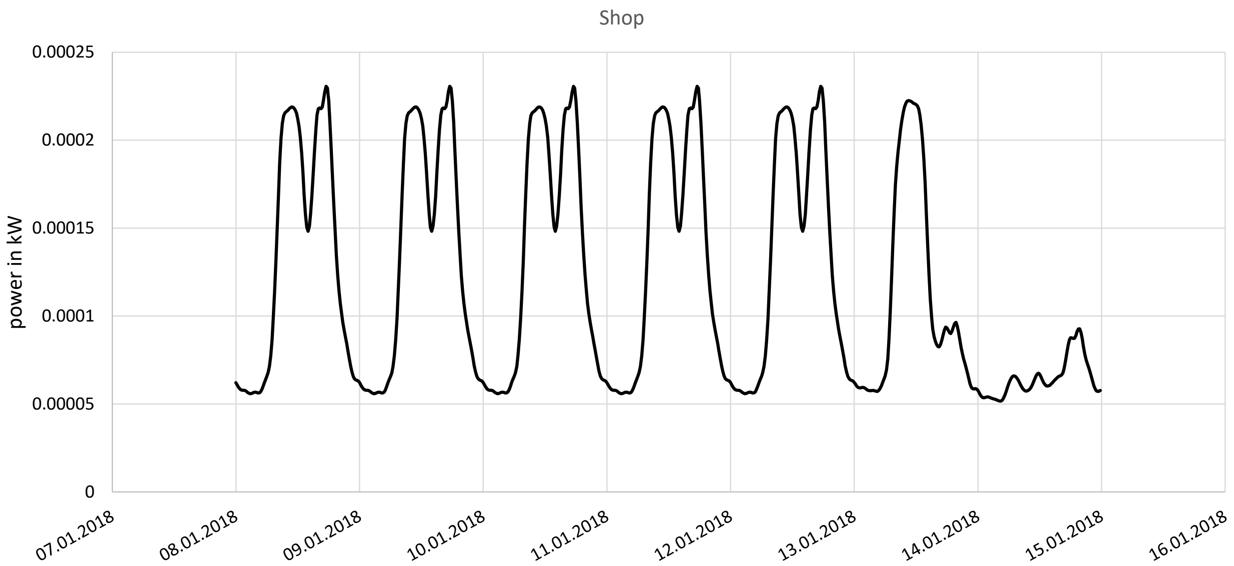


**Figure 10: Consumer profile of a shop**

## 2.4. Economic values (Country)

The selection of the country is used for the economic and ecological evaluation, as the average electricity costs, the feed-in tariffs and the share of $CO_2$ in the electricity mix are different in every country. These values have not to be entered by the user, only the country has to be selected. This approach was chosen, to simplify the use of the tool and to keep the number of necessary input variables reasonable.

It can be chosen between all participating countries (Slovenia, Croatia, Italy, Germany and Austria). The tool differentiates between industrial and non-industrial (private) users, depending on the chosen consumer profile (see Table 4). For industrial user peak power pricing and other electricity cost tariff (€/kWh) are considered. Based on the electricity costs (€/kWh), the peak power prices (€/kW) if an industrial profile is chosen, and the feed-in remuneration, the operational costs are calculated. For the reference case it is assumed, that the whole electricity demand must be purchased from the public grid (no production and no storage).

The investment costs consist of two parts, the costs for the production unit (€/kW) and the costs for the storage unit (€/kWh). Moreover, funding opportunities are also considered for photovoltaic and storage units. The funding opportunities are based on the mean funding amount per country, which can be expected. The investment costs and the actual funding amount can of course vary from case to case. Therefore, the calculated amortisation time can be only a rough estimation to be able to classify the selected scenario. The tool does not replace any individual technical configuration assessment.

The numbers which are currently used for the calculation are shown below. These numbers will be updated frequently in updated versions of the tool.

### 2.4.1. Electricity costs (non-industrial consumer)

For Austria, Slovenia and Germany the electricity costs are considered depending on the annual electricity consumption. The tariff for Austria starts with 43.92 Cent/kWh for very low demands (<1000 kWh/year) and goes down to 28.2 Cent/kWh for demands >10 MWh/year as shown in Figure 11.

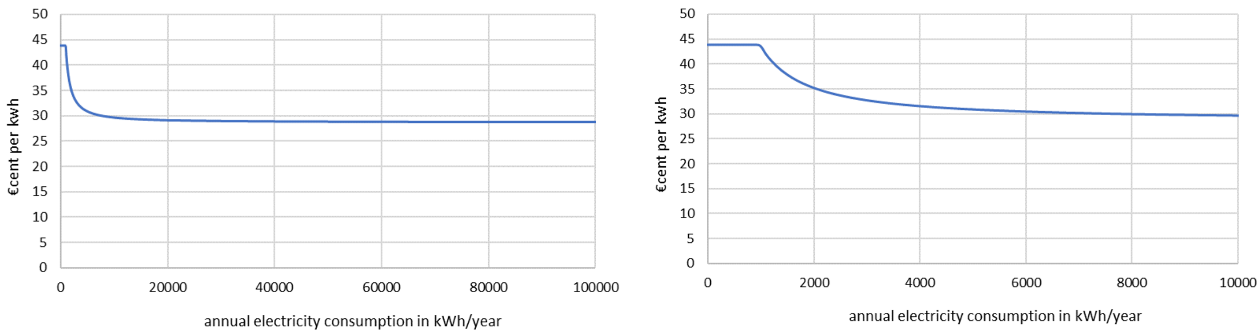


**Figure 11: Electricity costs in relation to the annual electricity consumption for Austria (left: larger area 0 – 100 MWh, right: detail between 0 and 10 MWh)4**

The tariff in Slovenia, see Figure 12, starts with 32.6 Cent/kWh for low demands and decreases down to 16.1 Cent for very large demands.

[4] Based on information from E-Control for the 2nd half of 2022, requested 06.2023, https://www.e-control.at/statistik/e-statistik/archiv/marktstatistik/preisentwicklungen

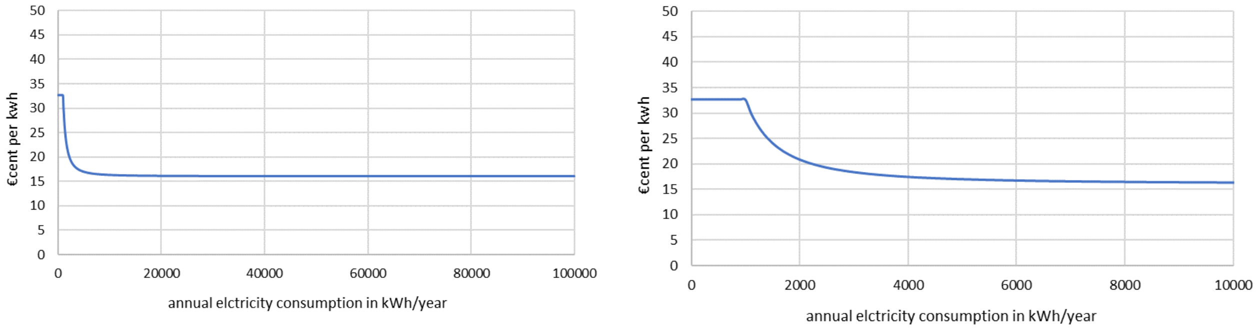


**Figure 12: Electricity costs in relation to the annual electricity consumption for Slovenia (left: larger area 0 – 100 MWh, right: detail between 0 and 10 MWh)[5]**

The tariff in Germany, see Figure 13, starts with 37.3 Cent/kWh for low demands and decreases down to 29.5 Cent for very large demands.

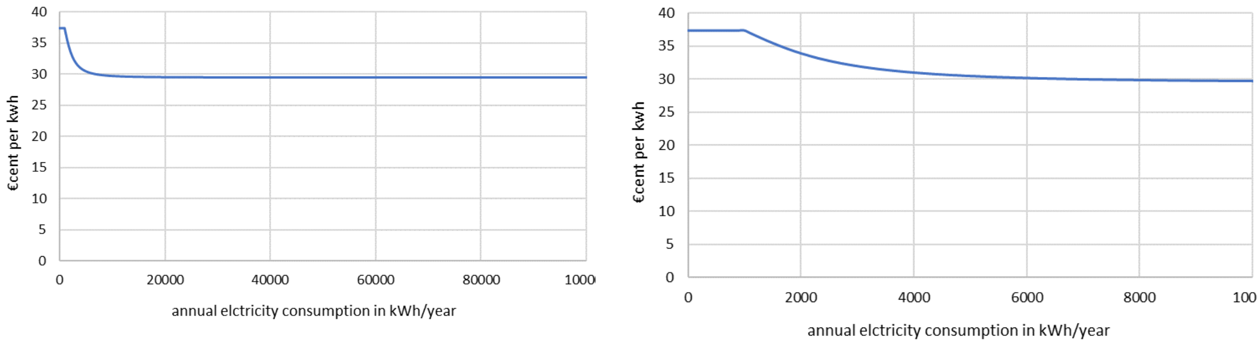


**Figure 13: Electricity costs in relation to the annual electricity consumption for Germany (left: larger area 0 – 100 MWh, right: detail between 0 and 10 MWh)** [6]

For Croatia and Italy constant electricity tariffs have been chosen, which are valid for average households:

- Croatia: 8.3 Cent/kWh[7]
- Italy: 23.75 Cent/kWh[8]

*Notice: Any price caps introduced or in force in 2022 and 2023 due to high energy prices are not taken into account here for any country.*

[5] Based on information from Ministrstvo za Infrastrukturo, requested 06.2023: https://www.energetika-portal.si/statistika/statisticna-podrocja/elektricna-energija-cene/

[6] Based on information from Stromvergleich.de, requested 06.2023: https://www.stromvergleich.de/strompreisrechner

[7] Based on information from HEP ELEKTRA, requested 06.2023: https://www.hep.hr/elektra/kucanstvo/tarifne-stavke-cijene/1547

[8] Based on information from ARERA, requested 06.2023: https://www.arera.it/it/dati/eep35.htm

## 2.4.2. Electricity costs (industrial consumer)

For Austria and Slovenia, the electricity costs are considered depending on the annual electricity consumption. The tariff for Austria starts with 31.76 Cent/kWh for lower demands (<20 000 kWh/year) and goes down to 22.75 Cent/kWh for demands >200 000 MW/year as shown in Figure 14.

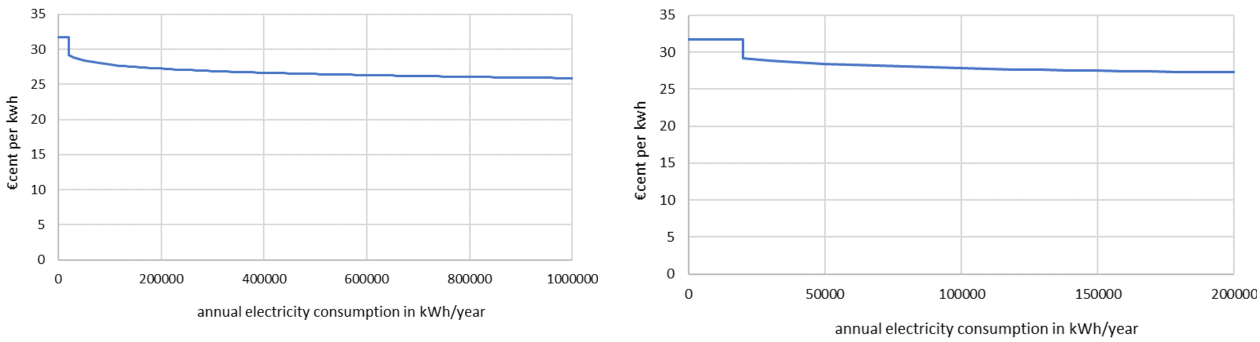


**Figure 14: Electricity costs for industrial consumer in relation to the annual electricity consumption for Austria (left: larger area 0 – 1000 MWh, right: detail between 0 and 200 MWh)[4]**

The tariff in Slovenia, see Figure 15, starts with 27.29 Cent/kWh for low demands and decreases down to 21.21 Cent/kWh for very large demands.

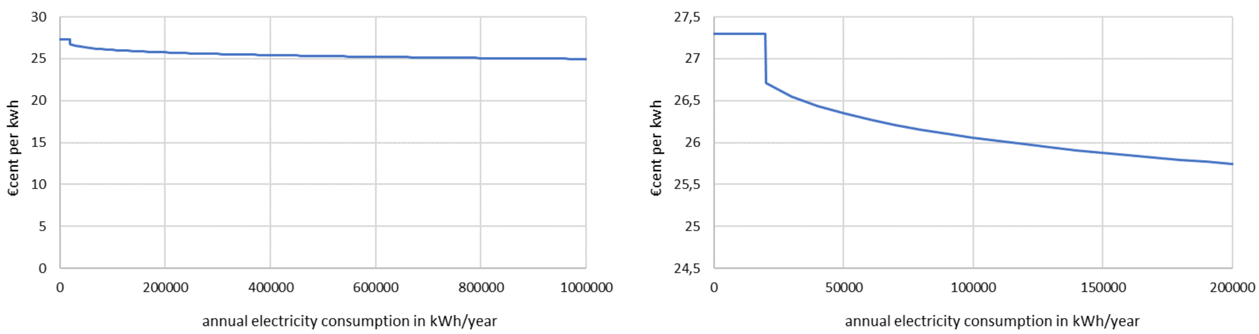


**Figure 15: Electricity costs for industrial consumer in relation to the annual electricity consumption for Slovenia (left: larger area 0 – 1000 MWh, right: detail between 0 and 200 MWh)[5]**

For Germany, Croatia and Italy constant electricity tariffs have been chosen which are valid for average industrial consumers:

- Germany: 26.84 Cent/kWh[9]
- Croatia: 25.82 Cent/kWh[10]
- Italy: 23.75 Cent/kWh

[9] Based on information from BDEW-Strompreisanalyse April 2023, requested 06.2023: https://www.bdew.de/service/daten-und-grafiken/bdew-strompreisanalyse/

[10] Based on information from HEP ELEKTRA, requested 06.2023: https://www.hep.hr/elektra/kucanstvo/tarifne-stavke-cijene/1547

## 2.4.3. Peak power prices

The peak power prices are only considered if an industrial consumer (see Table 4) is chosen. In this case, the electricity price is composed of the energy price (section 2.4.2 Electricity costs (industrial consumer)) and the price for the peak power shown below:

- Austria: 4.25 €/kW[11]
- Slovenia: 3.0 €/kW
- Italy: 4.822 €/kW
- Croatia: 4.67 €/kW[10]
- Germany: 14 €/kW[12]

The peak power costs are calculated monthly, by multiplying the peak power prices with the maximum power demand (kW) per month. The total costs result by summing up all monthly costs within the chosen calculation period.

[11] Based on RIS, requested 06.2023: https://www.ris.bka.gv.at/...

[12] Based on Westnetz, requested 01.2022: https://www.westnetz.de/...

### 2.4.4. Feed-in remuneration

The feed-in remuneration is the money the consumer gets for selling the production surplus to the public grid. In Austria, Slovenia and Germany the tariffs are chosen constant:

- Austria: 13.691 Cent/kWh[13]
- Slovenia: 9.57 Cent/kWh[14]
- Germany [15] (for surplus feed-in)
    - 8.6 Cent/kWh for PV-Systems < 10 kWp
    - 7.5 Cent/kWh for PV-Systems between 10 kWp and 40 kWh
    - 6.2 Cent/kWh for PV-Systems > 40 kWh

For Croatia, the feed-in remuneration is calculated on a monthly base according to equation (1)[16]. The annual feed-in remuneration is the sum of all months within the chosen calculation period.

$$Feedin\ remuneration = min\left[E_t * t_f;\ E_f * t_f\right] \tag{1}$$

$E_t$ = energy taken from the grid [kWh/year]

$E_f$ = energy fed into the grid [kWh/year]

$t_f$ = 6.084 Cent/kWh for households and 13.258 Cent/kWh for non-households

For Italy, the annual feed-in remuneration paid by the electricity grid operator for the exchanged energy is defined by the following equation (2):

$$Feedin\ remuneration = min\left[E_t * 0.08;\ E_f * 0.07\right] + min\left[E_t; E_f\right] * 0.06 \tag{2}$$

$E_t$ = energy taken from the grid [kWh/year]

$E_f$ = energy fed into the grid [kWh/year]

Another challenge of the electricity storage is related to auxiliary services in case of black-outs or performing efficiently by limiting the purchase from the grid.

[13] Based on data from OeMAG for Q2/2023, requested 07.2023: https://www.oem-ag.at/de/marktpreis/

[14] Based on data from POCENI ELEKTRIKA, requested 07.2023, https://www.pocenielektrika.si/...,

[15] Based on data from Solaranlagen-Portal, requested 07.2023: https://www.solaranlagen-portal.com/photovoltaik/...

[16] Based on data from HEP, requested 07.2023: https://www.hep.hr/...

### 2.4.5. Investment costs

The investment costs for photovoltaic units are shown in Figure 10. For all countries the same investment costs have been assumed. Thus small systems can cost up to 2002 €/kWp, larger systems cost about 1344 €/kWp.[17]

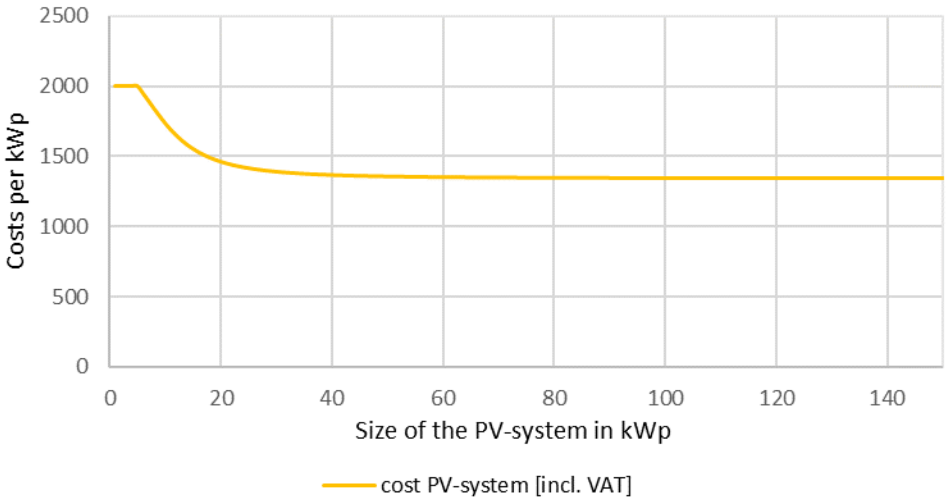


**Figure 16: Investment costs for photovoltaic systems per kWp**

The prices for wind energy and small-scale hydropower plants have been assumed the same for all countries. The prices are valid for smaller systems:

- Wind energy: 3800 €/kW[18]
- Hydropower: 7300 €/kW[19]

The investment costs of storages are depending on the storage type, the charging cycles, the efficiency, and of course the size of the storage. There is a certain bandwidth of possible storage costs. The differences between the countries however have turned out to be rather small. That is why the investment costs have been assumed the same for all five countries. Moreover, the prices for the most common lithium-ion storages are used for the calculation, which leads to a mean price of 1,183.2 €/kWh.[17]

### 2.4.6. Subsidies

In many countries there are lucrative funding opportunities for storages and photovoltaic systems available, which can reduce the costs of such systems significantly. To get a realistic assumption of the amortisation time, the funding opportunities of these technologies are also considered in the calculation.

---

[17] Biermayr P. et al, Innovative Energietechnologien in Österreich Marktentwicklung 2022, Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie (BMK), Wien, 2023

[18] Based on data from https://www.24ur.com/..., requested 01.2022

[19] Based i.a. on Veh M., Steinbacher F. Effizienzsteigerung und Optimierungspotenzial bei bestehenden Wasserkraftanlagen, Steinbacher-Consult IngenieurgmbH&Co. KG (Link) and Nachtnebel H.P., Wasserwirtschaftliche Planungsmethoden, Institut für Wasserwirtschaft, Hydrologie und konstruktiver Wasserbau, BOKU, Wien (Link)

For wind energy and small-scale hydropower no general funding opportunities are considered. It is common that grants for these technologies have to be evaluated individually.

- In Austria new funding options have been announced in 2022, due to the new legislation (Erneuerbaren-Ausbau-Gesetz), which are used for the calculations:

  A funding amount of 285 €/kWp for photovoltaic system smaller than 10 kWp can be expected. For systems between 10 kWp and 20 kWp, the funding amount is about 250 €/kWp. For systems with an installed PV capacity between 20 kWp and 100 kWp the funding is 160 €/kWp. For larger systems with 100 kWp to 1,000 kWp the funding amount is 140 €/kWp. In addition, a storage funding of 200 €/kWh is considered in the calculation. This funding opportunity is limited with a total amount of 10 000 € for storages smaller than 50 kWh.[20]

- In Slovenia, the funding for photovoltaic systems is either:
  - 500 €/kWp for an energy self-supply system with battery storage, but not more than 25 % of the eligible investment costs,
  - 50 €/kWp for an electricity self-supply system without battery storage, but not more than 25 % of the eligible investment cost, up to a maximum of 80% of the sum of the connected loads of the consumption points.[21]
- In Croatia the subsidies on photovoltaic systems amount up to 40 % of the investment with a maximum funding amount of 7250 €.[22]
- In Germany the subsidies for PV are loan subsidies offered by KfW funding (KfW loan 270), which have not been considered.
- In Italy national subsidies for PV are only provided in connection with improvement measures on buildings. The subsidy depends on many criteria. Furthermore every federal state has its own funding opportunities. As the tool is currently not able to deal with different situation within one country, the decision was made to not consider subsidies in Italy at all.

### 2.4.7. Amortisation period

For the calculation of the amortisation period, a pricing interest rate of 0.1 % and a useful lifetime of 15 years are assumed. Moreover, an increase of the electricity price of 2 % per year and an increase of the feed-in tariff of 1 % per year are taken into account.

## 2.5. Ecological values

The yearly $CO_2$ emission abatement ($KPI_3$) depend on the $CO_2$ emission factor of the applied energy source and the electrical energy consumption of the pilot system, which is supplied by an external source and is calculated as follows:

$$CO_2\ savings = E_{c\_tot} * EF \quad \textbf{(3)}$$

| | |
|---|---|
| $E_{c\_tot}$ | Total electrical energy consumption of the pilot system, supplied by external sources for one year in kWh |

[20] Photovoltaik Austria, requested 06.2023, https://pvaustria.at/eag-investzuschuss/

[21] EKO SKLAD, requested 06.2023, https://ekosklad.si/uploads/18448db0-b2e8-4854-acf8-fa305116391a/JP-104SUB-SO22.pdf

[22] ENERGETSKA-OBNOVA, requested 06.2023, http://energetska-obnova.hr/

$EF$ $CO_2$ emission factor to be applied to the energy source in $t_{CO2}$/kWh

Following $CO_2$ emission factors are used for the calculation:

- Austria: 57 g/kWh[23]
- Slovenia: 314 g/kWh[24]
- Italy: 260.5 g/kWh[25]
- Croatia: 120 g/kWh[26]
- Germany: 434 g/kWh[27]

## 2.6. Period

The input of the "period of time" gives the user the possibility to calculate the results also for a smaller period of time. Therefore, it is possible to calculate the autarky rate, for example, only for the summer or the winter months and see how it is changing. Or if the energy consumption is only known for a certain time period and not for a whole year, the particular time period can also be chosen for the calculation. However, if the calculation of the amortisation period is the goal, it is recommended to choose a whole year as calculation period.

[23] E-Control Stromkennzeichnung Österreich, requested 06.2023, https://www.e-control.at/...

[24] Institut „Joozef Stefan, requested 12.20, https://ceu.ijs.si/...

[25] ISPRA, Indicatori di efficienza e decarbonizzazione del sistema energetico nazionale del settore elettrico, requested 06.2023: https://www.isprambiente.gov.it/files2022/pubblicazioni/rapporti/r363-2022.pdf

[26] HEP, requested 06.2023. https://hep.hr/...

[27] Umweltbundesamt, requested 06.2023, https://www.umweltbundesamt.de/themen/co2-emissionen...

# Appendix

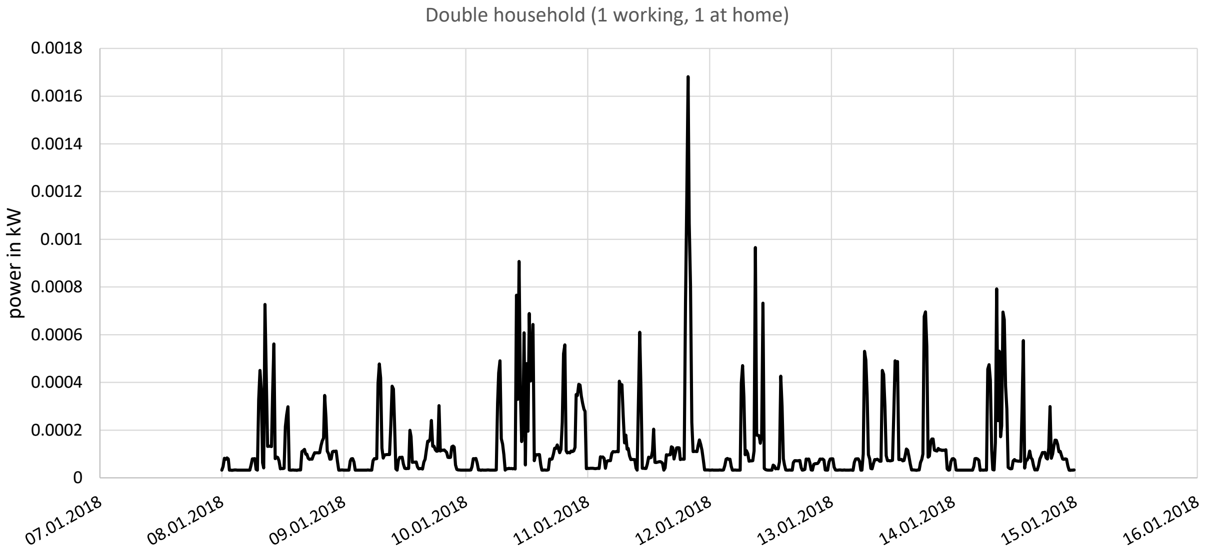


**Figure 17: Consumer profile of a double household (1 working, 1 at home)**

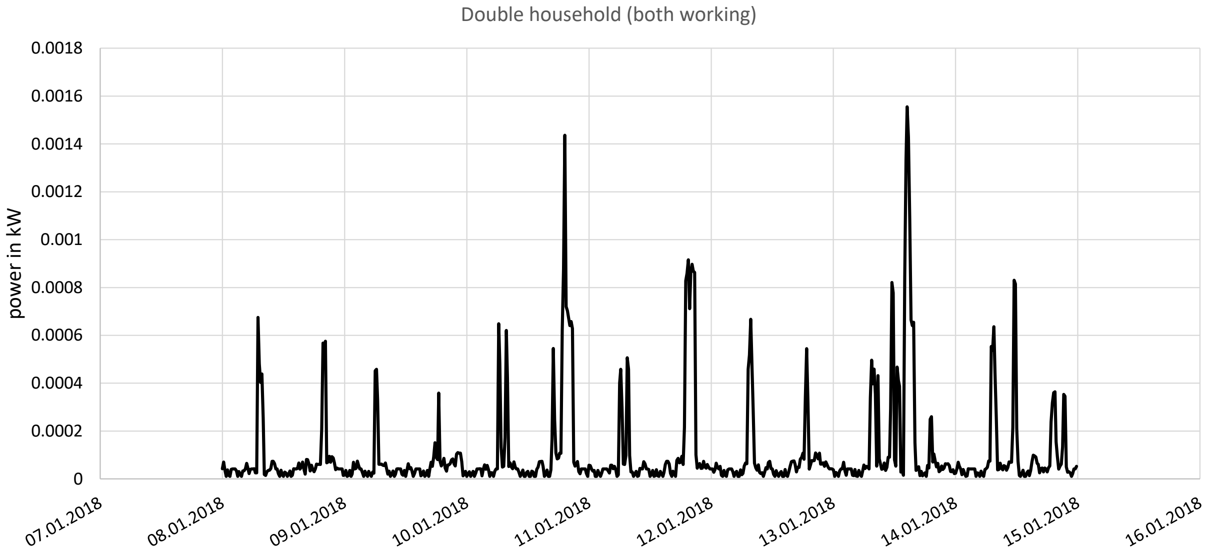


**Figure 18: Consumer profile of a double household (both working)**

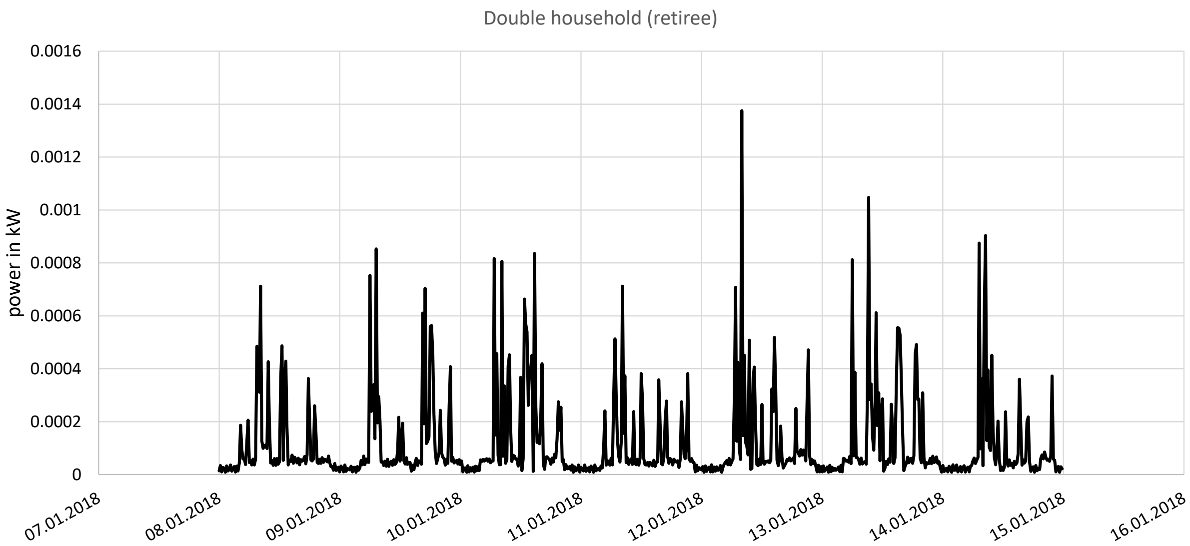


**Figure 19: Consumer profile of a double household (both at home)**

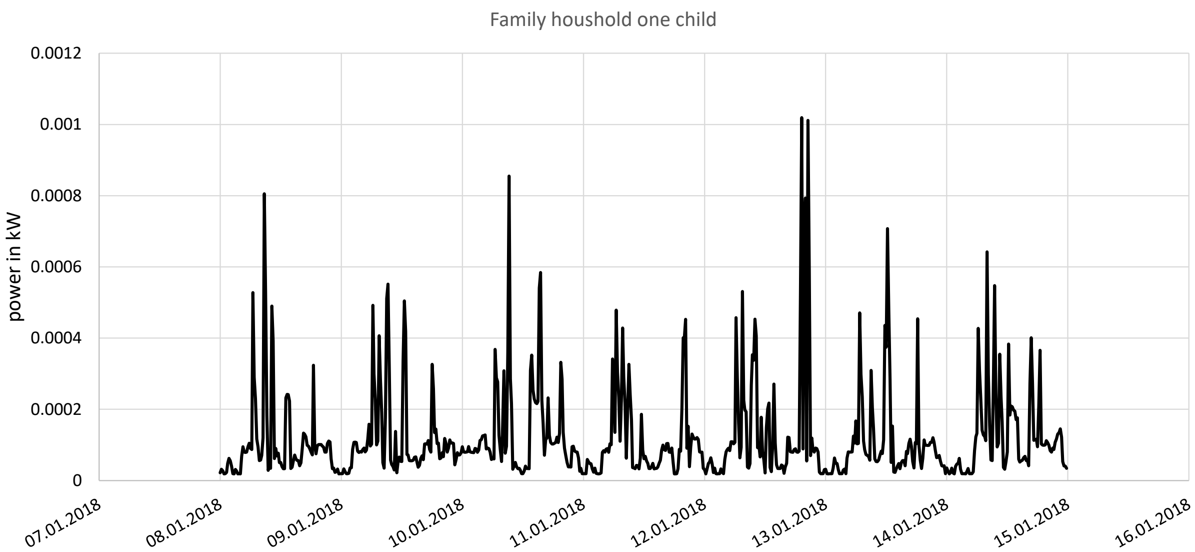


**Figure 20: Consumer profile of a family household with one child**

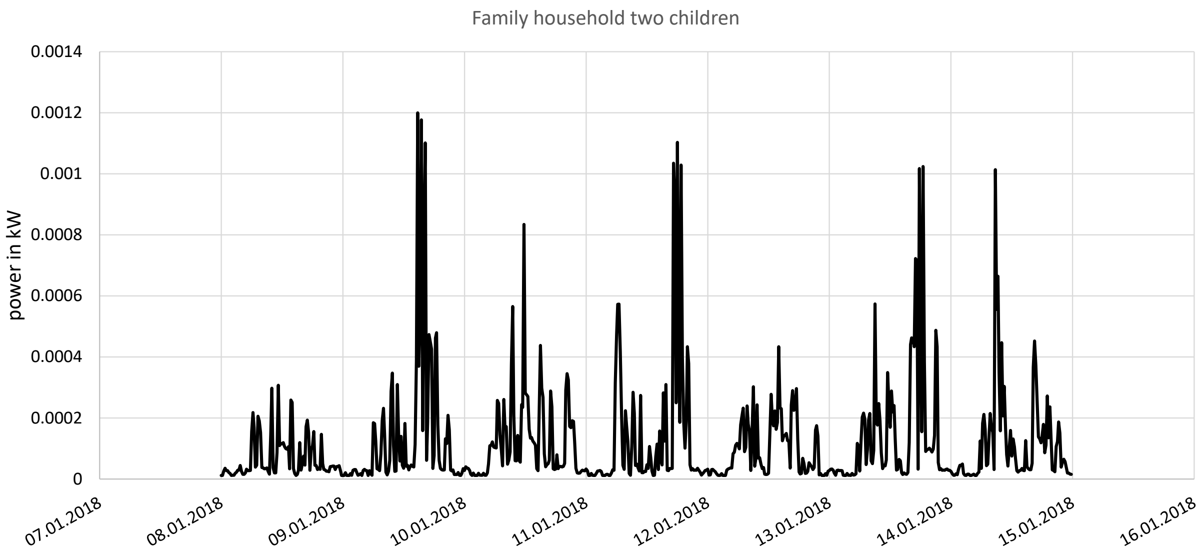


**Figure 21: Consumer profile of a family household with two children**

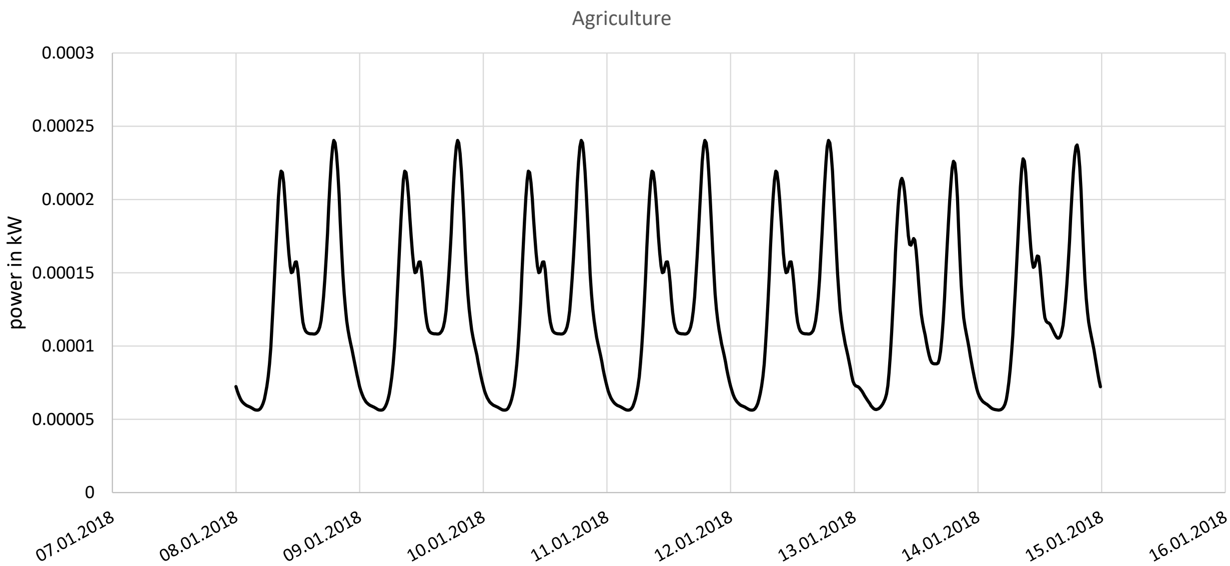


**Figure 22: Consumer profile of an agriculture holding**

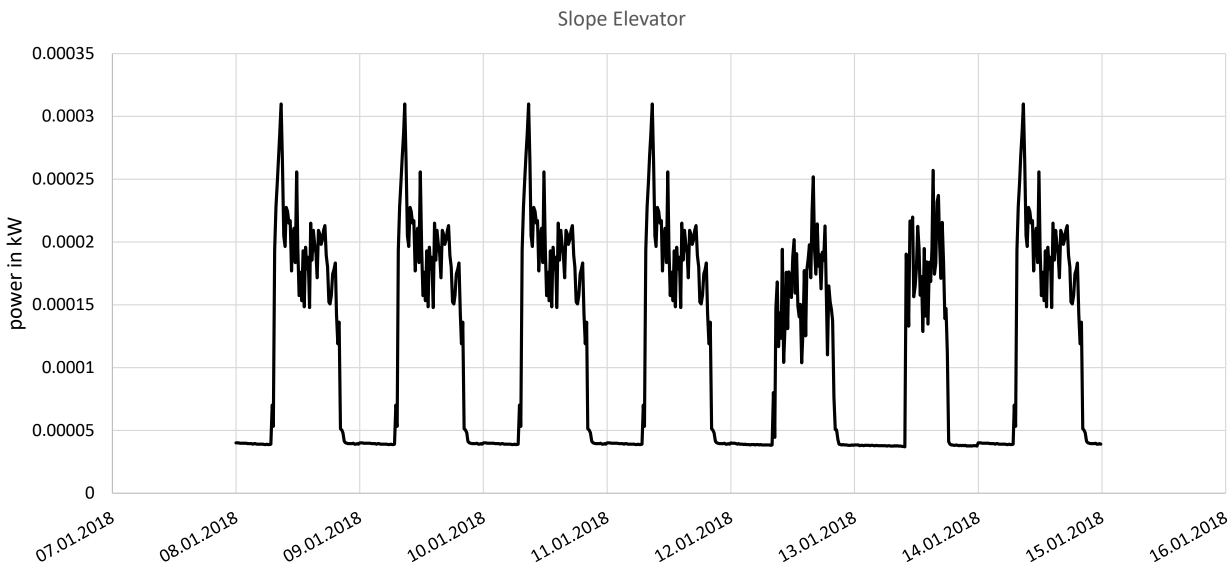


**Figure 23: Consumer profile of a slope elevator[28]**

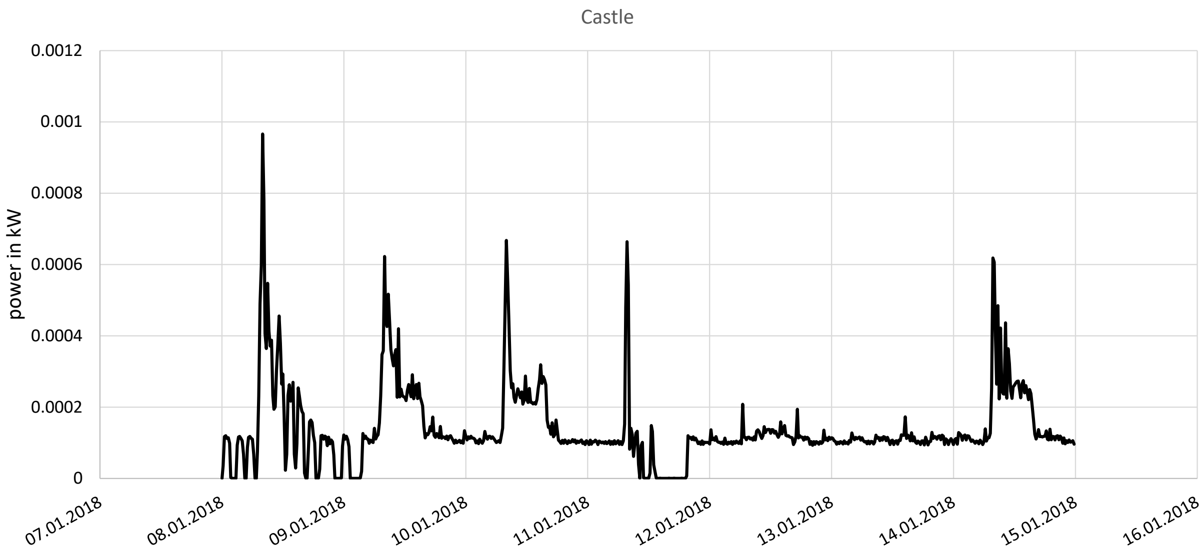


**Figure 24: Consumer profile of a castle (Bracak Manor)[29]**

[28] Information about the slope elevator pilot in Cuneo is available in the Deliverable D.T 2.1.2

[29] Information about the Bracak Manor pilot in Croatia is available in the Deliverable D.T 2.1.3