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Electricity Mixes in Life Cycle Assessments of Buildings

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Zusammenfassung

Ziel dieses Projektes war das Erarbeiten und Anwenden verschiedener Strommixe zur Modellierung des Stromverbrauchs in der Nutzungsphase von Gebäuden. Gebäudespezifische Strommixe und ein nationaler Schweizer Strommix wurden erarbeitet, indem die generischen Lastprofile von Wohn- beziehungsweise Bürogebäuden und das tatsächliche Lastprofil der Schweiz (in Intervallen von 60 Minuten) mit dem stündlichen Produktions- und Handelsprofil 2018 der Schweiz kombiniert und über das Jahr sowie das Winter- und Sommerhalbjahr integriert wurden. Zusätzlich wurden Schweizer Strommixe basierend auf Herkunftsnachweisen (HKN) sowie ein durchschnittlicher zukünftiger Strommix und ein langfristiger Schweizer Grenzstrommix erstellt. Die verschiedenen Strommixe wurden in Ökobilanzen eines Wohn- und eines Bürogebäudes angewendet. Neben dem Standard-Lastprofil des Wohngebäudes wurden Szenarien definiert mit Eigenproduktion aus einer PV-Anlage, zusätzlichen Batteriespeichern sowie mit Ladestationen für Elektroautos.

Die Zusammensetzung und damit auch die Umweltbelastungen der beiden gebäudespezifischen und des Schweizer Strommix sind sehr ähnlich. Diese Strommixe zeigen einen deutlichen saisonalen Unterschied mit deutlich geringeren spezifischen Umweltauswirkungen des Sommermix. Die Umweltauswirkungen der Jahresmixe sind deutlich höher als diejenigen der Mixe auf Basis von HKN und auch höher als diejenigen des zukünftigen Strommix. Die Installation von PV und Batterie-Systemen resultiert in höheren spezifischen Umweltauswirkungen der noch vom Netz bezogenen Elektrizität aber zu insgesamt tieferen Umweltauswirkungen in der Gebäude-Ökobilanz. Die Umweltauswirkungen der Errichtung und Entsorgung der analysierten Gebäude tragen die Hälfte und mehr bei zu den Lebensweg-bezogenen Umweltauswirkungen der Gebäude.

Es wird empfohlen in Gebäude-Ökobilanzen den in diesem Projekt erarbeiteten Schweizer Strommix basierend auf Produktion und ökonomischem Handel zu verwenden. In Szenarioanalysen von Investitionsvorhaben und insbesondere bei Sanierungsprojekten mit relativ hohem spezifischem Stromverbrauch wird empfohlen, den langfristigen Schweizer Grenzstrommix zu verwenden. Der durchschnittliche zukünftige Schweizer Strommix kann geeignet sein in Analysen gemäss einer zukünftigen revidierten SIA 2040.

Résumé

L'objectif de ce projet était de développer et de tester différentes modélisations de mix électriques appliqués à la phase d'utilisation des bâtiments. Des mix électriques spécifiques aux bâtiments et un mix électrique suisse ont été élaborés en combinant les profils de charge génériques des immeubles résidentiels et des immeubles de bureaux ainsi que le profil de charge réel de la Suisse (par intervalles de 60 minutes) avec les profils horaires de production, d'importation et d'exportation d'électricité de la Suisse en 2018, en les intégrant à des mix saisonniers (été et hiver) et annuel. Des mix électriques suisses basés sur les garanties d'origine (GO), un mix électrique moyen à venir et un mix électrique marginal à long terme pour la Suisse ont aussi été élaborés. Les différents mix électriques ont été appliqués aux écobilans d'un immeuble résidentiel et d'un immeuble de bureaux. Outre le profil de consommation standard, des scénarios incluant une autoproduction au moyen d'une installation photovoltaïque, des batteries de stockage supplémentaires et des stations de recharge pour voitures électriques ont été définis pour l'immeuble résidentiel.

La composition et donc l'impact sur l'environnement des mix électriques spécifiques aux deux immeubles et du mix électrique suisse sont très similaires. Ces mix présentent une nette variation saisonnière, avec des incidences spécifiques sur l'environnement nettement plus faibles en été. Les incidences sur l'environnement des mix annuels sont nettement plus élevées que celles des mix basés sur les GO et celles du mix électrique à venir. La mise en place d'installations photovoltaïques et de systèmes de batterie a des incidences environnementales spécifiques plus grandes pour l'électricité encore prélevée sur le réseau, mais globalement plus faibles dans l'écobilan des bâtiments. Les incidences environnementales de la construction et du démantèlement des bâtiments analysés contribuent au minimum pour moitié à l'empreinte environnementale des bâtiments sur l'ensemble de leur cycle de vie.

Dans les écobilans des bâtiments, il est recommandé d'utiliser le mix électrique suisse basé sur la production, l'importation et l'exportation développé dans ce projet. Dans les analyses de scénarios de projets d'investissement, et en particulier dans les projets de rénovation avec une consommation spécifique d'électricité relativement élevée, il est recommandé d'utiliser le mix électrique marginal à long terme pour la Suisse. Le mix électrique moyen à venir pour la Suisse peut être utilisé dans les analyses conformément à la norme SIA 2040 prochainement révisée.

Summary

Goal of this project was to assess different approaches of modelling the electricity mix used in the phase of operation of buildings and to offer electricity mix LCI datasets for the different approaches and applications. Building specific mixes and a Swiss national mix were established, matching the generic electricity load profiles of residential and office buildings and of Switzerland (in 60 minutes intervals) with the corresponding hourly production and trade profiles of Switzerland in 2018 and integrating them to seasonal and a yearly electricity mixes. Additionally, electricity mixes based on guarantees of origin as well as future average and longterm marginal electricity mixes were established. The different electricity mixes were applied on the life cycle assessment of a residential and an office building. Besides the standard consumption profile, scenarios with PV self production, battery storage and electric car charging stations were additionally defined for the residential building.

The environmental impacts caused by the two building-specific and the Swiss national mixes are very similar. All mixes show a clear seasonal variation with substantially lower specific environmental impacts in the summer period. Their environmental impacts are substantially higher than those of the Swiss electricity mixes based on guarantees of origin and of the average future electricity mix. The installation of PV and of battery systems result in higher specific environmental impacts of the remaining electricity delivered by the grid but to overall lower environmental impacts of the residential building. The environmental impacts caused by the construction and end of life of the buildings contribute half and more to the life cycle based environmental impacts of the buildings analysed.

It is recommended to use the Swiss national electricity mix based on physical production and commercial trade in buildings LCA and to use the long-term marginal electricity mix in scenario analyses of investments in new buildings and particularly in refurbishment projects with comparatively low energy efficiency. The average future electricity mix may be suited in assessments according to SIA 2040.

Main findings

- Building specific electricity mixes do not differ substantially from the electricity mix of Switzerland derived from hourly production and commercial trade data matched with the hourly consumption profile of Switzerland. LCA databases do not need to offer building specific electricity mixes.
- The technology mixes of the Swiss national electricity mix based on physical production and commercial trade and of the Swiss electricity mix based on guarantees of origin differ substantially and the environmental impacts of the former are much higher. This insight may help in improving the GO system to require the purchase of GOs coupled to the purchase of physical production.
- The specific primary energy demand and greenhouse gas emissions of the case study buildings analysed meet the target values of the current SIA 2040, irrespective of the electricity mix chosen. This may change when lowering the target values in a future revision of SIA 2040, following the more strict reduction requirements regarding CO_2 emissions.
- The importance of the environmental impacts caused by construction, replacement and end of life of the building clearly shows the urgent need of construction material manufacturing industry to lower their emissions substantially.

Contents

Executive Summary

Goal and scope

This study dealt with the question on which electricity mix to use in modelling the use phase in the environmental life cycle assessment of buildings. Several electricity mixes were defined and established. In particular, annual and seasonal electricity mixes were derived matching the hourly generic use profile of a residential and an office building with the technology mix producing the electricity in Switzerland and the technology mixes used to produce the electricity imported from neighbouring countries. The building specific annual electricity mixes are compared to the Swiss electricity mix matching the national hourly consumption profile with the technology mixes as described above, to the Swiss consumer and supply mixes based on guarantees of origin 2018, to the average future Swiss electricity mix 2020-2050 (to cover 30 years of operation of a building erected today), to a long term marginal power plant technology (natural gas fired gas combined cycle power plant), and to the ewz mix 2017.

Furthermore, the influence of self generation of electricity with PV system and of on site battery storage on the specific electricity mix of the residential building was evaluated and quantified.

On the basis of the life cycle inventories established the specific environmental impacts of these electricity mixes were quantified. Finally the different electricity mixes were applied in the use phase of the life cycle assessments of a residential and an office building to show the consequences of the choice of the electricity mix model on their environmental performance.

Methods

Several electricity mix models were developed and applied in this project:

- Annual and seasonal attributional electricity mixes of Switzerland in 2018. These electricity mixes were established by determining the hourly production, subtracting the hourly commercial exports and adding the hourly commercial imports of Switzerland. The resulting technology mix profiles were matched with the load (consumption) profiles of a residential and an office building (see Fig. S. 1) and with the consumption profile of Switzerland in 2018. The technology mixes of the imports and the exports represent the country mix of the respective hours.
- The Swiss supply mix based on guarantees of origin 2018, the Swiss consumer mix based on guarantees of origin 2018 and the ewz electricity mix based on guarantees of origin 2017.
- The average future electricity mix of Switzerland according to the “New Energy Policy” scenario of the Energy Strategy 2050 was determined in 5 years time steps from 2020 until 2050. It does not include commercial trade but only imports required to satisfy the domestic demand.
- The long term marginal electricity mix of Switzerland and of ewz, the utility of the City of Zürich was derived comparing the electricity demand and production volumes of the Business as Usual and the New Energy Policy scenarios. The additional electricity is expected to be produced in gas fired gas combined cycle power plants.

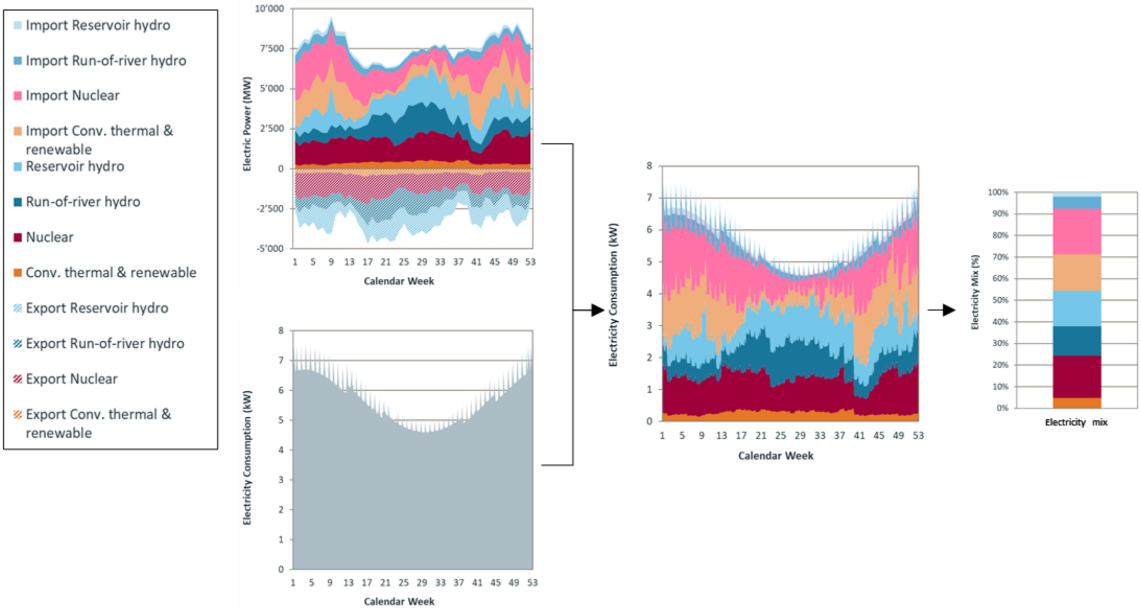

Fig. S. 1 Derivation of the annual attributional electricity mix for buildings (and Switzerland). The electricity generation, export and import profile (top left) and the consumption profile of the building (and Switzerland, respectively; bottom left) are combined (centre) and integrated over time (right) in order to obtain the attributional electricity mix supplied to the building (and to Switzerland, respectively).

Material manufacture and construction of the buildings was modelled with the Swiss supply mix 2011 as published in the KBOB recommendation 2009/1:2016.

Results

The results of the LCA of the residential building are described here as they are considered representative for both buildings assessed. The greenhouse gas emissions of the residential building Rautistrasse operated with the different electricity mixes vary between 9.8 and 12.4 kg CO_2-eq per m^2 and year (with 20.3 kg CO_2-eq per m^2 and year applying the longterm marginal electricity mix, see Fig. S. 2). The variation is uniquely caused by differences in the amount of electricity supplied from the grid, the manufacturing of PV and battery systems for self generation and consumption of electricity and the greenhouse gas emission intensity of the electricity mix used in operation. The greenhouse gas emissions of material manufacture and construction (labelled “building” in Fig. S. 2) are identical.

In most cases the share of greenhouse gas emissions caused during construction (and the corresponding end of life) is higher than the share of operational greenhouse gas emissions. More than two third of the greenhouse gas emissions caused during the life cycle of the residential building are due to construction and in particular building material manufacture.

The greenhouse gas emissions of the operation phase differ substantially, in particular when comparing for instance the environmental impacts of the attributional mixes established in this project with the mixes based on guarantees of origin, the average future electricity mix, the long term marginal mix and the ewz mix 2017.

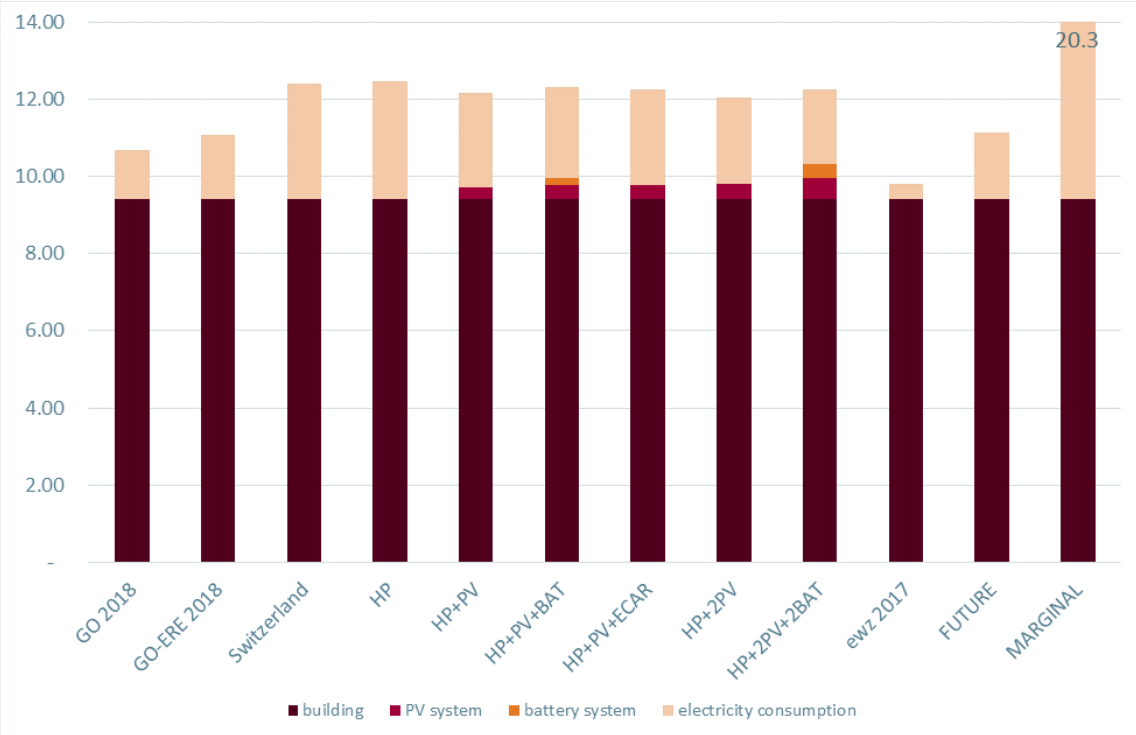

Fig. S. 2 Greenhouse gas emissions in kg CO_2-eq. per m^2a of the residential building Rautistrasse, Zurich. Target values SIA 2040:2017: 9 and 3 kg CO_2-eq./m^2a (construction including end of life and operation, respectively).
GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based to guarantees of origin 2018, i.e. excluding deliberately purchased electricity products based on renewable energies; Switzerland: Swiss annual mix (national load profile); HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; ewz 2017: ewz electricity mix based to guarantees of origin 2017; FUTURE: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; MARGINAL: long term marginal electricity mix (Switzerland and ewz).

The greenhouse gas emissions of the building specific electricity mix (“HP”) and of the national average attributional mix (“Switzerland”) are nearly identical. Self generated electricity leads to lower environmental footprints. The reduction in environmental impacts is mainly due to the lower demand of grid electricity. The environmental profile of grid electricity supplied to the building is hardly affected by the self generated and consumed PV electricity. The investment in storage facilities does not necessarily lower the greenhouse gas emissions of the building.

The results of the LCA of the office building show similar patterns: the environmental impacts of the building are very similar when applying the building specific and the Swiss average attributional electricity mix and lower when applying the Swiss and the ewz mix based on guarantees of origin.

The environmental impacts of the summer electricity mixes (building specific and Swiss average) differ substantially from those of the winter mixes. The winter mixes cause for instance between 160 and 169 g CO_2-eq/kWh and the summer mixes between 70 and 78 g CO_2-eq/kWh.

Conclusions

The results of this study confirm the environmental relevance of electricity consumption of buildings and of the choice of the appropriate electricity mix model, irrespective of the environmental indicator chosen. However, at the same time the results show that construction (manufacture of building materials, building elements and building technology) contributes between somewhat less than 50 % and more than 95 % to the life cycle based environmental impacts of buildings and therefore necessarily needs to be included in environmental analyses of buildings and the corresponding target values.[1]

The summer and winter Swiss electricity mixes show distinctly different patterns. During the summer period, more electricity is being produced with hydropower and the mix relies much less on imports of non renewable electricity from neighbouring countries. During the winter period substantial shares of fossil based electricity is being imported.

The annual and seasonal electricity mixes derived from the load profile of the two buildings and of Switzerland are close to identical. Obviously the load profile of energy efficient residential and office buildings are very similar to the load profile of the country.

The comparison of the Swiss national electricity mix 2018 established by integrating the combination of hourly technology mixes (domestic production minus commercial exports plus commercial imports) with the hourly load profile of Switzerland with the Swiss supply mix based on guarantees of origin (GO) 2018 reveal substantial discrepancies: while Switzerland still consumes electricity with a share of 40 % nuclear power and 10 % fossil power, the GO mix shows shares of about 20 % and 4 % of nuclear and fossil power, respectively.

The average future Swiss electricity mix causes less environmental impacts than the Swiss annual attributional electricity mix. The level of environmental impacts is similar to the Swiss supply mix based on guarantees of origin 2018. The average future mix lacks trade related technology shares and thus is hardly comparable with the other mixes which represent the current situation.

Countries like Denmark use a future electricity mix in their buildings LCA and Switzerland might consider to do the same. The future Swiss electricity mix described in this report is in principle suited to represent the operational electricity consumption of buildings in LCAs according to the technical bulletin SIA 2040 “SIA efficiency path energy”, if the question whether and how future electricity trade is taken into account. The SIA target values for building operation would need to be adjusted (lowered).

The ewz 2017 electricity mix shows the lowest specific environmental impacts due to the low share of nuclear power and the absence of fossil based electricity. This is however not a carte blanche for an excessive and inefficient use of electricity. Capacity constraints (in the case of ewz but also on country level) would call for additional power plant capacities, which, according to the national energy strategy 2050 and ewz scenarios, would likely be natural gas fired gas combined cycle power plants.

Despite the large variety in electricity mixes developed and analysed in this study, its variability can effectively be narrowed down by assigning specific electricity mixes to specific policy relevant questions and scopes.

[1] A recent study showed that building material manufacturers may lower the specific greenhouse gas emissions of their products by 65 % on average (Alig et al. 2020), by investing in completely new technologies (hydrogen based steel) and in technical reduction measures such as carbon capture and storage (e.g. in cement production) in addition to switching to renewable energy sources.

Recommendations

The analyses and results presented in this study lead to the following recommendations:

- Refrain from establishing building sector specific electricity mixes and instead use Swiss national electricity mixes based on physical production and commercial trade as established in this project.
- Use the seasonal Swiss national electricity mixes in case the seasonal electricity consumption pattern of the building under assessment differs substantially from the seasonal consumption pattern of Switzerland.
- Reconsider the current use of the Swiss consumer mix based on guarantees of origin in building LCAs and in LCAs in general. It is recommended to use the Swiss national electricity mix based on physical production and commercial trade, which reflects the economic reality of the purchase of electricity *production* (which is considered more important than the economic reality of the purchase of the *quality* of the electricity).
- Evaluate whether or not to use the average future Swiss electricity mix to model the operational electricity consumption of buildings in the upcoming revision of the technical bulletin SIA 2040 “SIA efficiency path energy”.
- Use the long term marginal electricity mix in scenario analyses of investments in new buildings and in particular in refurbishment projects with comparatively low energy efficiency. This is particularly important in situations where the electricity causes low specific environmental impacts and greenhouse gas emissions and shows the resilience of the investment towards changes in the electricity producing technologies.
- Self generation of electricity with PV helps to reduce the environmental impacts of buildings supplied with a building specific or a national average electricity mix. The effect of on site individual storage of electricity in batteries is less distinct and thus not recommended. Centralised storage facilities on district level may show a different performance.

Given the increasing significance of the construction phase of buildings as shown in the building case studies, establish binding and steadily lowering target values on greenhouse gas emissions per m^2 and year. The SIA 2040 technical bulletin is a reality proven basis for such a regulation.

Abbreviations

a	year (annum)
AC	alternating current
AHB	Office for Building Engineering of the City of Zurich (German: Amt für Hochbauten der Stadt Zürich)
AIB	Association of Issuing Bodies
BAU	business as usual (German: Weiter wie bisher)
CED	cumulative energy demand
CH	Switzerland
CH4	methane
CO2	carbon dioxide
CO2-eq	carbon dioxide equivalent
DSM	demand side management
EAM	European attribute mix
ENTSO-E	European Network of Transmission System Operators for Electricity
ewz	Electric Utility of the City of Zurich (German: Elektrizitätswerk der Stadt Zürich)
GHG	greenhouse gas
GO	guarantee of origin (German: Herkunftsnachweis)
GWP	global warming potential
HP	heat pump
KBOB	Coordination Group for Construction and Property Services (German: Koordinationskon-ferenz der Bau- und Liegenschaftsorgane des Bundes)
kWh	kilowatt hour
kWp	kilowatt peak
LCA	life cycle assessment
LCI	life cycle inventory analysis
LCIA	life cycle impact assessment
MFH	apartment building (German: Mehrfamilienhaus)
NEP	new energy policy (German: Neue Energiepolitik)
N2O	nitrous oxide
POM	political measures (German: Politische Massnahmen)
PV	photovoltaic
RER	Europe
SF6	sulphur hexafluoride
SFOE	Swiss Federal Office of Energy

SIA	Swiss Society of Architects and Engineers (German: Schweizerischer Ingenieur- und Ar-chitektenverein)
UBP	eco-points (German: Umweltbelastungspunkte)
UVEK	Federal Department of the Environment, Transport, Energy and Communications (Ger-man: Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation)

1 Introduction

1.1 Background information and current situation

Electricity used for room heating, hot water preparation, ventilation, auxiliary energy, lighting and operational facilities usually has a significant share in the operational energy demand of buildings. The electricity mix may therefore strongly influence the environmental impacts of the operation phase of buildings. According to the technical bulletin SIA 2040 of the Swiss Society of Architects and Engineers (SIA) that sets the rules for the life cycle assessment (LCA) of buildings, the Swiss consumer mix should be used to quantify the environmental impacts of the operational electricity consumption (SIA 2017)[2]. The temporal variations of the shares of different technologies in the electricity mix are thereby neglected. However, both the electricity consumer mix and the electricity consumption of buildings vary over time (see Tab. 1).

Tab. 1 Examples of temporal variations of the electricity consumer mix and the operational electricity demand by buildings over different time scales. Please note that some of the variations are interrelated since production and consumption of electricity have to be balanced at any time.

Time scale	Electricity consumer mix	Operational electricity demand
Building's lifetime	Transition towards renewable technologies Phase-out of nuclear power plants	Better thermal insulation after refurbishment More efficient electrical appliances and lighting devices Increased cooling demand due to global warming
Year	Higher production from nuclear power and more import in winter Higher production from hydropower and photovoltaics in summer	Heating energy and more lighting demand in winter Cooling demand in summer
Week	Different pattern of reservoir hydropower and imports on work days and weekends	Higher demand by commercial and industrial buildings on work days than on weekends
Day	Higher production from photovoltaics and reservoir hydropower at noon More imports in the afternoon and during night	Consumption peaks in the morning, at noon and in the evening for households Higher demand by commercial and industrial buildings during the day

A differentiated modelling approach with respect to the temporal variations in the electricity mix and to the specific questions to be addressed may be used to refine the environmental life cycle assessment of buildings. Potential applications of differentiated electricity mixes are:

- benchmarking and building certifications,
- strategies and measures for building refurbishments,
- environmental optimisation of building construction and operation, and
- load management.

[2] Certified electricity based on renewable energies may be applied for up to 50 % of the electricity demand in case long term contracts are signed for the building under analysis, see clause 2.3.1.4 in SIA 2040.

1.2 Purpose of the project

This study aims at creating and improving the methodological and data-related basis to assess the environmental impacts of operational electricity consumption of buildings depending on the question under investigation which usually implies a certain time scale. To this end, a methodology for the differentiated modelling of electricity consumption by buildings is developed. The methodology is used as a basis to compile differentiated archetypical electricity mixes for Switzerland and the City of Zurich. Two case studies are carried out in order to assess the environmental impacts of a residential and an office building depending on the electricity mix, the heating system and the presence (or not) of a photovoltaic (PV) system, a battery storage or electric cars.

1.3 Contents of this report

The scope of this study is described in Chapter 2 and the methodology for the differentiated modelling of electricity consumption by buildings is explained in Chapter 3. The life cycle inventories of the differentiated electricity mixes are presented in Chapter 4 and the results of the building case studies are discussed in Chapter 5. The conclusions of this study and recommendations on how to model the operational electricity consumption of buildings are described in Chapter 6.

2 Scope

2.1 Functional unit

The functional unit of the electricity mixes (see Chapter 4) is 1 kilowatt hour (kWh) electricity from the grid. It is distinguished between electricity supplied at high, medium and low voltage. The electricity demand of buildings is usually measured/calculated on low voltage level.

The functional unit of the building case studies (see Chapter 5) is 1 square meter energy reference area during 1 year ($m^2 \cdot a$).

2.2 System boundaries

The life cycle inventories of the electricity mixes include the construction, maintenance and decommissioning of the power plants, the fuel supply and its waste management (if applicable), emissions during operation as well as the infrastructure, the losses and the emissions of electricity transmission and distribution.

The building case studies are carried out according to the technical bulletin SIA 2040 of the Swiss Society of Architects and Engineers (SIA 2017) and include the construction, maintenance and demolition as well as the operation of the building. The induced mobility during the use phase is independent of the electricity mix model and thus excluded from the assessment.

2.3 Data sources

Most of the data used in this project are publicly available. Data on the power plant production portfolio and on the commercial exchanges for Switzerland and the neighbouring countries (France, Germany, Austria, Italy) with a time resolution of 1 hour were downloaded from the Transparency Platform[3] of the European Network of Transmission System Operators of Electricity (ENTSO-E). Typical load profiles for residential and office buildings with a 15 minutes time resolution were taken from VDEW (1999)

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3 https://transparency.entsoe.eu/dashboard/show (accessed on 27.11.2019).

and adapted with additional data to the different cases. These data are then processed and integrated in order to compile the differentiated electricity mixes. In addition, literature studies are used for certain electricity mixes.

The environmental impacts of the residential and the office building used in the case studies were previously assessed and documented by Wyss et al. (2014) and Tschümperlin et al. (2016). The life cycle inventories of building construction, maintenance and demolition will be adopted from those studies. The life cycle inventories of building operation will be used as a basis to test the differentiated electricity mixes.

The life cycle inventories created in this study are linked to the UVEK life cycle assessment data DQRv2:2018 (KBOB et al. 2018), which are based on ecoinvent data v2.2 (ecoinvent Centre 2010). This data source contains extensive updates on energy supply and material production datasets and ensures methodological continuity with former versions of the ecoinvent database. The analyses are performed with SimaPro v9.0.0 (PRé Consultants 2019).

2.4 Life cycle impact assessment

The environmental impacts of the electricity mixes and buildings analysed in this study are assessed with the following three different impact assessment methods:

- Ecological scarcity method 2013 according to Frischknecht and Büsser Knöpfel (2013), expressed in eco-points (UBP),
- Cumulative energy demand (CED), which is further separated into renewable and non-renewable CED and expressed in MJ oil-eq, according to Frischknecht et al. (2015b),
- Greenhouse gas (GHG) emissions, expressed in kg CO_2-eq, based on the 100 year global warming potentials (GWPs) reported by IPCC (IPCC 2013).

3 Methodology

3.1 Overview

The most suitable electricity mix to be used in life cycle assessments of buildings should be identified by considering three important aspects:

- Modelling present electricity mixes, including treatment of guarantees of origin (GO),
- attributional vs. consequential life cycle assessment, and
- time scale of variations in electricity production and consumption.

Different approaches to model present electricity mixes, covering physical flows, purchases of physical amounts and purchases of guarantees of origin, are described in Subchapter 3.2. Attributional and consequential modelling approaches taking into account the production portfolio in a specific time span and the respective load profile of the building to be analysed are described in Subchapters 3.3 and 3.4, respectively. These subchapters address the time scales of a day, a season, a year and the building’s lifetime.

3.2 Modelling present electricity mixes

3.2.1 Overview

The supply of electricity in a given year to the consumers in a country can be modelled in different ways. In the early phase of life cycle assessment databases four different models were distinguished (Ménard et al. 1998; see Fig. 1):

- M1: production mix;
- M2: production plus imports;
- M3: production minus exports plus imports;
- M4: production plus net trade.

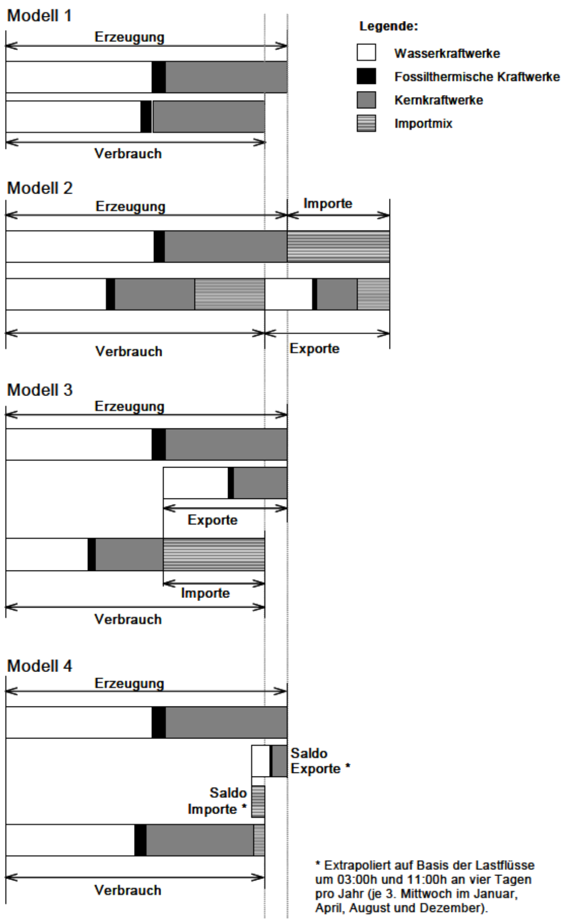

Fig. 1 Electricity mix models in LCA; the bars represent annual averages, Frischknecht and Faist Emmenegger (2003), adapted from Ménard et al. (1998)

The LCA databases "Ökoinventare von Energiesystemen" (Frischknecht et al. 1994) and ecoinvent v1 and following (Frischknecht et al. 2004, 2007; Weidema et al. 2013) featured model M2. However, recent analyses in connection with the time series of environmental footprints of Swiss consumption revealed that model M3 seems to be more appropriate (Frischknecht et al. 2018a, 2018b). The data in the "Cockpit Stromkennzeichnung" published by Swissgrid (2016) shows that Switzerland tends to export Swiss hydroelectric power rather than electricity (mainly from non-renewable sources) previously imported.

Since a few years the Swiss national electricity mix is modelled based on the data of the "Cockpit Stromkennzeichnung" (see details in Section 3.2.4), which relies on guarantees of origin (GOs).

In the following we distinguish three different ways to model the electricity mix supplied to consumers in a given year:

- electricity mix based on the physical flows of electricity;
- electricity mix based on the purchases of physical amounts of electricity;
- electricity mix based on purchases of guarantees of origin.

The three models, which all qualify as present attributional electricity mixes (see Subchapter 3.3), are described in the following sections. Future attributional electricity mixes and consequential electricity mixes are modelled based on scenario information, which usually disregard the trade of guarantees of origin and electricity trade (except for imports needed to match the demand).

3.2.2 Electricity mixes based on the physical flows of electricity

The national electricity mixes (except the Swiss supply and consumer mixes which are based on guarantees of origin, see Section 3.2.4) available in the ecoinvent databases and the UVEK life cycle assessment data DQRv2:2018 (KBOB et al. 2018) are based on the production of electricity in the country and the physical imports from neighbouring countries (following model M2) measuring the physical flows at the border.

On a building or community level the electricity mix based on the physical flows of electricity would be determined by the proximity of the building or community to power plants rather than by the contracts with the utility supplying the electricity. A building in Gösgen/SO would most probably be supplied with 100 % nuclear electricity, whereas a building in Küblis/GR would receive 100 % of hydroelectric power.

This approach may roughly reflect economic realities on a country level but not on the level of buildings and communities. It disregards the ownership of power plants as well as the economic realities of electricity sales and purchases. Investment and purchase decisions of building owners are not accounted for. That is why we discourage using this modelling approach in the context of building LCAs.

3.2.3 Electricity mixes based on purchases of physical amounts of electricity

Instead of measuring the physical flows of electricity, the electricity mix can be established based on the purchases of physical amounts of electricity. These physical amounts may be purchased from spot markets or from dedicated power plants. The provenance, the power plant technology producing the physical amounts may thus not be known (from spot markets, non-verifiable sources) or known (from dedicated power plants).

3.2.4 Electricity mixes based on purchases of guarantees of origin

The current electricity market distinguishes between the physical electricity and the quality of the electricity (described by certificates called "guarantees of origin", GOs), which are traded separately from each other (see Fig. 2). As a consequence, the certified quality of the electricity purchased and consumed by a country or a building may significantly deviate from the physical electricity mix purchased and consumed. This deviation occurs when the electricity qualities are purchased independently of the physical amounts, which may be purchased on a spot market with no information about their provenance.

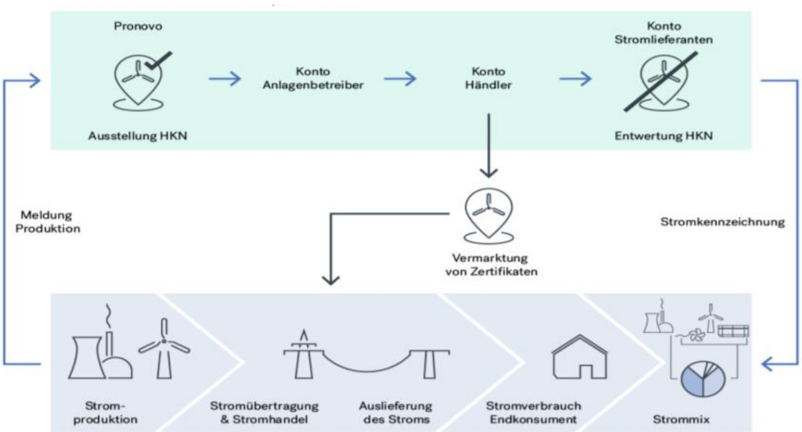

Fig. 2 Swiss system of guarantees of origin Pronovo;

Source: https://pronovo.ch/de/herkunftsnachweise/information/informationen-zu-hkn/

Electric utilities have to balance their GOs with the electricity supplied on a yearly basis. Temporal variations within days, weeks and seasons are not reported and thus disregarded. An electricity mix based on GOs is thus by definition an annual attributional average electricity mix. In this report annual average electricity mixes based on GOs are listed and treated separately from other attributional electricity mixes due to their particularities described above.

The electricity mix used for instance in life cycle assessments of buildings according to the technical bulletin SIA 2040 SIA energy efficiency path (SIA 2017) is based on the Swiss consumer mix which currently accounts for GOs. The life cycle inventories of the Swiss supply and consumer mixes in 2018 were compiled by Krebs and Frischknecht (2020) using the "Cockpit Stromkennzeichnung" published by Pronovo (2020). This is an aggregation of the reported electricity certificates of all electric utilities in Switzerland. The Swiss supply and consumer mixes contain a relevant share of non-verifiable electricity not covered by GOs.[4] The technological composition of non-verifiable electricity needs to be suitably approximated in the life cycle inventory. The Swiss residual mix published by the Association of Issuing Bodies, AIB (2019) account for the non-cancelled GOs in Switzerland. The Swiss residual mix was used to model the share of non-verifiable electricity in the Swiss supply and consumer mixes 2018.

The "Cockpit Stromkennzeichnung" does not distinguish whether or not the quality of electricity was purchased from the same source as the physical amount of electricity. Hence, the electricity mix based on the purchases of the physical amounts of electricity and its supply to Swiss consumers may differ from the one reported in the "Cockpit Stromkennzeichnung". Several Swiss reseller utilities offer electricity products including significant shares of European hydroelectric power. It is likely that these utilities purchase power from one of the big utilities with significant shares of nuclear power, and add GOs from e.g. Norwegian hydroelectric power plants to create electricity products which appear to be 100 % renewable.

The KBOB guidelines for life cycle assessment of building products (KBOB et al. 2015) include rules on how to deal with GOs. Companies which may choose their electricity supplier must purchase the physical amounts and the quality of electricity from the same power plants (congruency/coupling). Otherwise they shall establish the environmental profile of the mix of the physical electricity purchase and may report on the environmental benefits due to the purchase of GOs of renewable electricity as an improvement measure.

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4 The declaration of non-verifiable electricity on the electricity labelling is no more allowed since 1 January 2018 (UVEK 2017).

3.3 Attributional electricity mixes

3.3.1 Overview

Attributional or descriptive life cycle assessments approximate the reality as it is at a specific point in time. As described in the previous Subchapter 3.2, different models are available to model present attributional national or utility electricity mixes. In the case of electricity mixes, attributional life cycle assessments may be used, for instance, for benchmarking and building certifications.

The methodology to compile attributional electricity mixes derived from detailed production profiles is explained for the annual and the daily perspective in Sections 3.3.2 and 3.3.3. The future attributional electricity mixes are addressed in Section 3.3.4.

3.3.2 Annual and seasonal attributional electricity mix

Hourly data of the electricity production by technology, of (commercial) electricity imports and exports by country and of the electricity consumption of a given building are used as a basis for the attributional electricity mixes.

Electricity generation and trade data for Switzerland, France, Germany, Austria and Italy were retrieved from the ENTSO-E Transparency Platform[3]. The imports and exports of electricity are based on the scheduled commercial exchanges between two bidding zones, which allow the accounting of simultaneous imports and exports at the same border.[5] The imports of electricity from a given country are modelled by the production mix of that country in the respective time period (see model M3 in Fig. 1 and Section 3.2.1). This approximation is based on the observation that electricity is hardly traded across (large) countries. Furthermore Switzerland's neighbouring countries have big markets, and the imports and exports from their neighbouring countries are low compared to their domestic electricity generation. The electricity exports from Switzerland are also modelled by the production mix as Frischknecht et al. (2018a, 2018b) found the model 3 to best describe the data from the "Cockpit Stromkennzeichnung"of past years up to 2015.

The typical load profiles of residential and office buildings were adopted from VDEW (1999). These load profiles are based on measurements in Germany from 1996 and 1997. A comparison of the VDEW load profile of households with confidential data for two households obtained from the Electric Utility of the City of Zurich (ewz) showed satisfying agreement. However, the measured load profiles of the households showed much higher variation than the load profile by VDEW. ewz also provided 10 exemplary load profiles of office buildings, which exhibited significant differences among each other. The typical load profile for office buildings according to VDEW (1999) is therefore used.

The procedure of calculating an annual attributional electricity mix of residential buildings is illustrated in Fig. 3. The graph in the top left shows the generation, import and export of electricity in Switzerland in 2018 with an hourly resolution. The areas above the zero line show the electricity supplied to the Swiss customers (domestic production and imports), while negative values refer to exports of electricity produced in Switzerland. The typical load profile of households from VDEW (1999) was scaled to an annual electricity consumption of 50 MWh (Fig. 3, top right), which corresponds approximately to the electricity consumption of the residential building analysed in the case study.

Electricity production and consumption always have to be synchronous in order to maintain grid stability. The production profile is therefore combined with the consumption profile (Fig. 3, centre).

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[5] Life cycle inventory models depict economic realities. The commercial exchanges are chosen (and preferred to physical exchanges) because they better reflect the economic realities of electricity trade.

Integration over time yields the annual attributional electricity mix for residential buildings (Fig. 3, bottom). The attributional electricity mix corresponds to the consumption-weighted average of the technology shares in the hourly supply mix.

The load profile of the building differs depending on the heating system and the presence of a photovoltaic (PV) system, a battery storage or electric cars. A specific electricity mix is determined for each of these variants (see Chapter 5). Additionally, the load profile of Switzerland in 2018 was applied to derive a national average attributional electricity mix based on physical production and commercial trade with neighbouring countries.

The methodology to derive seasonal electricity mixes for an attributional life cycle assessment of a specific building is analogous to the annual electricity mix, integrating from October to March and from April to September for a winter and a summer mix, respectively.

The building specific attributional electricity mixes established in this project have no link to the purchase of the electricity (the physical production) of the buildings. The national attributional electricity mix however is an approximation of the purchase of physically produced electricity, within the country and in neighbouring countries.

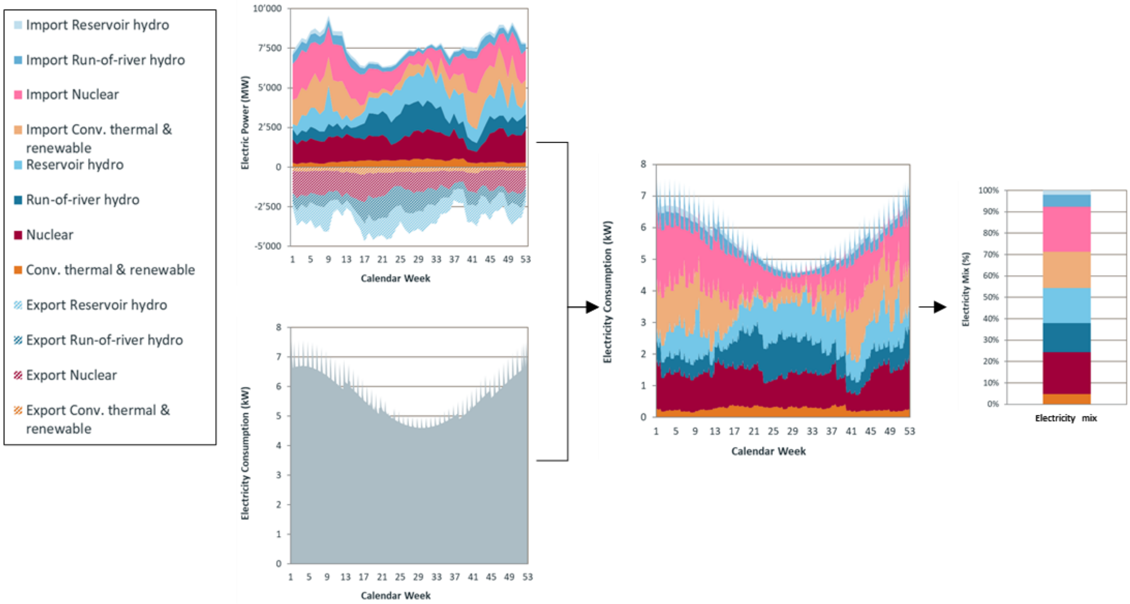

Fig. 3 Derivation of the annual attributional electricity mix for buildings and for Switzerland. The electricity generation, import and export profile (top left) and the consumption profile (top right) are based on ENTSO-E[3], VDEW (1999) and Swissgrid, respectively. The hourly production and consumption profiles are combined (centre) and integrated over time (bottom) to obtain the attributional electricity mix.

3.3.3 Daily attributional electricity mix

The methodology to derive daily attributional electricity mixes is analogous to the annual perspective (see Section 3.3.2). Fig. 4 illustrates the procedure for a residential building. The graph in the top left shows the generation, import and export of electricity in Switzerland on Wednesday, 28 February 2018, with an hourly resolution. The load profile is taken from VDEW (1999) and represents the course of electricity consumption of a typical residential building with an annual consumption of about 50 MWh on the last Wednesday in February (see Fig. 4, top right).

The production profile is combined with the consumption profile (see Fig. 4, centre). Integration over time yields the attributional electricity mix for residential buildings on a typical work day (see Fig. 4, bottom). The attributional electricity mix corresponds to the consumption-weighted average of the technology shares in the hourly supply mix.

The daily mixes are neither determined nor applied in this project.

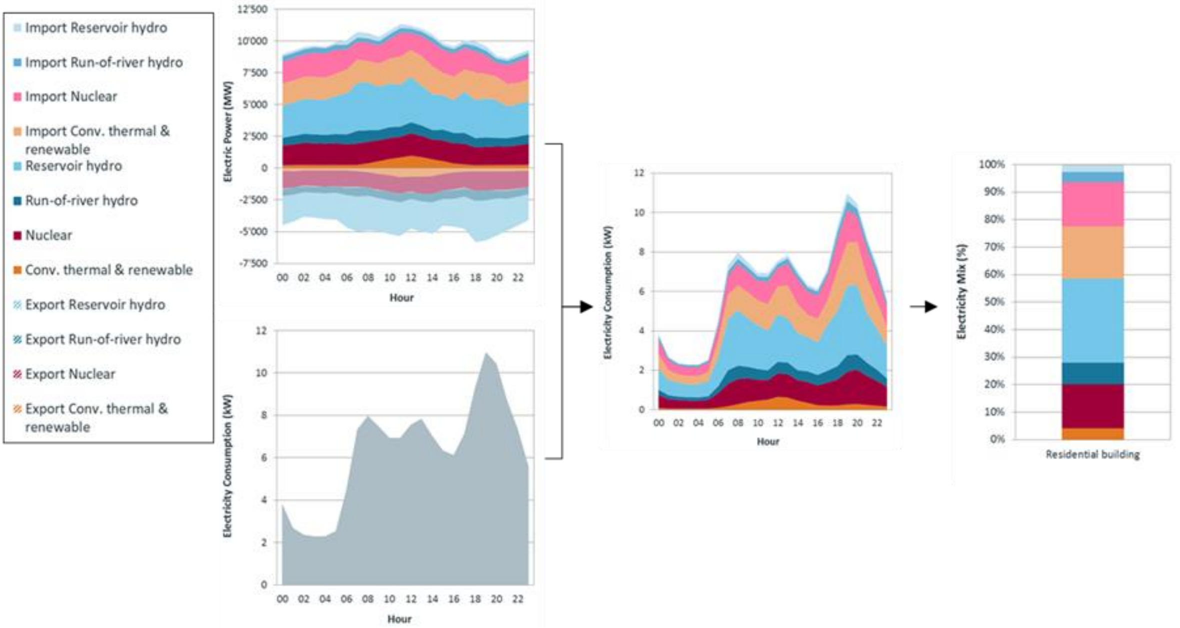

Fig. 4 Example for the derivation of a daily attributional electricity mix for a residential building. The production profile (top left) and the consumption profile (top right) are based on ENTSO-E and VDEW (1999), respectively. Both represent the last Wednesday in February. The production and consumption profiles are then combined (centre) and integrated over time (bottom) in order to obtain the attributional electricity mix.

3.3.4 Future attributional electricity mixes

The future electricity mix for Switzerland for 2020, 2025, 2030, 2035, 2040, 2045 and 2050 is developed according to the report by Prognos (2012). For the Swiss future electricity mix, the scenario “new energy policy” (NEP) in the variant C&E (central and renewable electricity generation) is considered.

The calculated future attributional electricity mixes are interpolated to cover the time period until 2050. The electricity mixes are then used to assess the environmental impacts of buildings over the reference study period of 30 years. Future changes in the efficiency of PV power plants (Frischknecht et al. 2015a), as well as in the supply chain and production of important materials, in the electricity mixes of producing regions and in road and rail transport services are considered based on recent work published by Alig et al. (2020).

In contrast to the present attributional mixes established within this project, the future mixes are not derived from production profiles and do not consider the specific load profile of residential or office buildings.

3.4 Consequential electricity mixes

3.4.1 Overview

Consequential or decision-oriented life cycle assessments are used to quantify the environmental impacts of changes in the supply or demand of a specific product or service compared to a reference state. This modelling approach is particularly relevant with regard to the Swiss energy strategy 2050, which aims at significant changes in electricity production and consumption. Potential applications of consequential electricity mixes may be the identification of strategies and measures for building refurbishments, the environmental optimisation of building construction and operation and load management.

In consequential life cycle assessment, the (short- or longterm) marginal power plants are considered and integrated over time to obtain a marginal electricity mix. Marginal power plants are the power plants used to cover changes (increase or decrease) in electricity demand. The methodology to compile consequential electricity mixes for the annual perspective is explained in Section 3.4.2.

3.4.2 Annual and seasonal consequential electricity mix

The consequential electricity mixes for the seasonal and the annual perspective are intended to analyse the environmental impacts of future changes in the power plant portfolio. These electricity mixes are suitable for the environmental optimisation of building construction and operation (e.g. heat pumps or heating load reduction). Life cycle inventories of annual marginal electricity mixes for Switzerland and a Swiss municipality were developed by Frischknecht and Stolz and presented at the LCA forum 62 (2016) and can be used as a basis. The marginal electricity mixes were derived in two ways:

- increase in electricity production in 2050 according to the scenario "business as usual" (BAU, variant C) compared to 2050 of the scenario "new energy policy" (NEP, variant C&E) (Prognos 2012);
- export of excess electricity produced with renewable energy to Europe to allow European utilities to shut down power plants based on non-renewable energy (hard coal, lignite, nuclear, etc).

Similar considerations may be applied on seasonal marginal electricity mixes.

We suggest applying the first approach to derive the annual and seasonal consequential electricity mixes for Switzerland. The second model does not seem appropriate because of the significant share of electricity generated by nuclear power plants in the Swiss production mix. The difference in electricity production and consumption in Switzerland in 2050 between the Business as Usual (BAU) and the New Energy Policy (NEP) scenarios is about 8 TWh per year (see Tab. 2).

Tab. 2 Power plant technologies in Switzerland in 2009 and in 2050 according to three different policy scenarios as well as the difference in production in the BAU and NEP scenario (Prognos 2012).

Technology	Production mix 2009 [TWh]	Business As Usual BAU 2050 [TWh]	New Energy Policy NEP 2050 [TWh]	Political Measures POM 2050 [TWh]	long-term marginal mix: BAU minus NEP [TWh]
Hydroelectric power	37.14	41.58	44.15	44.15	-2.57
New renewables	0.91	8.96	22.59	22.59	-13.63
Nuclear power	26.12	0.00	0.00	0.00	0
Fossil Power plants	0.36	29.51	4.67	2.12	24.84
Waste	1.97	2.28	2.96	2.96	-0.68
Imports	0.00	0.00	0.00	7.2	0
Total	66.49	82.33	74.37	79.02	7.96

The additional electricity consumption of the BAU scenario compared to the most ambitious NEP scenario will be covered with electricity from fossil power plants, mainly natural gas fired power plants. Natural gas will also be used to step in for the new renewables which are assumed to produce much less in the BAU scenario compared to the NEP scenario. Hence, the long-term marginal electricity mix of Switzerland is likely to be composed of 100 % natural gas fired gas combined cycle power plants. This marginal power plant technology is needed in case Switzerland fails to develop its electricity consumption and production according to the NEP scenario.

ewz mainly produces electricity from renewable energy. All but one of the future scenarios also rely on renewable electricity generation technologies (ewz 2012). The scenario 4 with a substantial share of fossil power production (natural gas fired gas combined cycle power plants) assumes a significant increase in electricity demand. Hence, the marginal mix of ewz is likely to be the same as the Swiss national consequential electricity mix.

4 Electricity mixes

4.1 Overview

This chapter contains a description of the electricity mixes established according to the approaches described in Chapter 3 (see also Tab. 3). Subchapter 4.2 contains a description of the mixes based on guarantees of origin (GO) of Switzerland and the utility of the city of Zürich, Subchapter 4.3 deals with the use specific electricity mixes derived for the load profiles of a residential and an office building, respectively. Several load profiles were defined for the residential building to explore the variation in the electricity mix composition and thus in the environmental performance. In Subchapter 4.4 Swiss national annual future and marginal electricity mixes are described.

Tab. 3 Overview of electricity mixes established in this project

	Switzerland			**ewz**		
	Attributional		Consequential	Attributional		Consequential
	Production plus commercial	Guarantee of Origin[1)]		Production plus commercial	Guarantee of Origin[1)]	
Current electricity mixes						
Seasonal (summer)	X			X		
Seasonal (winter)	X			X		
Annual (today)	X	X	X	X	X	(X)[2)]
Future electricity mixes						
Annual average (2020-2050)	X (5-year steps)					

Attributional: descriptive; Consequential: decision oriented; 1): Guarantees of Origin are booked annually; that is why seasonal mixes are identical with annual mixes; 2): consequential electricity mix of ewz is identical with the corresponding Swiss electricity mix

4.2 Attributional electricity mixes based on guarantees of origin

4.2.1 Switzerland

The life cycle inventory of the annual attributional electricity mix based on GOs for Switzerland in the year 2018 was published by Krebs and Frischknecht (2020). The life cycle inventory of the Swiss consumer mix is based on the "Cockpit Stromkennzeichnung" (Pronovo 2020) and Swiss electricity statistics about renewable energies (BFE 2019, Pronovo 2019). Electricity consumption in life cycle assessments of buildings according to the technical bulletin SIA 2040 (SIA 2017) is modelled by the Swiss consumer mix, which does not include the portion of renewable electricity sold in certified electricity products (Pronovo 2019). The share of electricity from non-verified sources in the Swiss supply mix 2018 amounts to 6.25 % and was modelled with the Swiss residual mix (AIB 2019). The shares of the Swiss consumer and supply mixes 2018 are shown in Fig. 5.

Additionally, the Swiss electricity mix is determined based on 15 minutes data on electricity consumption in Switzerland (aggregated to hourly consumption) matched to hourly data on domestic physical production and commercial trade (same data as used to determine building specific electricity mixes, see Section 3.3.2 and Subchapter 4.3).

4.2.2 ewz

The electricity mix of the Electric Utility of the City of Zurich (ewz) based on GOs is based on the electricity declaration for the year 2017[6]. The shares of electricity produced in hydropower plants, nuclear power plants and biomass cogeneration plants are further disaggregated to specific technologies based on Swiss electricity statistics (BFE 2018c, 2018b, 2018a). The technology shares included in subsidised electricity were determined based on KEV (2017). The shares of the ewz supply mixes 2017 are shown in Fig. 5.

4.3 Annual and seasonal attributional electricity mixes for Switzerland

The electricity mixes applied on the load profile of a residential building (Rautistrasse, Zürich) are based on the hourly production and trade statistics of Switzerland and the neighbouring countries Austria, France, Germany and Italy. The following mixes are quantified (see also Tab. 4):

1. HP: electricity consumption for heating (8’753 kWh), hot water production (14’973 kWh), ventilation (3’593 kWh), lighting, elevators and auxiliary (23’357 kWh), household consumption (40’600 kWh);
2. HP+PV: same as A. including 21’767 kWh self consumed electricity produced with a 32 kWp PV system;
3. HP+PV+BAT: same as B. plus a 32 kWh LiIon battery system from which additional 4’651 kWh PV electricity is self consumed;
4. HP+PV+ECAR: same as B with an increased overall electricity consumption of 108’546 kWh (of which 17’273 kWh by electric cars) and including 24’350 kWh self consumed electricity (building and electric cars) produced with a 32 kWp PV system;
5. HP+2PV: same as B. but the PV system being twice as big; self consumed PV electricity is 28’019 kWh.
6. HP+2PV+2BAT: same as C. with the PV and the battery system being twice as big; additional 12’296 kWh PV electricity is self consumed via the battery system.

Although the PV system specified for the alternatives 5. and 6. is bigger than the available space on the roof of the building, these options provide additional insights for buildings with substantially higher PV production.

Tab. 4 Electricity consumption of the building, provenience of the electricity, PV electricity production and exported electricity of the different alternatives

[6] https://www.stromkennzeichnung.ch/de/suche/detail/powera/show/powersortyear/2017/supplier/ewz-elektrizitaetswerk-der-stadt-zuerich.html (accessed on 27.11.2019).

		HP	HP+PV	HP+PV+BAT	HP+PV+ECAR	HP+2PV	HP+2PV+2BAT
Consumption	Building	91'273	91'273	91'273	91'273	91'273	91'273
	Electric car	-	-	-	17'273	-	-
Electricity	from grid	91'273	69'506	64'855	84'196	63'254	50'958
	from PV directly	-	21'767	21'767	24'350	28'019	28'019
	from PV via battery	-	-	4'651	0	0	12'296
PV Production		-	29'459	29'459	29'459	58'918	58'918
Exported electricity		-	7'692	3'041	5'109	30'899	18'603

The electricity mixes for these different load profiles are shown in Fig. 5, Fig. 6 and Fig. 7. The electricity mixes derived from hourly production profiles and (economic) trade are rather similar and do not differ substantially from the annual mix derived from hourly production profiles and (economic) trade. Their shares of nuclear electricity is about 40 %, hydro power contributes about 35 %, new renewables up to 10 % and fossil based electricity about 10 %.

The load profile of the office building leads to an annual electricity mix with slightly higher shares of hydroelectric power and PV electricity mainly at the expense of nuclear power.

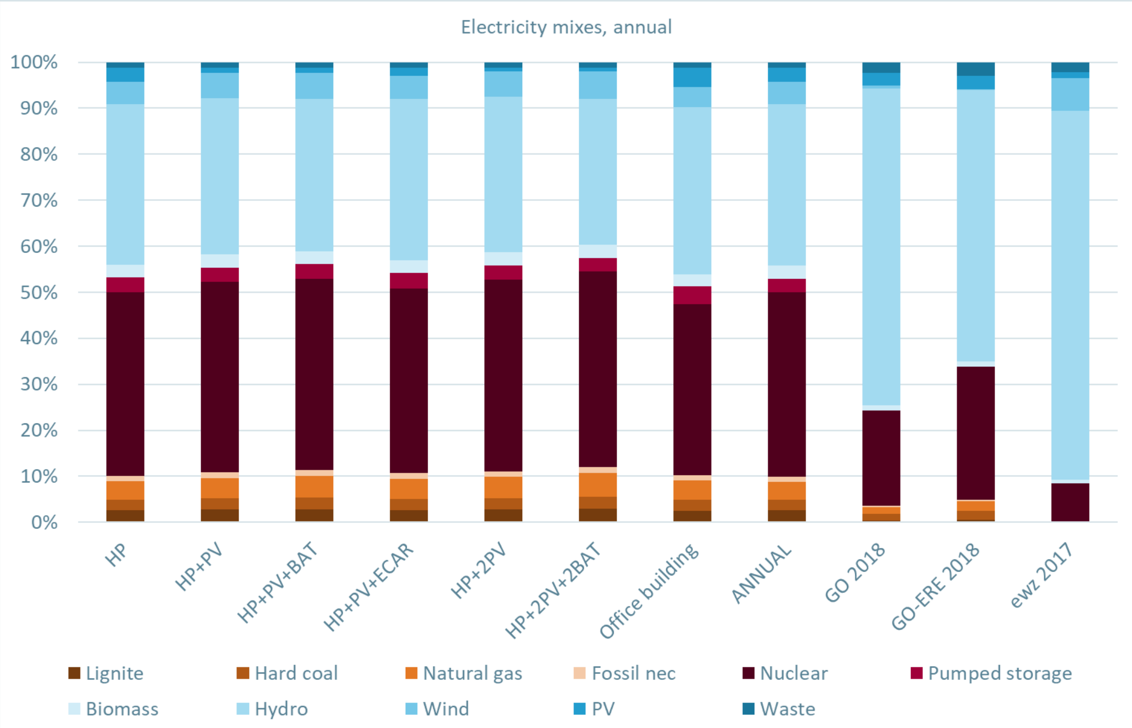

Fig. 5 Technology shares of the **annual** Swiss electricity mixes for the different load profiles of the residential building Rautistrasse, the load profile of the ARE office building, the **annual** Swiss electricity mix (national load profile) and the Swiss consumer electricity mix 2018 according to guarantees of origin;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; ANNUAL: Swiss annual mix (national load profile); GO 2018: Swiss supply mix 2018 based on guarantees of origin; GO-ERE 2018: Swiss consumer mix 2018 (excluding electricity products based on renewable energy sold separately); ewz 2017: supply mix of the utility of the city of Zürich.

The Swiss electricity mixes based on guarantees of origin show substantially higher shares of hydroelectric power and substantially lower shares of nuclear and fossil power. About one fourth of the electricity supplied to Swiss consumers is based on non renewable energies. If the electricity products based on renewable energies sold separately are excluded from the consumer mix, the share of electricity based on non renewable energies is about one third. More than 90 % of the ewz supply mix is produced with renewable energies, mainly in hydroelectric power plants.

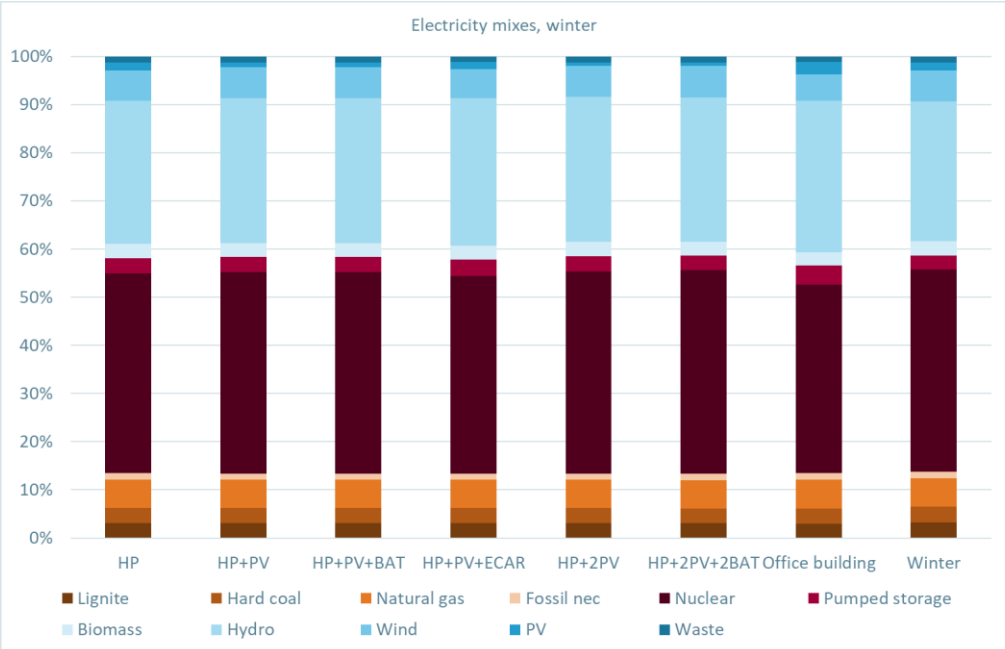

Fig. 6 Technology shares of the **winter** Swiss electricity mixes for the load profiles of the residential building Rautistrasse, the ARE office building and the plain **winter** Swiss electricity mix (national load profile);
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Winter: Swiss winter mix (national load profile).

The Swiss seasonal mixes exhibit moderate differences compared to the annual mixes. The Swiss winter mixes derived from the load profiles of residential and office buildings exhibit somewhat higher shares of nuclear and fossil based electricity. Their profiles are all very similar. Thus there is only little variation. The Swiss summer mixes consists of less nuclear and less fossil based power plants. They show a somewhat higher dependency on the load profiles of the buildings. It is particularly interesting to note that the installation of on site PV systems leads to electricity mixes with a zero share of PV in the electricity mixes delivered from the grid.

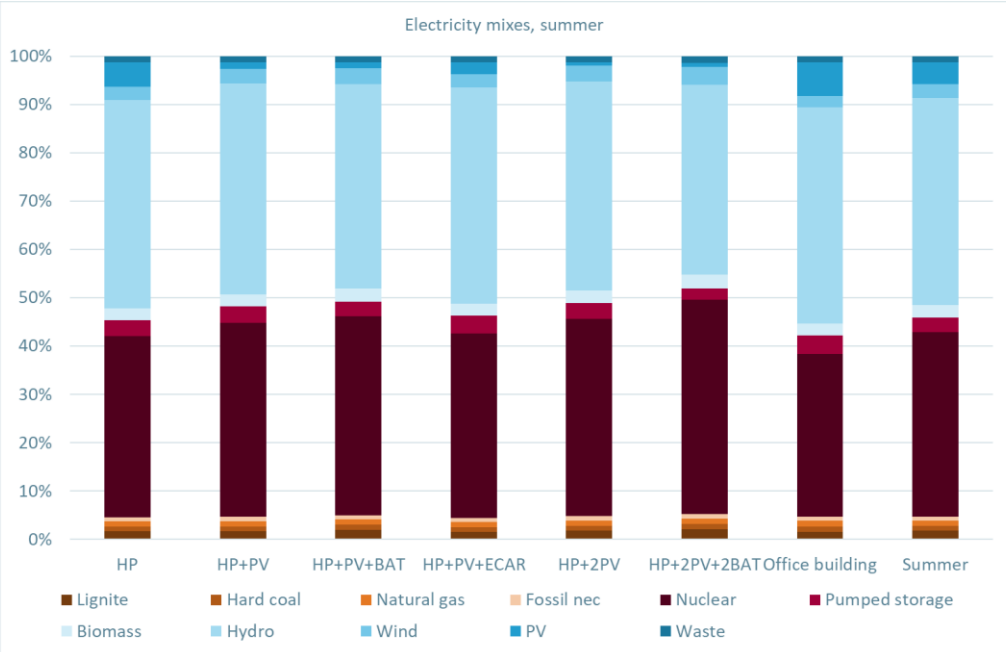

Fig. 7 Technology shares of the **summer** Swiss electricity mixes for the load profiles of the residential building Rautistrasse, the ARE office building and the plain **summer** Swiss electricity mix (national load profile);
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Summer: Swiss summer mix (national load profile).

4.4 Annual future attributional electricity mix for Switzerland

The annual future Swiss electricity mix according to the Scenario “New Energy Policy”, Variant C&E will shift from nuclear power to substantially more power from renewable sources (see Fig. 8). One part of the reduction in production volumes from nuclear power plants will be compensated by natural gas fired power plants. They reach a share of up to 16 % in 2035 and then drop to about 6 % in 2050. PV production will increase from a share of below 1 % to 15 % in 2050. Geothermal power reaches 6 % in 2050, wind power slightly less.

The future electricity mixes generally show more similarities to the annual electricity mix derived from annual production and (economic) trade data. The shares of new renewable energies and fossil based power in the 2018 electricity mix are higher and the share of pumped storage is smaller than in the Prognos electricity mix 2020. These seven electricity mixes are used to establish an average electricity mix for 2020 to 2050, i.e. the first half of the 60 years amortisation period of buildings. The average future electricity mix includes nearly 50 % hydroelectric power, 15 % nuclear power, 8 % produced with natural gas and 7 % PV electricity.

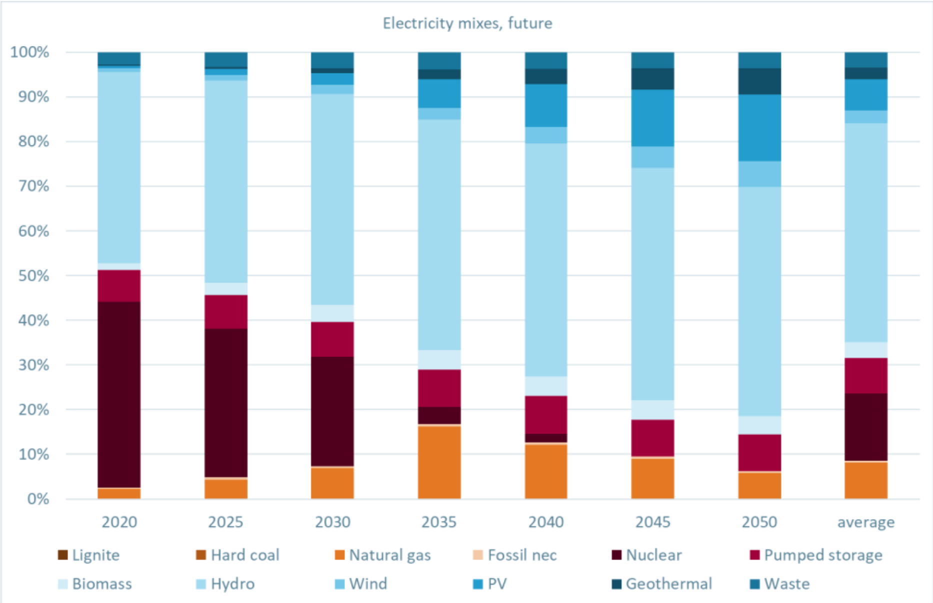

Fig. 8 Technology shares of annual future Swiss electricity mixes from 2020 to 2050 according to Prognos (2012) and for the average electricity mix 2020 to 2050

4.5 Long term marginal (consequential) electricity mixes

The longterm marginal electricity mix of Switzerland and ewz is based on 100 % natural gas fired combined heat and power plants as described and substantiated in Subchapter 3.4. According to Prognos (2012) this technology would generate the additional electricity in case electricity demand exceeds the demand as assumed in the “New Energy Policy” scenario.

4.6 Environmental impacts of the electricity mixes

4.6.1 Overview

The environmental impacts of the electricity mixes described in the Subchapters 4.2 to 4.5 are described and discussed in this Subchapter. The subchapter is structured along the different electricity mixes established. Section 4.6.2 shows the environmental impacts of the annual present and future national and ewz mixes, Section 4.6.3 the environmental impacts of the annual electricity mixes of the residential building, Section4.6.4 follows with the seasonal mixes of the residential building, in paragraph 4.6.5 the electricity mixes of the office buildings are shown and paragraph 4.6.6 discusses data quality aspects. The first four paragraphs are structured along the environmental indicators addressed, namely greenhouse gas emissions, environmental impacts and cumulative energy demand .

4.6.2 Annual present and future national and ewz mixes

The specific greenhouse gas emissions of the Swiss national electricity mix 2018 (see Subchapter 4.2) vary between 55 g CO_2-eq/kWh (Swiss supply mix), 70 g CO_2-eq/kWh (Swiss consumer mix) and nearly 130 g CO_2-eq/kWh (physical production and commercial trade covering the national load profile 2018, see Fig. 9). Imports of electricity generated with fossil fuels (lignite, hard coal and natural gas) contribute up to three quarters of the total emissions.

The ewz 2017 electricity mix (see Subchapter 4.2) causes less than 20 g CO_2-eq/kWh which is mainly due to the fossil free electricity mix. The long term marginal electricity mix (100 % natural gas fired gas combined cycle, see Subchapters 3.4 and 4.5) emits more than 450 g CO_2-eq/kWh.

The greenhouse gas emissions of the annual Swiss electricity mix, modelled according to the New Energy Policy (NEP) scenario of the Swiss energy strategy 2050 (see Subchapter 4.4), increase from less than 40 g CO_2-eq/kWh in 2020 to nearly 120 g CO_2-eq/kWh 2035. This is mainly due to an increase in electricity production with natural gas fired power plants which compensates the reduced electricity production in nuclear power plants (see also Fig. 8). After that, they drop again to about 60 g CO_2-eq/kWh with new renewables replacing natural gas.

On average 73 g CO_2-eq/kWh are emitted from 2020 to 2050. The emissions in 2020 are distinctly lower than those of the electricity mix 2018 based physical production plus commercial trade, because the future electricity mixes disregards trade.

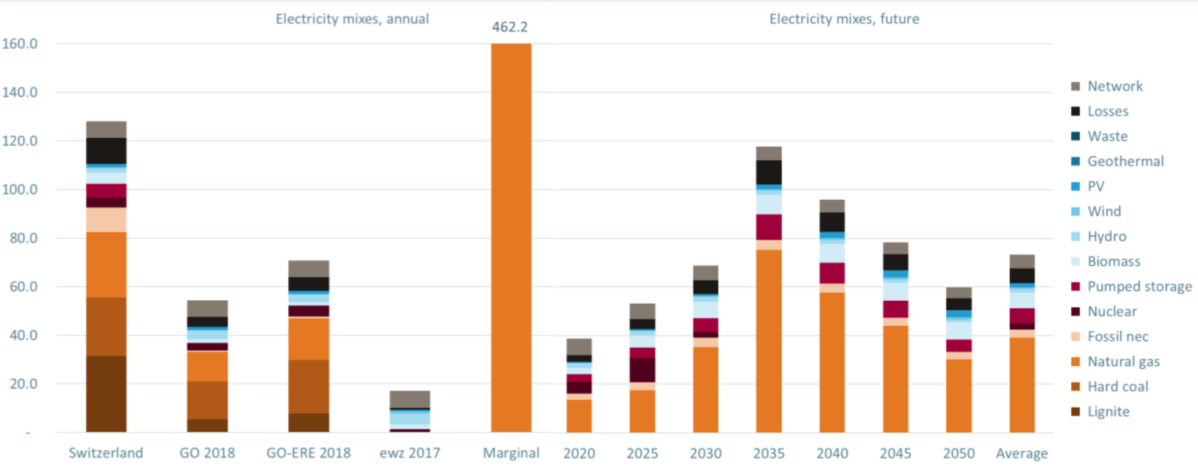

Fig. 9 Greenhouse gas emissions in g CO_2-eq/kWh low voltage of the **annual** Swiss electricity mix (national load profile, Switzerland), the Swiss supply mix (GO 2018), the Swiss consumer mix (GO-ERE 2018, excluding electricity products based on renewable energy sold separately), the ewz electricity mix 2017 based on guarantees of origins, the long term marginal electricity (Switzerland and ewz), and the average **future** electricity mix Switzerland 2020-2050 (based on the New Energy Policy (NEP) scenario).

The specific environmental impacts of the Swiss national electricity mix 2018 vary between 170 UBP/kWh (Swiss supply mix), 220 UBP/kWh (Swiss consumer mix) and more than 320 UBP/kWh (physical production and commercial trade covering the national load profile 2018, see Fig. 10). Domestic production with nuclear power plants as well as imports of electricity generated with fossil fuels (lignite, hard coal and natural gas) and nuclear power plants contribute up to 80 % of the total impacts.

The ewz 2017 electricity mix (see Subchapter 4.2) causes less than 90 UBP/kWh with the largest share from nuclear power. The long term marginal electricity mix (100 % natural gas fired gas combined cycle, see Subchapters 3.4 and 4.5) causes more than 300 UBP/kWh.

The environmental impacts of the annual Swiss electricity mix, modelled according to the New Energy Policy (NEP) scenario of the Swiss energy strategy 2050, decreases from about 280 UBP/kWh in 2020 to 66 UBP/kWh 2050 with a thirty years average (from 2020 to 2050) of 160 UBP/kWh.

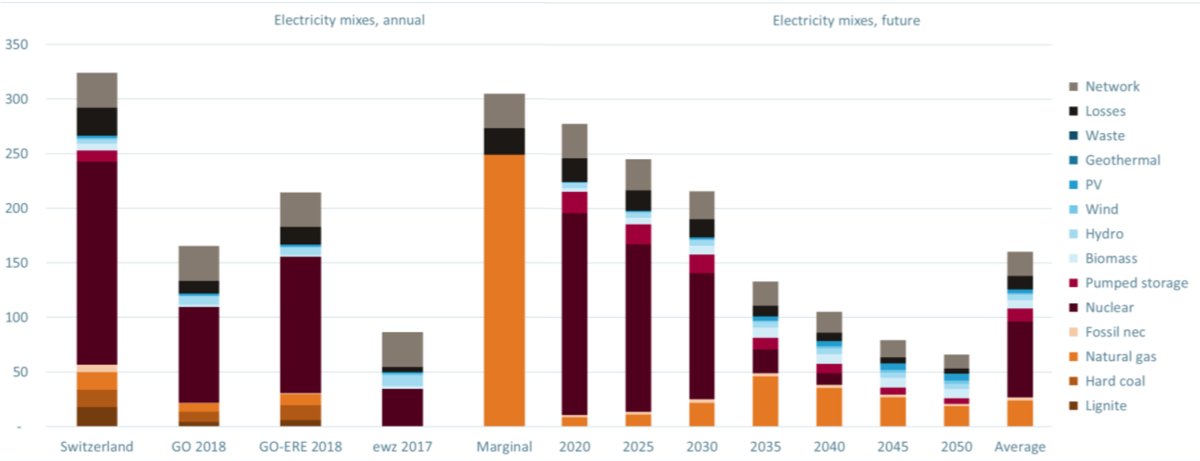

Fig. 10 Environmental impacts (based on the eco-factors 2013 of the ecological scarcity method) in UBP/kWh low voltage of the **annual** Swiss electricity mix (national load profile, Switzerland), the Swiss supply mix (GO 2018), the Swiss consumer mix (GO-ERE 2018, excluding electricity products based on renewable energy sold separately), the ewz electricity mix 2017 based on guarantees of origins, the long term marginal electricity (Switzerland and ewz), and the average future electricity mix Switzerland 2020-2050 (based on the New Energy Policy (NEP) scenario).

The specific non renewable cumulative energy demand of the Swiss national electricity mix 2018 varies between 1.1 kWh oil-eq/kWh (Swiss supply mix), 1.5 kWh oil-eq /kWh (Swiss consumer mix) and 2.1 kWh oil-eq /kWh (physical production and commercial trade covering the national load profile 2018, see Fig. 11). Domestic production with nuclear power and imports of electricity generated with fossil fuels (lignite, hard coal and natural gas) are the main sources of the non renewable primary energy demand.

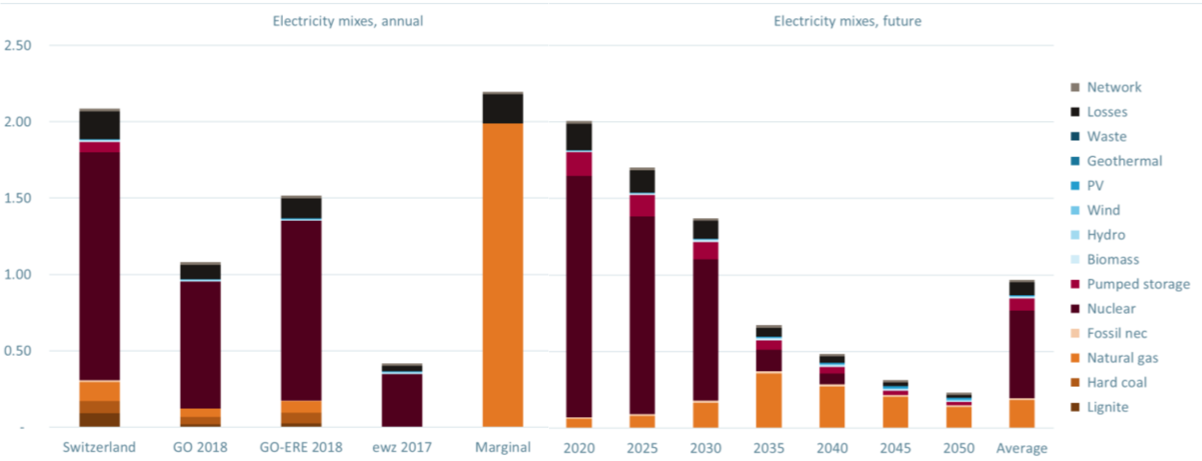

Fig. 11 Cumulative energy demand, non renewable in kWh oil-eq/kWh low voltage of the **annual** Swiss electricity mix (national load profile, Switzerland), the Swiss supply mix (GO 2018), the Swiss consumer mix (GO-ERE 2018, excluding electricity products based on renewable energy sold separately), the ewz electricity mix 2017 based on guarantees of origins, the long term marginal electricity (Switzerland and ewz), and the average future electricity mix Switzerland 2020-2050 (based on the New Energy Policy (NEP) scenario);

The ewz 2017 electricity mix (see Subchapter 4.2) causes 0.42 kWh oil-eq/kWh with the largest shares from nuclear power and the network. The long term marginal electricity mix (100 % natural gas fired gas combined cycle, see Subchapters 3.4 and 4.5) requires about 2.2 kWh oil-eq /kWh.

The non renewable cumulative energy demand of the annual Swiss electricity mix, modelled according to the New Energy Policy (NEP) scenario of the Swiss energy strategy 2050, decreases from about 2.0 kWh oil-eq /kWh in 2020 to 0.25 kWh oil-eq /kWh 2050 with a thirty years average (from 2020 to 2050) of 0.97 kWh oil-eq /kWh.

4.6.3 Annual electricity mixes residential building

The specific greenhouse gas emissions of electricity supplied to the residential building "Rautistrasse" amount to between nearly 130 g CO_2-eq/kWh and nearly 150 g CO_2-eq/kWh (see Fig. 12). Imports of fossil based electricity are the main cause.

The specific greenhouse gas emissions of the base case (HP), i.e. excluding any self generated electricity nor on site storage, are nearly identical to the specific greenhouse gas emissions of the Swiss electricity mix (physical production and commercial trade matching the national load profile). This is not surprising because the electricity mixes are very similar too (see Subchapter 4.3 and Fig. 5).

Self generation of electricity with PV and storage of this electricity in stationary batteries leads to higher specific greenhouse gas emissions of the remaining electricity supplied from the grid. For instance, PV electricity from the building displaces PV electricity in the mix supplied to the building (compare the colums "HP" and "HP+PV").

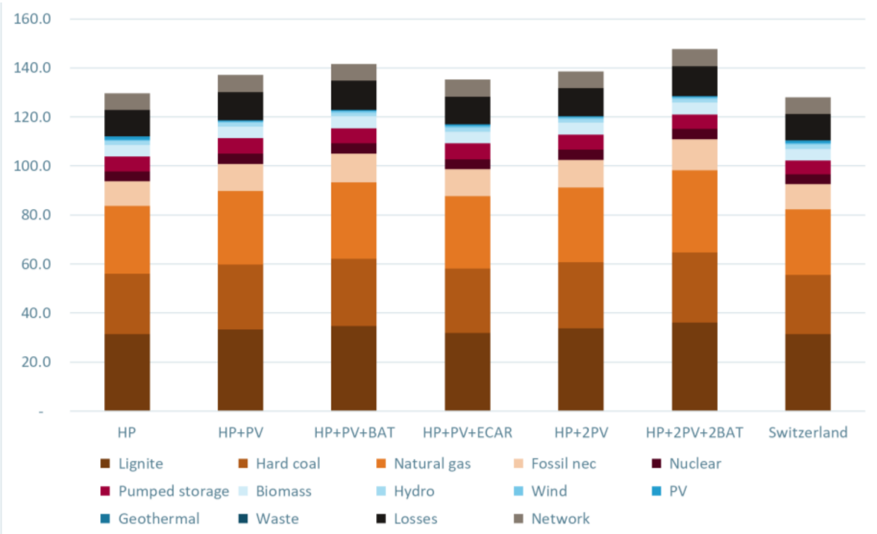

Fig. 12 Greenhouse gas emissions in g CO_2-eq/kWh low voltage of the **annual** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss annual mix (national load profile).

The specific environmental impacts vary by less than 10 % between 325 (base case "HP" as well as Swiss production and trade mix 2018) and 350 UBP/kWh low voltage electricity (HP+2PV+2BAT, see Fig. 13). The specific impacts of the (remaining) electricity supplied to the building increases with PV self generation, daily battery storage and with increasing capacity of the two.

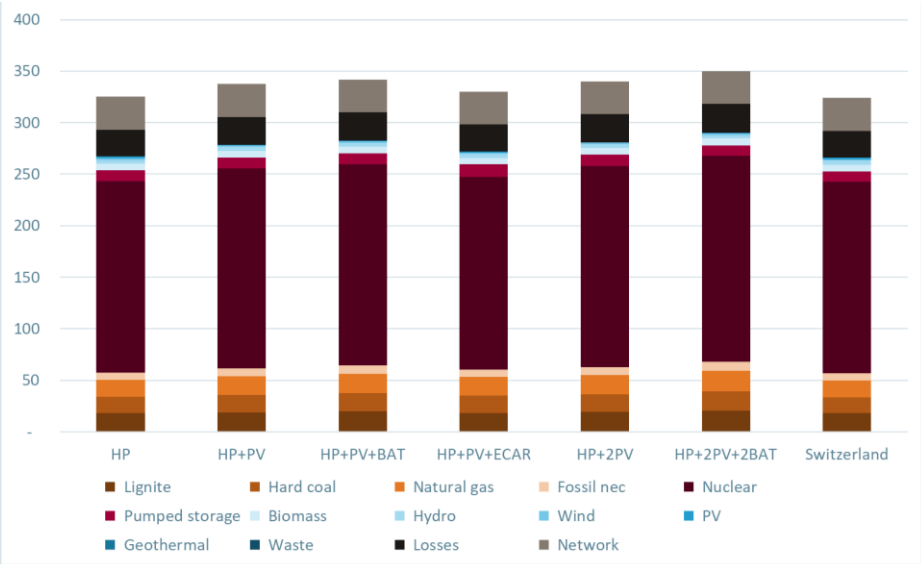

Fig. 13 Environmental impacts (based on the eco-factors 2013 of the ecological scarcity method) in UBP/kWh low voltage of the **annual** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss annual mix (national load profile).

The specific cumulative energy demand is between 2.1 (base case “HP” as well as Swiss production and trade mix 2018) and 2.2 kWh oil-eq/kWh (HP+2PV+2BAT, see Fig. 14). The same effects are observed as with greenhouse gas emissions and environmental impacts.

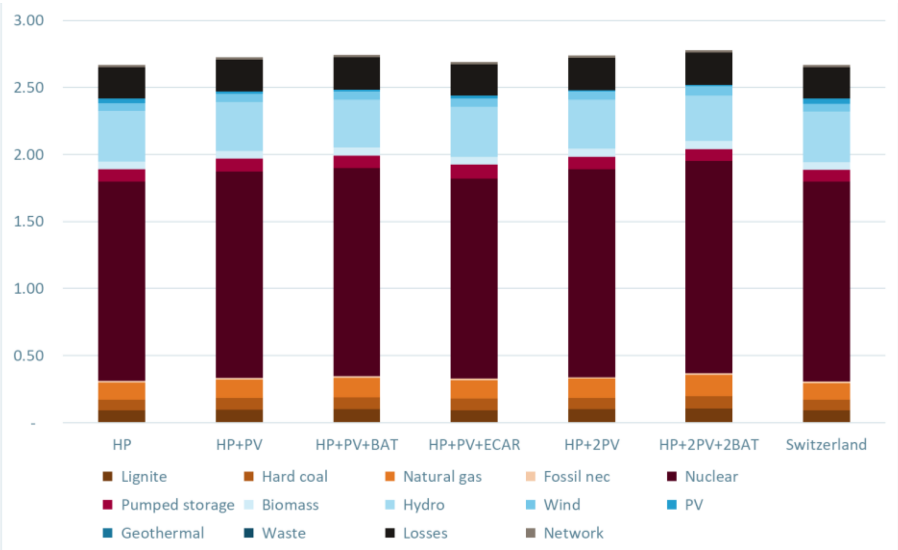

Fig. 14 Cumulative energy demand, total in kWh oil-eq/kWh low voltage of the **annual** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss annual mix (national load profile).

4.6.4 Seasonal electricity mixes residential building

The specific greenhouse gas emissions of the seasonal (summer and winter, respectively) electricity mixes of the residential building and of the Swiss electricity mix based on physical production and commercial trade differ considerably: in summer (April to September) the greenhouse gas emissions vary between 70 and 78 g CO_2-eq/kWh whereas in winter (October to March) they amount to between 164 and 169 g CO_2-eq/kWh (see Fig. 15). One kWh consumed in the winter period causes more greenhouse gas emissions than 2 kWh consumed during the summer period. The influence of self generation and storage of electricity on the specific greenhouse gas emissions of the remaining electricity supplied to the building is more pronounced during the summer than the winter period.

The specific greenhouse gas emissions of the remaining electricity supplied to the building decrease both in the summer and winter period. This seems to be contradictory to the effect of self generation and storage on the specific greenhouse gas emissions of the remaining electricity supplied the building on an annual basis (see Section 4.6.3). However, the share of winter period electricity (with higher specific greenhouse gas emissions) is higher in cases with self production and storage, which leads to the observed increase in specific greenhouse gas emissions of the electricity mix supplied to the building on an annual basis.

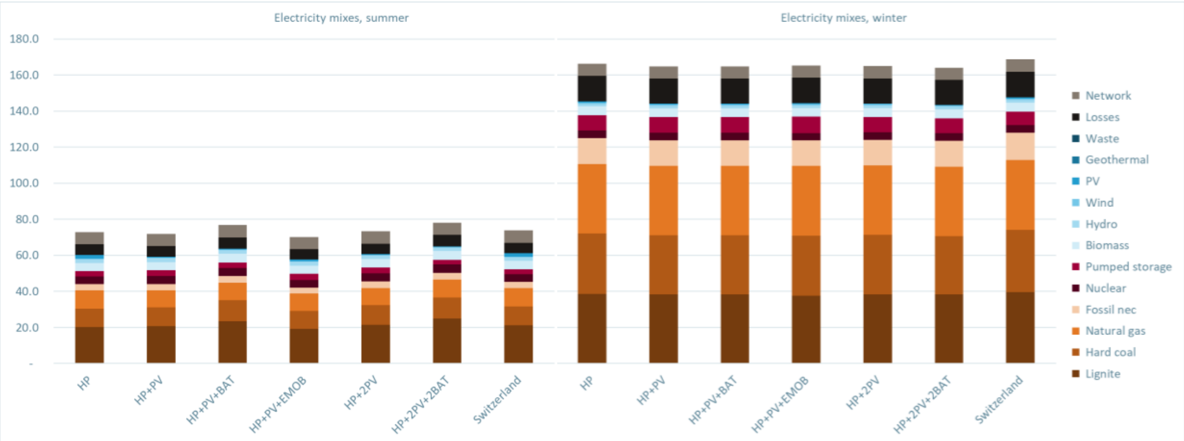

Fig. 15 Greenhouse gas emissions in g CO_2-eq/kWh low voltage of the **seasonal** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;

HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss seasonal mix (national load profile).

The specific environmental impacts of the seasonal electricity mixes vary between 275 and 310 UBP/kWh (summer mixes) and amount to about 360 UBP/kWh (winter mixes, see Fig. 16). The summer electricity mix supplied to the building shows higher specific environmental impacts when the building generates, stores and consumes on site PV electricity. The specific environmental impacts of the winter supply mixes are hardly affected by self generated and stored electricity.

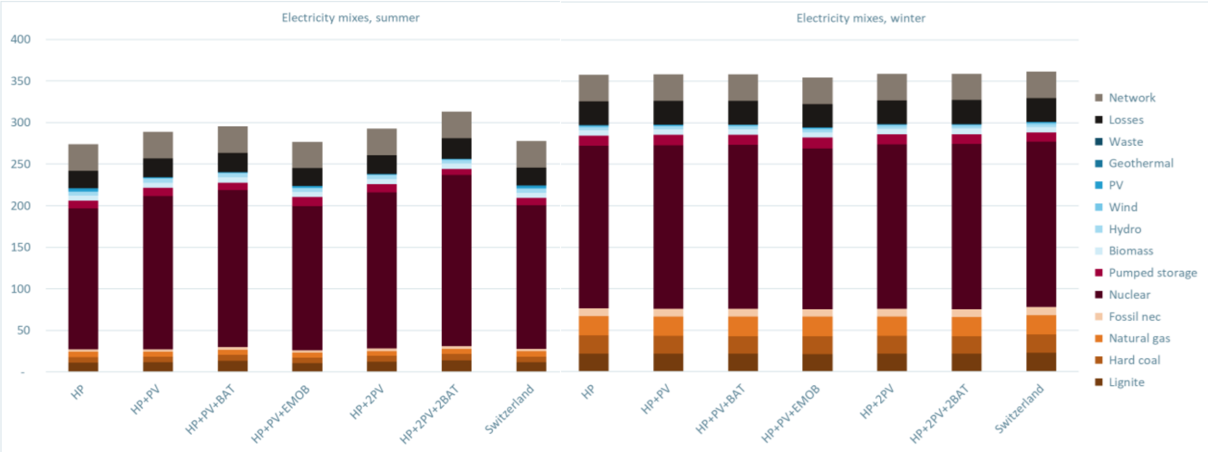

Fig. 16 Environmental impacts (based on the eco-factors 2013 of the ecological scarcity method) in UBP/kWh low voltage of the **seasonal** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss seasonal mix (national load profile).

The specific cumulative energy demand shows the same pattern like the specific environmental impacts (see Fig. 17). Hardly any variation in the winter supply mixes, whereas PV self generated and stored electricity lead to an increase in the specific cumulative energy demand. The major source of difference in the specific cumulative energy demand is the different shares in fossil based electricity.

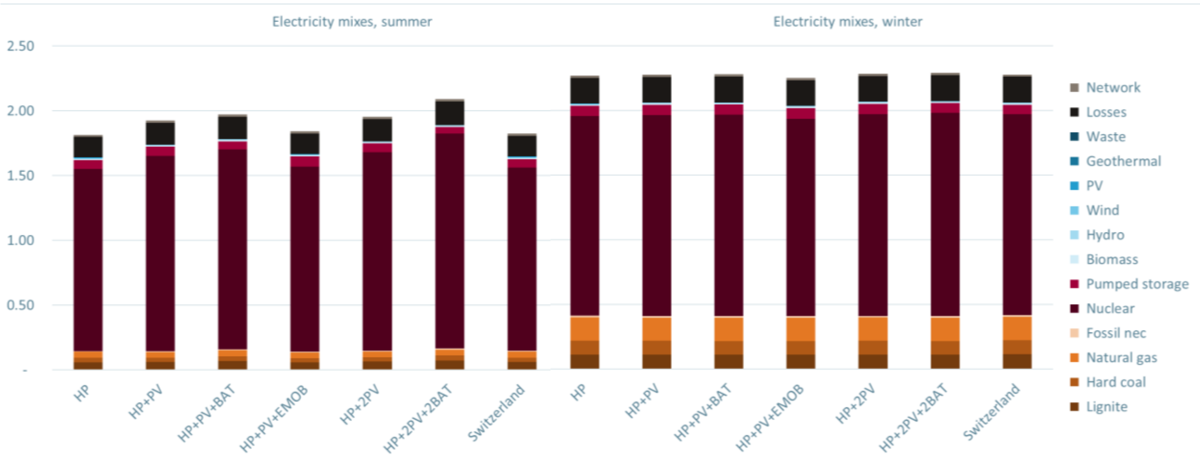

Fig. 17 Cumulative energy demand, non renewable in kWh oil-eq/kWh low voltage of the **seasonal** electricity mixes of the load profiles of the **residential building** and of **Switzerland**;
HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; Switzerland: Swiss seasonal mix (national load profile).

4.6.5 Electricity mixes office building

The specific greenhouse gas emissions of the annual, the summer and the winter electricity mixes supplied to the office building are similar to the ones of the electricity mixes of the base case ("HP") of the residential building. The specific greenhouse gas emissions of the winter mix are more than twice as high as those of the summer electricity mix. The specific greenhouse gas emissions of the annual mix are similar to the ones of the national mix based on physical production and commercial trade but distinctly different from the Swiss consumer and supply mixes based on guarantees or origin (GO 2018 and GO-ERE 2018, see Fig. 18).

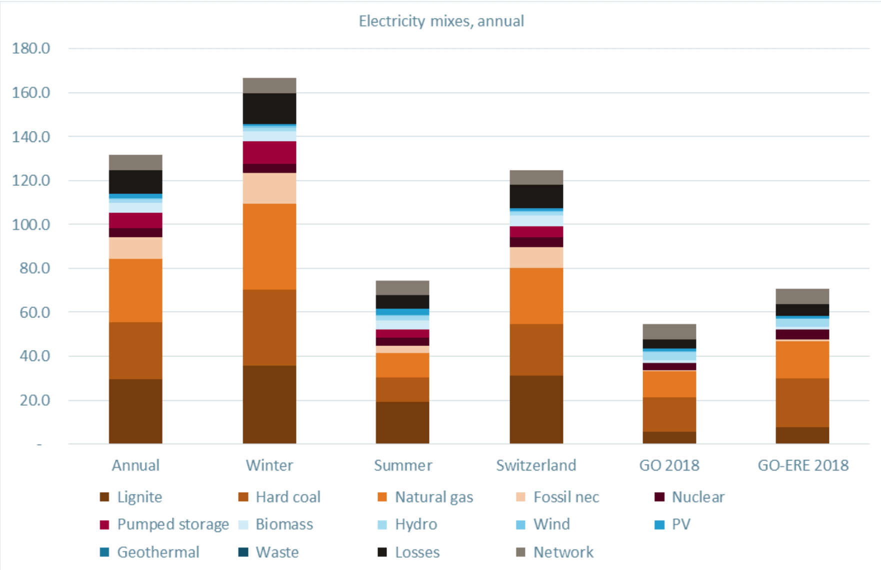

Fig. 18 Greenhouse gas emissions in g CO_2-eq/kWh low voltage of the electricity mixes of the load profiles of the **office building** and of **Switzerland**

The specific environmental impacts of the electricity mixes supplied to the office building amount to 310, 250 and 350 UBP/kWh (year, summer and winter, respectively) and thus are slightly lower than those of the electricity mixes supplied to the residential building and those of the Swiss electricity mix based on physical production and commercial trade (see Fig. 19). They are twice as high as compared to the Swiss supply mix based on guarantees of origin.

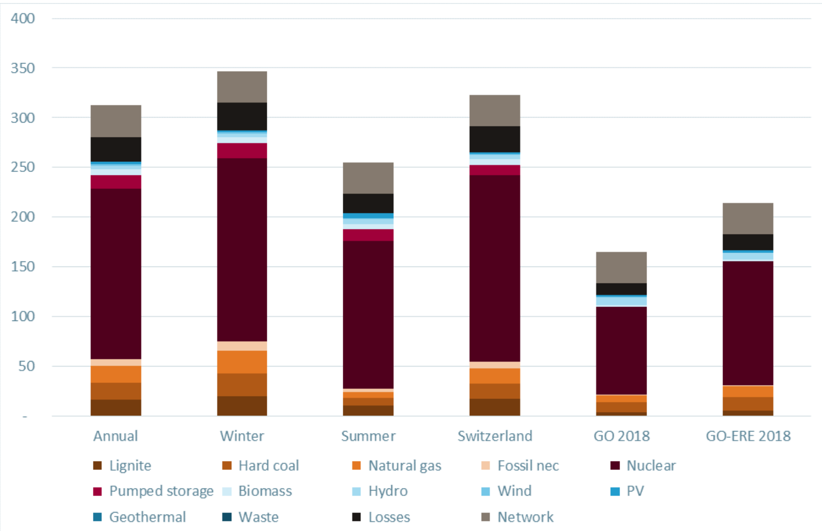

Fig. 19 Environmental impacts (based on the eco-factors 2013 of the ecological scarcity method) in UBP/kWh low voltage of the electricity mixes of the load profiles of the **office building** and of **Switzerland**

The specific non renewable cumulative energy demand varies between 1.1 and 2.2 kWh oil-eq/kWh and is slightly lower than the specific cumulative energy demand of the respective electricity mixes of the residential building (see Fig. 20). The difference in cumulative energy demand (and in environmental impacts) is caused by a smaller share in nuclear power (compared to the electricity mixes of the residential building and of the Swiss mix based on physical production and commercial trade).

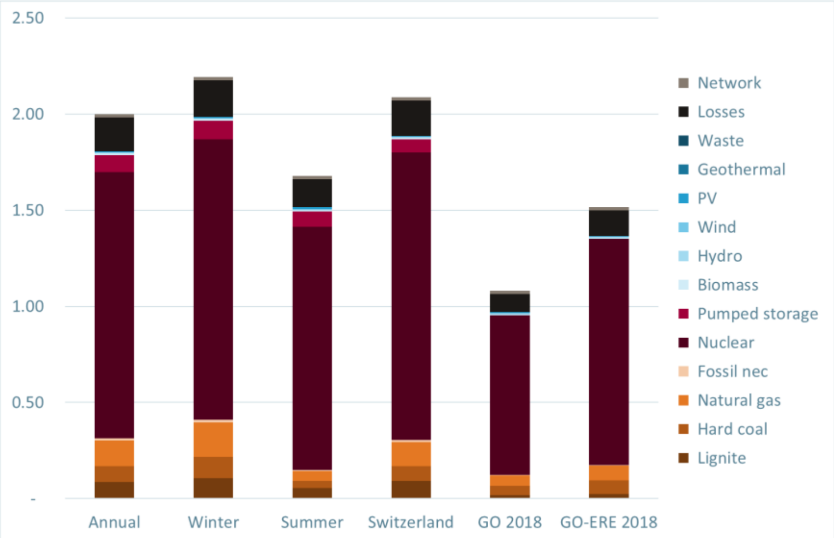

Fig. 20 Cumulative energy demand, non renewable in kWh oil-eq/kWh low voltage of the electricity mixes of the load profiles of the **office building** and of **Switzerland**

4.6.6 Data quality considerations

The data on hourly electricity production are provided by ENTSO-E. They receive the information from national transmission grid operators and other organisations. These data may contain errors. The electricity generation of small power plants is estimated, and the total electricity production is generally lower than according to national statistics / Eurostat data. Differences in production volumes often concern specific technologies such as natural gas, oil, biomass and PV.

The total electricity generation by different technologies in Switzerland was determined based on SFOE electricity statistics. The ENTSO production profiles were scaled accordingly. The differences between national statistics / Eurostat data on one hand and ENTSO data on the other hand for other countries are smaller and no adjustments were made.

Electricity exports from Switzerland are modelled with the Swiss production mix at the time of export even though commercial exchanges may also contain electricity imports with final destination in other neighbouring countries (e.g. a Swiss trader buys electricity from Germany and re-sells it to Italy).

Electricity imports to Switzerland are modelled with the country specific technology mixes at the time of import. This approximation is based on the assumption that Switzerland's neighbouring countries have big markets, so their imports and exports from other countries are expected to be low compared to their domestic electricity generation and the imported electricity is consumed domestically.

The average future electricity mix does not contain electricity trade but only (declining) imports of electricity from French nuclear power plants (existing subscription rights). That is why the future electricity mixes differ substantially from the present Swiss electricity mix (based on physical production and commercial trade). This incompatibility could be overcome by adding a share of electricity trade with neighbouring countries. The imported electricity would need to represent future situations in those countries. According to the results of an LCA of future electricity mixes of

Switzerland (Wyss & Frischknecht 2013) the electricity trade (with a trade volume similar to today) contributes substantially to the environmental impacts of electricity supplied in Switzerland in 2050. However, with Europe and our neighbouring countries moving towards net zero greenhouse gas emissions (European Green Deal, European Commission 2019) and 100 % renewable electricity production, trade related greenhouse gas emissions are likely to decrease too.

The technology mix of electricity used by pumping storage power plants is determined by a 12 hours shift of the production mix of the respective country. This is a rough approximation of the (unknown) electricity mix used for pumping based on the assumption that pumping storage power plants are used to cover daily peaks of consumption using electricity during daily off-peak periods.

The environmental performance of the power plants represent country averages and is constant over the year.

5 Building case studies

5.1 Introduction

This chapter describes and discusses the effects of future production of building materials on the environmental impacts of construction, operation and and end of life management of entire buildings. For this purpose, two buildings were selected which differ in terms of materialization and use:

- Residential building Rautistrasse, Zurich (Subchapter 5.2)
- Office building ARE, Ittigen (Subchapter 5.2)

The buildings whose environmental characteristics are shown here were modelled in previous studies (Tschümperlin et al. 2016; Wyss et al. 2014). The bill of materials and the energy performance of the buildings were not changed and thus corresponds to the modelling as documented in the studies mentioned above.

Construction, operation and end of life management of the buildings are considered in the analyses. Building-induced mobility is not included. In addition to the actual construction phase, the building construction also includes replacements of building elements. Operation includes energy consumption during the use of the building (heating, hot water supply, ventilation, lighting, building equipment and auxiliaries). The buildings were structured according to the elementary cost classification (ECG) (SN 508502 1995) and include the following ECG items:

- D0: excavation building pit
- D1: backfilling, construction
- D2: bottom plate: construction
- E0: ceiling: construction
- E1: roof: construcion
- E2: pillar: construction
- E3: exterior wall basement: reinforced: construction
- E4: exterior wall upper floor: construction
- E5: window: construction
- E6: inner wall: brick built: construction
- M1: stud wall: construction
- M3: cement cast plaster floor: construction
- M4: wall cover: construction
- M5: roof cover: construction
- I: building equipment: construction
- B: operation of the building

The environmental impacts of “I: building equipment” are adjusted for those alternatives which include a PV and a battery system. The environmental impacts of the share of the PV system producing for delivery to the grid are disregarded.

The amortisation period of the buildings complies with the specifications of the SIA 2032 technical bulletin (SIA 2010) and is 60 years for all buildings examined. The materials and components required for construction are assessed in relation to the energy reference area and the amortisation period. This means that the values are amortised per square metre of energy reference area and year. Material production and construction are represented with the life cycle assessment data published in the recommendation 2009/1:2016 (KBOB et al. 2016), which includes the Swiss electricity consumer mix 2011.

The following buildings variants are assessed (see Tab. 5): the base case (no self generated electricity) of the residential building Rautistrasse is assessed using a building specific electricity mix, the average Swiss electricity mix based on physical production and commercial trade, a consequential (long term marginal) electricity mix, the Swiss consumer and the Swiss supply mixes based on guarantees of origin 2018 (Swiss GO, and Swiss GO-ERE, respectively), the average future Swiss electricity mix (2020-2050) according to the Swiss Energy Strategy 2050 and the ezw 2017 electricity mix. Furthermore a building specific electricity mix is derived for a situation where 32 kWp and 64 kWp PV system is being installed with or without a corresponding 32 kWh and 64 kWh battery storage system. Finally the building is modelled with a 32 kWh PV system and 7 charging stations for electric cars.

The office building ARE in Ittigen is assessed in its base case (excluding self generated electricity) and with the building specific, the Swiss national, the supply and consumer electricity mixes, with the ewz 2017 electricity mix and with the future and the marginal electricity mixes.

Tab. 5 Overview of buildings and variants

Residential building		Electricity self generation			
MFH Rautistrasse, Zürich		None	PV	PV&Battery	PV&electric car
Heating system	heat pump	1	2	2	1
Annual elelctricity mixes		attributional (building specific, Swiss national, Swiss GO, Swiss GO-ERE, ewz GO), long term marginal, average future Swiss	building specific attributional		
Total number of variants		10 (Switzerland) + 1 (ewz)			

Office building		Electricity self generation		
ARE, Ittigen		None	PV	PV&Battery
Heating system	heat pump	1		
Electricity mixes		attributional (building specific, Swiss national, Swiss GO, Swiss GO-ERE, ewz GO, Future, Marginal)		
Total number of variants		6 (Switzerland) + 1 (ewz)		

The operational electricity consumption covers room heating, hot water preparation, ventilation, auxiliary energy, lighting and operational facilities. For the residential building consumption by residents are additionally included, because this is considered in VDEW load profiles used in this study.

Temperature-dependent consumption profiles of heat pumps published by electric utilities in Germany are used and applied to the climatic conditions in Zurich in 2018. The production profiles of the PV systems installed in the City of Zurich and provided by ewz are used. The PV system produces 920 kWh/kWp over 30 years. Charge and discharge of the batteries are modelled based on the tool provided by ewz. It is maximising self-consumption. For E-mobility, the load profile of a system with seven loading stations was provided by ewz.

5.2 Residential building Rautistrasse, Zurich

5.2.1 Description

The residential building Rautistrasse in Zurich-Altstetten offers living space with 104 apartments. In order to construct the seven new buildings, four existing buildings were demolished (demolition is not part of the assessment). The new property replaces the wooden residential settlement built in 1948 and has been built according to the Minergie-Eco standard. All apartments have comfort ventilation and are equipped with underfloor heating, which is supplied with heat from geothermal probes and electric heat pumps.

Fig. 21: Exterior view of the residential building Rautistrasse, Zurich

5.2.2 Environmental impacts

The life cycle greenhouse gas emissions of the residential building vary between less than 10 kg CO_2-eq per m^2 and year (ewz 2017 electricity mix) and more than 20 kg CO_2-eq per m^2 and year (longterm marginal electricity, see Fig. 22). The share of greenhouse gas emissions caused during construction (including replacements and end of life treatment) varies between 9% and 46 %. The greenhouse gas emissions of the building operated with the Swiss supply mix (GO 2018), with the Swiss consumer mix (GO-ERE 2018), with the ewz 2017 mix and with the future mix as well as the building equipped with 64 kWp PV system comply with the SIA additional requirement of 12 kg kg CO_2-eq per m^2 and year (construction, replacement, end of life and operation).

The greenhouse gas emissions of the base case building (heat pump, no self generation of electricity) operated with the building specific electricity mix and the building operated with the national mix (physical production and commercial trade) amount to 12.4 kg CO_2-eq per m^2 and year.

The building operated with the average Swiss consumer mix based on guarantees of origin 2018 (GO-ERE 2018) and with the average future Swiss electricity mix (FUTURE) show a carbon footprint of about 11.1 kg CO_2-eq per m^2 and year. Using the Swiss supply mix based on guarantees of origin 2018 (GO 2018) results in a carbon footprint of 10.7 kg CO_2-eq per m^2 and year.

The installation of a PV system helps to reduce the carbon footprint by 250 g CO_2-eq per m^2 and year to 12.15 kg CO_2-eq per m^2 and year. The additional investment and use of a battery storage system leads to a carbon footprint of 12.3 kg CO_2-eq per m^2 and year. Doubling the size of the PV and the battery system results in a carbon footprint of the building of 12.05 kg CO_2-eq per m^2 and year (double size PV system only) and 12.25 kg CO_2-eq per m^2 and year (double size PV and battery systems).

The share of operational electricity consumption during winter time varies between 55 % (Swiss annual mix) and 80 % (HP+2PV+2BAT) and the share of operational emissions caused during the winter season varies between 75 % (Swiss annual mix) and 90 % (HP+2PV+2BAT). No seasonal mixes are available for GO 2018, GO-ERE 2018, the ewz, the future and the marginal mixes.

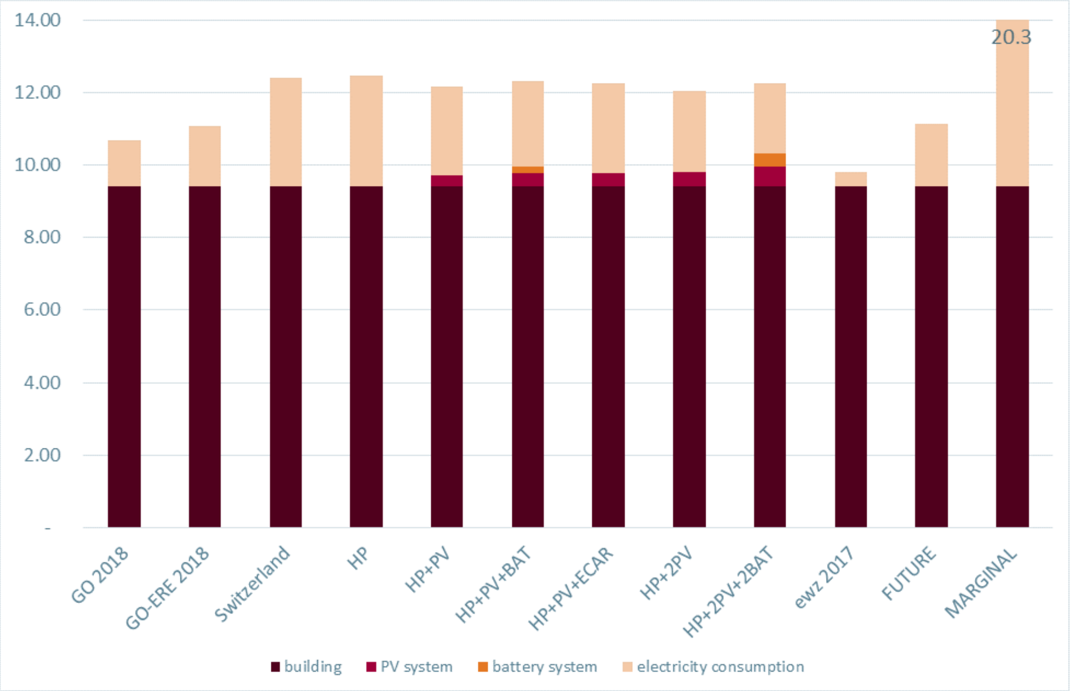

Fig. 22: Greenhouse gas emissions in kg CO_2-eq. per m^2a of the residential building Rautistrasse, Zurich. Target values SIA 2040:2017: 9 and 3 kg CO_2-eq./m^2a (construction and operation, respectively).
GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based to guarantees of origin 2018, i.e. excluding deliberately purchased electricity products based on renewable energies; Switzerland: Swiss annual mix (national load profile); HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; ewz 2017: ewz electricity mix based to guarantees of origin 2017; FUTURE: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; MARGINAL: long term marginal electricity mix (Switzerland and ewz).

The non renewable cumulative energy demand varies between about 45 kWh oil-eq per m^2 and year (ewz 2017 electricity mix) and more than 85 kWh oil-eq per m^2 and year (long term marginal electricity, see Fig. 23). The building operated with the building specific electricity mix and the building operated with the national mix (physical production and commercial trade) show very similar non renewable cumulative energy demand of about 83 kWh oil-eq per m^2 and year.

The share of construction in the total cumulative energy demand varies between 79 % and 40 %. The installation of a PV system helps to reduce the non renewable cumulative energy demand substantially (minus 9 and minus 12 kWh oil-eq per m^2 and year with the 32 and 64 kWp PV system, respectively), while the reduction achieved with the investment in a battery storage is less pronounced.

The building operated with the Swiss supply mix based on guarantees of origin 2018 (GO 2018) requires a similar amount of non renewable primary energy like the building operated with the average future Swiss electricity mix (FUTURE).

The share of non renewable primary energy demand during the winter season varies between 63 % (Swiss annual mix) and 81 % (HP+2PV+2BAT).

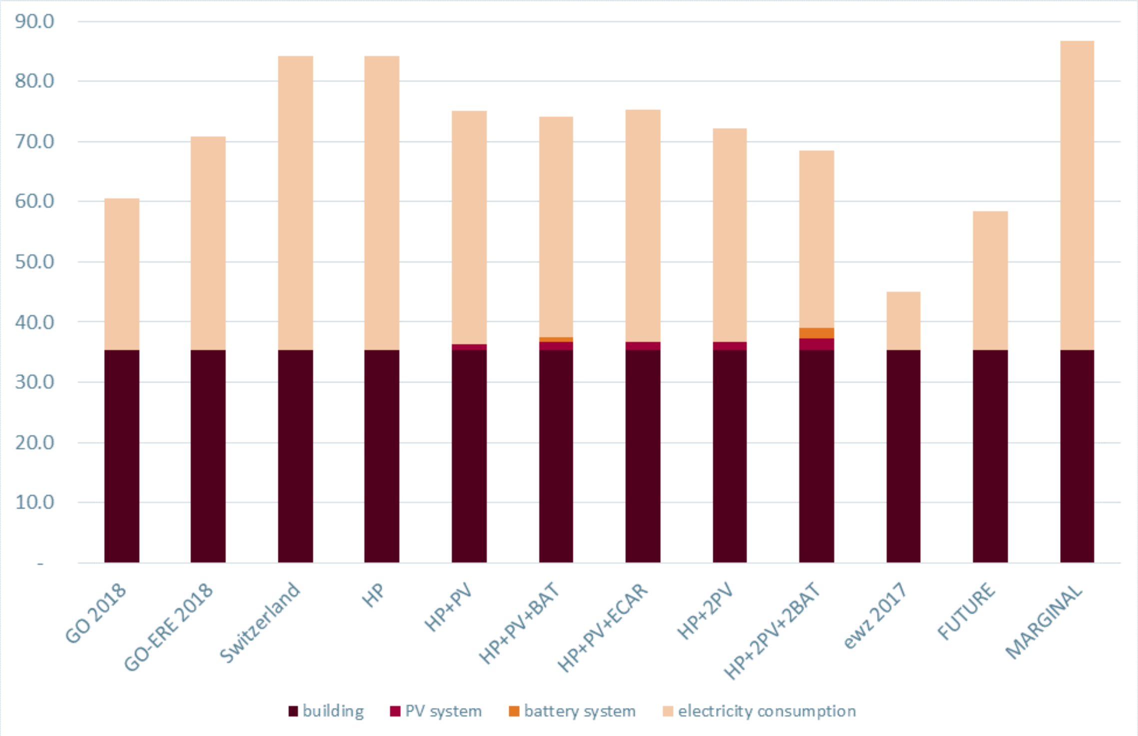

Fig. 23: Non-renewable primary energy demand in kWh oil-eq per m²a of the residential building Rautistrasse, Zurich. Target values SIA 2040:2017: 30 and 60 kWh oil-eq/m²a (construction and operation, respectively).
GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based to guarantees of origin 2018, i.e. excluding deliberately purchased electricity products based on renewable energies; Switzerland: Swiss annual mix (national load profile); HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; ewz 2017: ewz electricity mix based to guarantees of origin 2017; FUTURE: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; MARGINAL: long term marginal electricity mix (Switzerland and ewz).

The environmental impacts of the residential building vary between 16'500 UBP per m² and year (ewz 2017 mix) and 22'000 UBP per m² and year (building's base case electricity mix (HP), and Swiss mix based on physical production and commercial trade, see Fig. 24). The share of construction varies between 88 % and 66 %.

The installation of a PV system helps to reduce the environmental impacts considerably (minus 1'100 and minus 1'400 UBP per m² and year with the 32 and 64 kWp PV system, respectively), while the investment in a battery storage leads to a slight increase in overall environmental impacts.

The share of operational environmental impacts caused during the winter season varies between 61 % (Swiss annual mix) and 82 % (HP+2PV+2BAT).

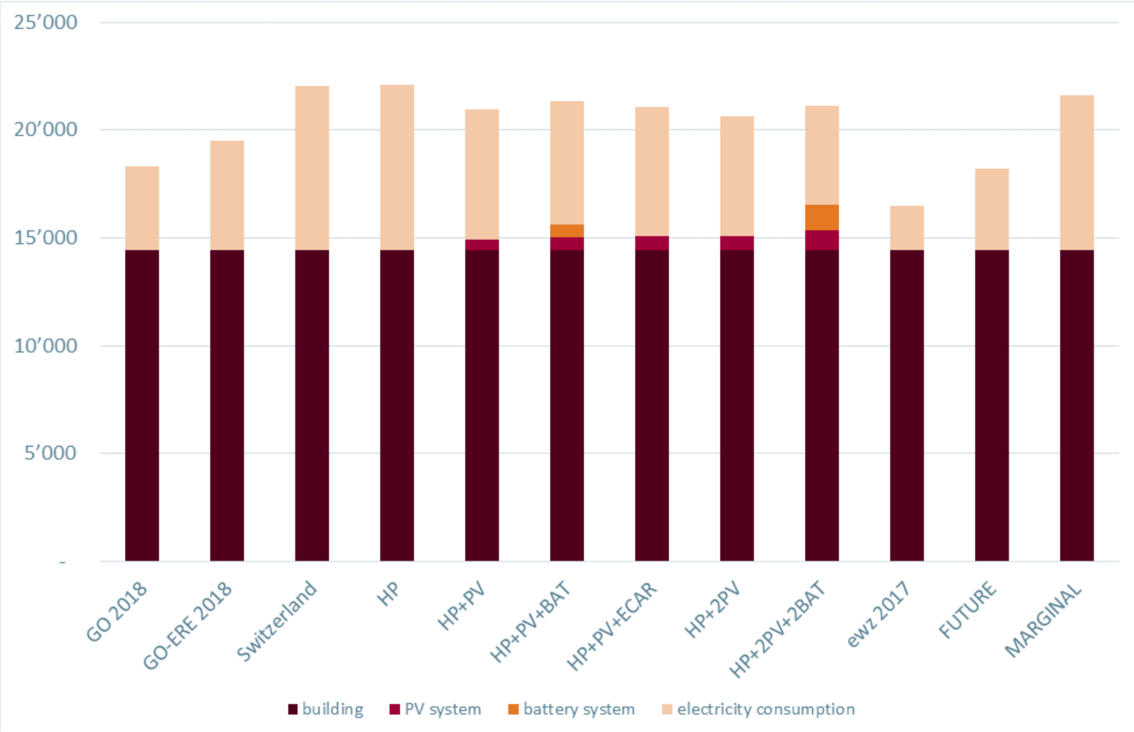

Fig. 24: Overall environmental impact in UBP per m²a of the residential building Rautistrasse, Zurich

GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based to guarantees of origin 2018, i.e. excluding deliberately purchased electricity products based on renewable energies; Switzerland: Swiss annual mix (national load profile); HP: heat pump for space heating and hot water; HP+PV: incl. 32 kWp PV system; HP+PV+BAT: including 32 kWp PV system and 32 kWh battery system; HP+PV+ECAR: including 32 kWp PV system and 7 electric car charging stations; HP+2PV: incl. 64 kWp PV system; HP+2PV+2BAT: incl. 64 kWp PV system and 64 kWh battery system; ewz 2017: ewz electricity mix based to guarantees of origin 2017; FUTURE: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; MARGINAL: long term marginal electricity mix (Switzerland and ewz).

In general, the difference in environmental footprint (greenhouse gas emissions, non renewable cumulative energy demand, overall environmental impacts) of the building is higher when applying a completely different electricity mix model (guarantees of origin rather than physical production and commercial trade or rather than average future mix) compared to different configurations of the building (with/without PV system and battery system).

The environmental performance of the building operated with a building specific electricity mix is practically identical with the building operated with the Swiss national electricity mix based on physical production and commercial trade.

5.3 Office building ARE, Ittigen

5.3.1 Description

The office building for the ARE (Federal Office for Spatial Development) meets the strict requirements of the federal government in terms of efficiency and sustainability.

The office building with 96 workplaces is certified according to Minergie-P-ECO (label BE-038-P-ECO), constructed in a 2000-Watt-society compatible manner and meets the requirements of GI Healthy Indoor Climate. This is made possible by a very compact structure with reduced facade surface and a modern timber construction with the minimum of necessary concrete structure.

Fig. 25: Exterior view of the office building ARE, Ittigen

The structure of the building including its building services is partly flexible, the office area is divided with non-load-bearing lightweight walls, which allow a variable use. The building is heated by an electric heat pump.

5.3.2 Environmental impacts

The greenhouse gas emissions of the office building vary between 9.8 and 12.7 kg CO_2-eq per m^2 and year with the ewz 2017 mix resulting in the lowest and the building specific electricity mix resulting in the highest value (see Fig. 26), except for the marginal electricity mix which leads to distinctly higher specific greenhouse gas emissions (21.1 kg CO_2-eq per m^2 and year). The SIA 2040 target value is met by all alternatives except when applying the marginal electricity mix.

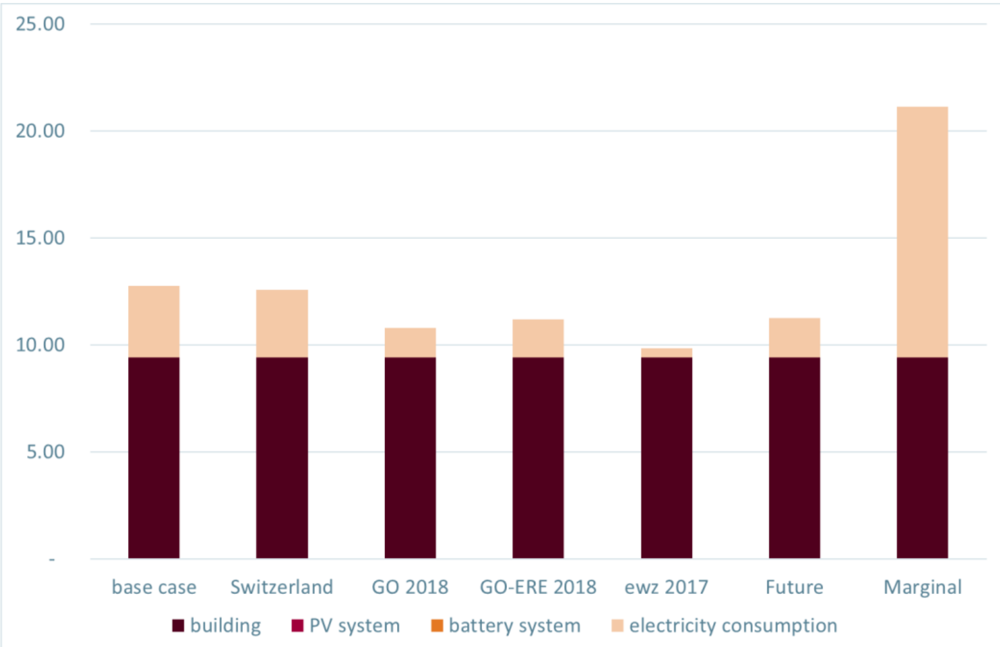

Fig. 26: Greenhouse gas emissions in kg CO_2-eq. per m^2a of the office building ARE, Ittigen. Target values SIA 2040:2017: 9 and 4 kg CO_2-eq./m^2a (construction and operation, respectively).

base case: heat pump for space heating and hot water; Switzerland: Swiss annual mix (national load profile); GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based on guarantees of origin 2018; ewz 2017: ewz electricity mix based to guarantees of origin 2017; Future: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; Marginal: long term marginal electricity mix (Switzerland and ewz).

Accordingly, the share of construction varies between 74 % and 96 % (44 % when applying the marginal electricity mix). Like with the residential building, the difference of the carbon footprint of the office building operated with its building specific or the national average electricity mix is much smaller than the difference to the building operated with the Swiss supply mix based on guarantees of origin 2018, the Swiss consumer mix based on guarantees of origin 2018, the ewz 2017 mix or the future Swiss mix.

The same pattern can be observed in the non renewable cumulative energy demand. While the non renewable cumulative energy demand of the building operated with its building specific electricity mix is slightly lower than when operated with the national average electricity mix (79 kWh compared to 81 kWh oil-eq per m^2 and year), the non renewable primary energy footprint is distinctly lower with the Swiss supply mix, the Swiss consumer mix, the future Swiss mix and the ewz 2017 mix (between 39 and 67 kWh oil-eq per m^2 and year; see Fig. 27). If the building is operated with a gas fired gas combined cycle power plant (marginal mix), the non renewable cumulative energy demand is slightly higher than using the building specific electricity mix.

The share of construction varies between 35 % and 73 %. All alternatives meet the SIA 2040 target value of 120 kWh oil-eq per m^2 and year.

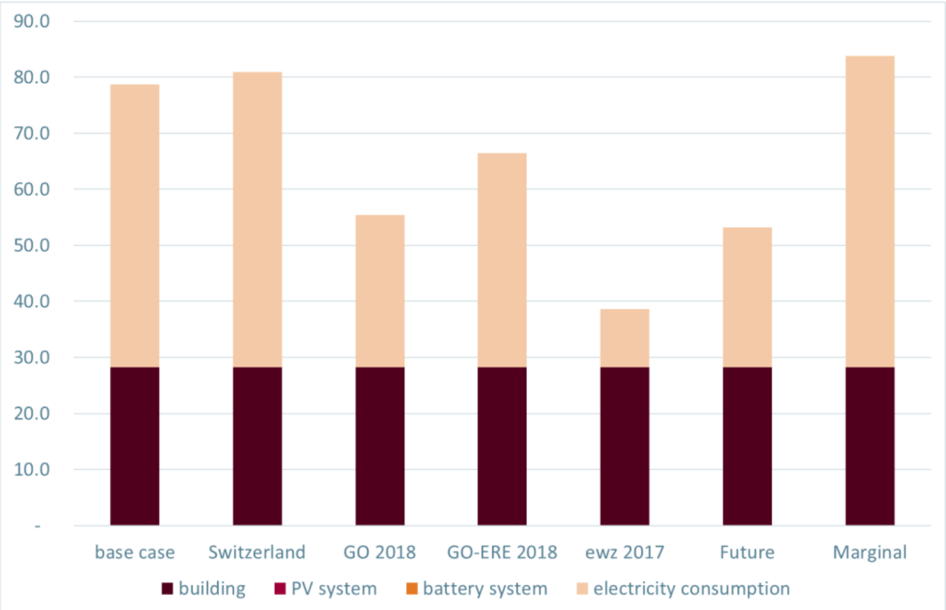

Fig. 27: Non-renewable primary energy demand in kWh oil-eq per m^2a of the office building ARE, Ittigen. Target values SIA 2040:2017: 40 and 80 kWh oil-eq/m^2a (construction and operation, respectively)
base case: heat pump for space heating and hot water; Switzerland: Swiss annual mix (national load profile); GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based on guarantees of origin 2018; ewz 2017: ewz electricity mix based to guarantees of origin 2017; Future: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; Marginal: long term marginal electricity mix (Switzerland and ewz).

The specific overall environmental impacts caused by the office building vary between 16’500 and 22’600 UBP per m^2 and year with the ewz 2017 mix resulting in the lowest and the Swiss annual electricity mix resulting in the highest value (see Fig. 28). The building operated with the marginal electricity mix causes specific environmental impacts similar to the building operated with its specific electricity mix. The share of construction varies between 64 % and 87 %. SIA 2040 offers no benchmark on environmental impacts.

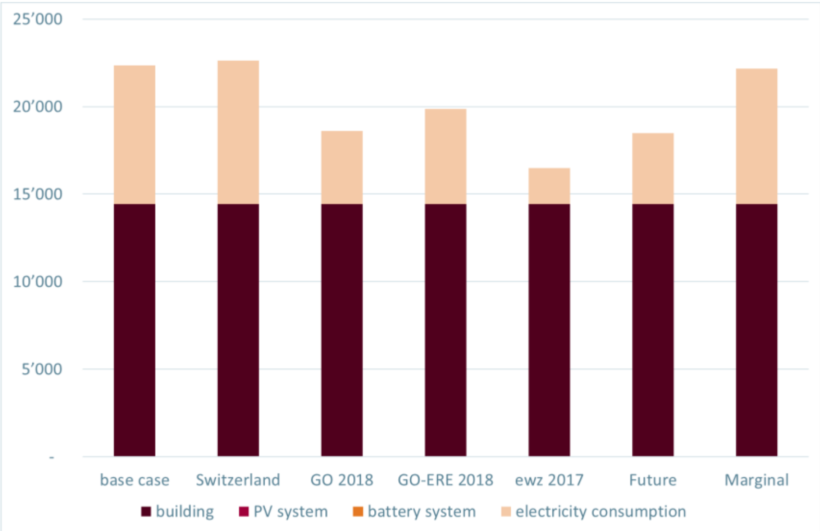

Fig. 28: Overall environmental impacts in UBP per m^{2}a of the office building ARE, Ittigen

base case: heat pump for space heating and hot water; Switzerland: Swiss annual mix (national load profile); GO 2018: Swiss supply mix based to guarantees of origin 2018; GO-ERE 2018: Swiss consumer mix based on guarantees of origin 2018; ewz 2017: ewz electricity mix based to guarantees of origin 2017; Future: average future electricity mix Switzerland 2020-2050 according to the New Energy Policy Scenario of the Swiss energy strategy 2050; Marginal: long term marginal electricity mix (Switzerland and ewz).

6 Data quality and uncertainty

The load profiles applied on the two buildings were published in Germany in 1996/1997. They are however still considered valid, representative and appropriate for the purpose of this study.

According to the New Energy Policy scenario of the Swiss Energy Perspectives 2050 (Prognos 2012) the energy consumption for space heating will be reduced more than the energy consumption for hot water. That is why the seasonal characteristic of the electricity consumption in residential buildings may become less pronounced in the future.

The production profile of the PV system may differ depending on the location, orientation, declination and the shading effect of neighbouring objects such as buildings and trees. This may influence the building specific electricity mix supplied to the building (in addition to the size of the PV system which affects the share of self consumption). The seasonal variation of electricity consumption may get less pronounced.

The loading profile of electric cars is based on actual measurements. It is not necessarily optimised to make maximum use of self generated PV electricity.

The construction and end of life of the buildings were assessed with the LCA data from KBOB recommendation 2009/1:2016, which includes the Swiss electricity consumer mix 2011 (and not any of the electricity mixes applied on the use phase of the buildings).

7 Conclusions and recommendations

7.1 Synthesis

This study dealt with the question on which electricity mix to use in the environmental life cycle assessment of buildings. Several electricity mixes were defined and established. In particular, annual and seasonal electricity mixes were derived matching the hourly generic use profile of a residential and an office building with the technology mix producing the electricity in Switzerland and the technology mixes used to produce the electricity imported from neighbouring countries. The building specific annual electricity mixes are compared to the Swiss electricity mix matching the national hourly consumption profile with the technology mixes as described above, to the Swiss consumer and supply mixes based on guarantees of origin 2018, to the average future Swiss electricity mix 2020-2050 (to cover 30 years of operation of a building erected today), to a long term marginal power plant technology (natural gas fired gas combined cycle power plant), and to the ewz mix 2017.

Furthermore, the influence of self generation of electricity with PV system and of on site battery storage on the specific electricity mix of the residential building was evaluated and quantified.

Life cycle inventories of these electricity mixes were established and the specific environmental impacts quantified. Finally the different electricity mixes were applied in the life cycle assessments of a residential and an office building to show the consequences of the choice of the electricity mix model on their environmental performance. The share of impacts caused by operational electricity consumption of the residential building during the winter and summer period was determined.

7.2 Conclusions

The results of this study confirm the environmental relevance of electricity consumption of buildings and of the choice of the appropriate electricity mix model, irrespective of the environmental indicator chosen. However, at the same time the results show that construction (manufacture of building materials, building elements and building technology) contributes between somewhat less than 50 % and more than 95 % to the life cycle based environmental impacts of buildings.[7] Therefore, environmental assessments of and environmental benchmarks for buildings should always consider its entire life cycle (including construction and end of life).

Even though the summer and winter Swiss electricity mixes exhibit only moderate differences in their composition compared to the annual mixes, their environmental impacts show distinctly different patterns. During the summer period, more electricity is being produced with hydropower and the mix relies much less on imports of non renewable electricity from neighbouring countries. During the winter period substantial shares of fossil based electricity is being imported. This leads to considerably higher greenhouse gas emissions of the winter mix compared to the summer mix (more than twice as high).

The annual and seasonal electricity mixes derived from the load profile of the two buildings and of Switzerland are close to identical. Obviously the load profile of energy efficient residential and office buildings are similar to the load profile of the country.

At least 75 % of the greenhouse gas emissions, at least 61 % of the non renewable cumulative energy demand and at least 63 % of the environmental impacts of the electricity consumption of Switzerland

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[7] A recent study showed that building material manufacturers may lower the specific greenhouse gas emissions of their products by 65% on average (Alig et al. 2020), by investing in completely new technologies (hydrogen based steel) and in technical reduction measures such as carbon capture and storage (e.g. in cement production) in addition to switching to renewable energy sources.

and of the residential building analysed are caused during the winter period. Installing PV and batteries in the building increases this share up to between 81 % and 90 %.

The comparison of the Swiss national electricity mix 2018 established by integrating the combination of hourly technology mixes (domestic production minus commercial exports plus commercial imports) with the hourly load profile of Switzerland with the Swiss supply mix based on guarantees of origin (GO) 2018 reveal substantial discrepancies: while Switzerland still consumes electricity with a share of 40 % nuclear power and 10 % fossil power, the GO mix shows shares of about 20 % and 4 % of nuclear and fossil power, respectively.

The average future Swiss electricity mix causes less environmental impacts than the Swiss annual attributional electricity mix. The level of environmental impacts is similar to the Swiss consumer mix based on guarantees of origin 2018. The average future mix lacks trade related technology shares and thus is hardly comparable with the other mixes which represent the current situation.

Countries like Denmark use a future electricity mix in their buildings LCA and Switzerland might consider to do the same. The future Swiss electricity mix described in this report is in principle suited to represent the operational electricity consumption of buildings in LCAs according to the technical bulletin SIA 2040 "SIA efficiency path energy", if the question whether and how future electricity trade is taken into account. The SIA target values for building operation would need to be adjusted (lowered).

The ewz 2017 electricity mix shows the lowest specific environmental impacts due to the low share of nuclear power and the absence of fossil based electricity. This is however not a carte blanche for an excessive and inefficient use of electricity. Capacity constraints (in the case of ewz but also on country level) would call for additional power plant capacities, which, according to the national energy strategy 2050 and ewz scenarios, would likely be natural gas fired gas combined cycle power plants. This long term marginal (consequential) electricity mix has the highest environmental footprints of all electricity mixes analysed in this study.

Despite the large variety in electricity mixes developed and analysed in this study, its variability can effectively be narrowed down by assigning specific electricity mixes to specific policy relevant questions and scopes.

7.3 Recommendations

The results and the considerations presented in this study lead to the following recommendations:

- Refrain from establishing building sector specific electricity mixes and instead use Swiss national electricity mixes based on physical production and commercial trade as established in this project.
- Use the seasonal Swiss national electricity mixes in case the seasonal electricity consumption pattern of the building under assessment differs substantially from the seasonal consumption pattern of Switzerland.
- Reconsider the current use of the Swiss consumer mix based on guarantees of origin in building LCAs and in LCAs in general. It is recommended to use the Swiss national electricity mix based on physical production and commercial trade, which reflects the economic reality of the purchase of electricity *production* (which is considered more important than the economic reality of the purchase of the *quality* of the electricity).
- Evaluate whether or not to use the average future Swiss electricity mix to model the operational electricity consumption of buildings in the upcoming revision of the technical bulletin SIA 2040 "SIA efficiency path energy".
- Use the long term marginal electricity mix in scenario analyses of investments in new buildings and in particular in refurbishment projects with comparatively low energy efficiency. This is

particularly important in situations where the electricity causes low specific environmental impacts and greenhouse gas emissions and shows the resilience of the investment towards changes in the electricity producing technologies.

- Self generation of electricity with PV helps to reduce the environmental impacts of buildings supplied with a building specific or a national average electricity mix. The effect of on site individual storage of electricity in batteries is less distinct and thus not recommended. Centralised storage facilities on district level may show a different performance.
- Given the increasing significance of the construction phase of buildings as shown in the building case studies, establish binding and steadily lowering target values on greenhouse gas emissions per m^2 and year. The SIA 2040 technical bulletin is a reality proven basis for such a regulation.

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9 Annex: Life cycle inventories of electricity mixes

9.1 Electricity mixes based on guarantees of origin, Switzerland

Tab. A.1.1 Life cycle inventory of the Swiss supply mix 2018 (GO 2018) based on guarantees of origin (Krebs & Frischknecht 2020).

	Name	Location	InfrastructureProcess	Unit	electricity, supply mix GO	UncertaintyType	StandardDeviation95%	GeneralComment
	Location				CH			
	InfrastructureProcess				0			
	Unit				kWh			
product	electricity, supply mix GO	CH	0	kWh	1			
technosphere	electricity, hydropower, at run-of-river power plant	CH	0	kWh	2.26E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Flury & Frischknecht 2012
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	2.77E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, own calculations
	electricity, hydropower, at small hydropower plant	CH	0	kWh	5.69E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Flury & Frischknecht 2012
	electricity, production mix photovoltaic, at plant	CH	0	kWh	2.37E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at wind power plant	CH	0	kWh	2.23E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	4.21E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.01E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	3.09E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.34E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.03E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	8.10E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	2.13E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	2.34E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, hard coal, at power plant	DE	0	kWh	0	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.01E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.42E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	2.71E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, production mix photovoltaic, at plant	DE	0	kWh	1.06E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, at wind power plant	RER	0	kWh	4.04E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	3.19E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, oil, at power plant	IT	0	kWh	0	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, natural gas, at power plant	UCTE	0	kWh	4.58E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hard coal, at power plant	DE	0	kWh	1.11E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, residual mix	CH	0	kWh	6.65E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); Non-verfied electricity; BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations

Tab. A.1.2 Life cycle inventory of the Swiss consumer mix 2018 (GO-ERE 2018) based on guarantees of origin (Krebs & Frischknecht 2020).

	Name	Location	Infrastructure Process	Unit	electricity, consumer mix GO	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH			
	Infrastructure Process				0			
	Unit				kWh			
product	electricity, consumer mix GO	CH	0	kWh	1			
technosphere	electricity, hydropower, at run-of-river power plant	CH	0	kWh	1.78E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Flury & Frischknecht 2012
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.75E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, own calculations
	electricity, hydropower, at small hydropower plant	CH	0	kWh	4.47E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Flury & Frischknecht 2012
	electricity, production mix photovoltaic, at plant	CH	0	kWh	2.24E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at wind power plant	CH	0	kWh	0	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.83E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	1.83E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	2.81E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.90E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, Pronovo Jahresbericht EVS, MKF 2018, BFE Statistik der erneuerbaren Energien 2018, own calculations
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.46E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	1.15E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	3.02E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	3.32E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity, hard coal, at power plant	DE	0	kWh	0	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.43E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.02E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	3.85E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, production mix photovoltaic, at plant	DE	0	kWh	1.51E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, at wind power plant	RER	0	kWh	1.27E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	4.53E-4	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, oil, at power plant	IT	0	kWh	0	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, natural gas, at power plant	UCTE	0	kWh	6.49E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, hard coal, at power plant	DE	0	kWh	1.57E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations
	electricity, residual mix	CH	0	kWh	9.44E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); Non-verfied electricity; BFE Elektrizitätsstatistik 2018, Pronovo Cockpit Stromkennzeichnung 2018, own calculations

Tab. A.1.3 Life cycle inventory of the Swiss residual mix 2018 (Krebs & Frischknecht 2020).

	Name	Location	InfrastructureProcess	Unit	electricity, residual mix	UncertaintyType	StandardDeviation95%	GeneralComment
	Location				CH			
	InfrastructureProcess				0			
	Unit				kWh			
product	electricity, residual mix	CH	0	kWh	1			
technosphere	electricity, hard coal, at power plant	UCTE	0	kWh	4.62E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, lignite, at power plant	UCTE	0	kWh	6.69E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, natural gas, at power plant	UCTE	0	kWh	1.71E-1	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, nuclear, at power plant	UCTE	0	kWh	5.67E-1	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, oil, at power plant	UCTE	0	kWh	7.01E-3	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	1.36E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); Differentiated between different hydropower technologies according to statistical factsheet ENTSO-E 2018; AIB (2018), ENSO-E (2018)
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.36E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); Differentiated between different hydropower technologies according to statistical factsheet ENTSO-E 2018; AIB (2018), ENSO-E (2018)
	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.63E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); Differentiated between different hydropower technologies according to statistical factsheet ENTSO-E 2018; AIB (2018), ENSO-E (2018)
	electricity, at wind power plant	RER	0	kWh	5.26E-3	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, production mix photovoltaic, at plant	DE	0	kWh	8.21E-2	1	1.05	(1,1,1,1,1,1,BU:1.05); Same dataset used as in the dataset ENTSO based on technologies; AIB (2018), ENSO-E (2018)
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.08E-3	1	1.05	(1,1,1,1,1,1,BU:1.05); ; AIB (2018), ENSO-E (2018)
	electricity, at wind power plant	RER	0	kWh	1.72E-5	1	1.05	(1,1,1,1,1,1,BU:1.05); Geothermal; AIB (2018), ENSO-E (2018)

A.1 Electricity mixes based on guarantees of origin, ewz

Tab. A.1.4 Life cycle inventory of the supply mix 2017 of ewz based on guarantees of origin.

	Name	Location	Infrastructure Process	Unit	electricity mix, ewz 2017, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH			
	Infrastructure Process				0			
	Unit				kWh			
product	electricity mix, ewz 2017, at plant	CH	0	kWh	1			
technosphere	electricity, hydropower, at run-of-river power plant	CH	0	kWh	2.35E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	2.59E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, hydropower, at small hydropower plant	CH	0	kWh	6.37E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, production mix photovoltaic, at plant	CH	0	kWh	1.46E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, at wind power plant	CH	0	kWh	3.72E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	4.88E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	1.89E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	3.16E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.41E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	5.09E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	4.05E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.79E-3	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.63E-1	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	5.01E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations
	electricity, at wind power plant	RER	0	kWh	7.29E-2	1	1.07	(1,1,1,1,1,3,BU:1.05); ; ewz Stromkennzeichnung 2017, own calculations

A.2 Building specific attributional electricity mixes, Rautistrasse

Tab. A.2.5 Life cycle inventory of the building specific electricity mix, base case (HP), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	1.04E-1	7.31E-2	1.54E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.52E-1	1.31E-1	1.86E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.56E-2	1.80E-2	3.78E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.18E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.82E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.75E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	1.67E-2	6.59E-3	3.26E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	9.79E-4	1.00E-3	9.44E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	7.11E-3	6.43E-3	8.19E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.21E-3	1.99E-3	2.54E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	5.05E-3	4.57E-3	5.82E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.02E-1	9.46E-2	1.14E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.18E-2	8.51E-2	1.03E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.57E-4	1.42E-4	1.80E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.92E-3	4.44E-3	5.66E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.23E-3	8.35E-3	1.06E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.27E-3	1.93E-3	2.31E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	2.99E-4	4.49E-4	5.95E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.05E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.57E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	2.14E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	6.54E-4	9.92E-4	1.17E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.17E-3	1.85E-3	8.64E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	2.69E-4	4.20E-4	3.02E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.03E-4	1.60E-4	1.11E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	6.22E-5	9.71E-5	6.72E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	3.67E-3	5.73E-3	3.96E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.29E-3	2.02E-3	1.23E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	5.48E-5	8.62E-5	5.04E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.23E-6	1.93E-6	1.13E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	8.04E-5	1.26E-4	8.40E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	2.95E-3	4.60E-3	3.29E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.53E-5	2.38E-5	1.79E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.10E-2	2.13E-2	2.06E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	8.62E-3	9.53E-3	7.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.56E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	3.03E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	1.80E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	3.99E-3	3.26E-3	5.15E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.46E-2	1.84E-2	8.56E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.12E-3	1.15E-3	1.09E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.36E-4	5.47E-4	5.18E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	1.91E-1	2.17E-1	1.49E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.52E-2	2.17E-2	4.84E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.72E-3	3.61E-3	1.31E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	8.39E-4	9.91E-4	5.97E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.30E-5	7.44E-5	4.48E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.51E-4	1.04E-3	8.06E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.65E-3	3.10E-3	1.94E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.53E-4	1.68E-4	1.29E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	1.98E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.59E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	1.02E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	7.24E-3	5.41E-3	1.01E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.08E-3	5.09E-3	2.47E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	1.83E-2	2.32E-2	1.06E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.80E-4	3.49E-4	1.69E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.13E-6	7.44E-6	4.05E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.65E-3	4.49E-3	2.32E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.44E-3	5.46E-3	2.81E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.16E-2	1.44E-2	7.24E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.15E-3	3.90E-3	1.96E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	7.75E-3	1.06E-2	3.21E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.58E-2	3.15E-2	1.66E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.62E-2	2.16E-2	7.56E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.32E-4	6.69E-4	3.15E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	4.65E-5	5.85E-5	2.75E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.51E-4	9.15E-4	4.91E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.34E-4	8.51E-4	5.46E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.19E-3	1.46E-3	7.55E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.87E-2	3.40E-2	2.04E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.39E-3	5.28E-3	3.00E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.08E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	7.27E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.61E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	1.61E-3	1.31E-3	2.08E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	9.10E-3	1.20E-2	4.53E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.64E-3	3.35E-3	1.52E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.15E-4	1.03E-3	4.70E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.41E-2	2.09E-2	3.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.58E-3	4.00E-3	3.25E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.54E-4	3.18E-4	1.53E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.16E-3	1.44E-3	6.97E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.6 Life cycle inventory of the building specific electricity mix, with PV system (HP+PV), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	9.68E-2	7.39E-2	1.53E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.48E-1	1.32E-1	1.88E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.38E-2	1.82E-2	3.76E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.13E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.85E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.81E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	4.99E-3	3.75E-3	8.05E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	1.02E-3	1.03E-3	9.97E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.98E-3	6.46E-3	8.24E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.16E-3	2.00E-3	2.56E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.96E-3	4.59E-3	5.86E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.01E-1	9.58E-2	1.15E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.12E-2	8.62E-2	1.03E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.54E-4	1.42E-4	1.81E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.82E-3	4.47E-3	5.70E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.06E-3	8.39E-3	1.07E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.45E-3	1.92E-3	2.80E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.33E-4	4.40E-4	7.10E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.24E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.63E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	2.92E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	4.71E-4	6.47E-4	3.95E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.36E-3	1.88E-3	9.64E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	3.04E-4	4.13E-4	3.51E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.16E-4	1.58E-4	1.30E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	7.02E-5	9.56E-5	7.88E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	4.12E-3	5.62E-3	4.57E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.45E-3	1.98E-3	1.44E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	6.07E-5	8.32E-5	5.52E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.36E-6	1.86E-6	1.23E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	8.95E-5	1.22E-4	1.00E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.31E-3	4.51E-3	3.77E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.73E-5	2.34E-5	2.09E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.22E-2	2.15E-2	2.40E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	9.26E-3	9.59E-3	8.46E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.77E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	3.02E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	2.16E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	2.17E-3	2.21E-3	2.07E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.63E-2	1.87E-2	1.04E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.17E-3	1.13E-3	1.26E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.58E-4	5.40E-4	6.03E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	2.05E-1	2.18E-1	1.75E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.69E-2	2.15E-2	5.67E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.93E-3	3.47E-3	1.62E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	9.05E-4	9.90E-4	6.98E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.80E-5	7.44E-5	5.24E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.02E-3	1.05E-3	9.46E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.77E-3	3.11E-3	1.92E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.54E-4	1.65E-4	1.27E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.24E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.67E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	1.19E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	2.95E-3	3.18E-3	2.40E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.41E-3	5.15E-3	2.60E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.03E-2	2.39E-2	1.15E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.97E-4	3.48E-4	1.70E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.43E-6	7.41E-6	4.03E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.86E-3	4.49E-3	2.33E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.69E-3	5.45E-3	2.83E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.24E-2	1.44E-2	7.27E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.35E-3	3.91E-3	1.97E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	8.39E-3	1.05E-2	3.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.72E-2	3.14E-2	1.69E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.72E-2	2.11E-2	7.50E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.65E-4	6.66E-4	3.18E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	4.94E-5	5.82E-5	2.78E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.92E-4	9.13E-4	4.95E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.67E-4	8.60E-4	5.38E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.25E-3	1.45E-3	7.75E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	3.02E-2	3.44E-2	2.01E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.61E-3	5.30E-3	2.91E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.61E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	7.24E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.63E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	7.07E-4	7.93E-4	4.95E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	9.96E-3	1.21E-2	4.70E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.81E-3	3.35E-3	1.48E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.65E-4	1.03E-3	4.57E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.55E-2	2.11E-2	1.67E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.90E-3	3.96E-3	2.95E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.68E-4	3.17E-4	1.48E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.22E-3	1.44E-3	6.74E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.7 Life cycle inventory of the building specific electricity mix, with PV system and battery system (HP+PV+BAT), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	9.35E-2	7.39E-2	1.52E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.42E-1	1.32E-1	1.72E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.30E-2	1.81E-2	3.73E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.01E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.85E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.49E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	4.51E-3	3.68E-3	7.01E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	1.03E-3	1.03E-3	1.00E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.95E-3	6.47E-3	8.37E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.15E-3	2.01E-3	2.60E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.93E-3	4.60E-3	5.95E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.01E-1	9.61E-2	1.17E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.12E-2	8.64E-2	1.05E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.53E-4	1.42E-4	1.84E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.80E-3	4.47E-3	5.79E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.02E-3	8.40E-3	1.09E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.51E-3	1.93E-3	2.45E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.44E-4	4.41E-4	5.75E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.27E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.64E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	1.80E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	4.90E-4	6.43E-4	3.29E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.44E-3	1.89E-3	8.89E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	3.19E-4	4.14E-4	3.26E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.22E-4	1.58E-4	1.20E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	7.37E-5	9.59E-5	7.29E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	4.32E-3	5.63E-3	3.86E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.52E-3	1.98E-3	1.26E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	6.37E-5	8.34E-5	4.81E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.42E-6	1.87E-6	1.07E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	9.38E-5	1.22E-4	9.01E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.47E-3	4.52E-3	3.30E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.81E-5	2.35E-5	1.94E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.22E-2	2.15E-2	2.43E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	9.27E-3	9.59E-3	8.32E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.73E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	3.01E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	1.91E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	2.03E-3	2.17E-3	1.63E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.67E-2	1.87E-2	1.07E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.17E-3	1.13E-3	1.30E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.60E-4	5.39E-4	6.22E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	2.08E-1	2.18E-1	1.79E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.75E-2	2.15E-2	5.66E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.99E-3	3.44E-3	1.66E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	9.19E-4	9.89E-4	7.10E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.90E-5	7.43E-5	5.33E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.03E-3	1.05E-3	9.70E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.88E-3	3.11E-3	2.19E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.58E-4	1.64E-4	1.42E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.29E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.64E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	1.24E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	2.93E-3	3.13E-3	2.31E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.59E-3	5.15E-3	2.90E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.12E-2	2.40E-2	1.30E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	3.10E-4	3.48E-4	1.94E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.70E-6	7.41E-6	4.57E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	4.02E-3	4.49E-3	2.64E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.89E-3	5.45E-3	3.21E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.29E-2	1.44E-2	8.27E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.49E-3	3.91E-3	2.24E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	8.79E-3	1.05E-2	3.62E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.83E-2	3.14E-2	1.92E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.79E-2	2.10E-2	8.53E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.89E-4	6.66E-4	3.62E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	5.15E-5	5.82E-5	3.16E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	8.25E-4	9.13E-4	5.63E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.99E-4	8.62E-4	6.11E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.31E-3	1.45E-3	8.84E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	3.15E-2	3.44E-2	2.29E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.78E-3	5.28E-3	3.27E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.81E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	7.18E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.70E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	7.01E-4	7.80E-4	4.64E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.04E-2	1.21E-2	5.35E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.93E-3	3.34E-3	1.69E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	9.04E-4	1.03E-3	5.22E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.63E-2	2.11E-2	1.72E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	3.04E-3	3.95E-3	3.30E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.80E-4	3.17E-4	1.70E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.27E-3	1.44E-3	7.71E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.8 Life cycle inventory of the building specific electricity mix, with PV system and electric car charging stations (HP+PV+ECAR), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	9.87E-2	7.39E-2	1.55E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.59E-1	1.40E-1	2.02E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.42E-2	1.82E-2	3.80E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.36E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	2.00E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	3.19E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	8.74E-3	5.26E-3	1.66E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	9.75E-4	9.92E-4	9.36E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.95E-3	6.41E-3	8.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.16E-3	1.99E-3	2.54E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.94E-3	4.55E-3	5.81E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.01E-1	9.48E-2	1.14E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.05E-2	8.52E-2	1.03E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.53E-4	1.41E-4	1.80E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.81E-3	4.43E-3	5.66E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.03E-3	8.32E-3	1.06E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.44E-3	1.96E-3	2.49E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.42E-4	4.65E-4	6.37E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.24E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.67E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	2.52E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	6.74E-4	9.40E-4	7.27E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.30E-3	1.84E-3	8.68E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	2.92E-4	4.07E-4	3.17E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.11E-4	1.55E-4	1.17E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	6.73E-5	9.39E-5	7.06E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	4.14E-3	5.78E-3	4.16E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.39E-3	1.95E-3	1.30E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	6.06E-5	8.52E-5	4.98E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.36E-6	1.91E-6	1.11E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	8.55E-5	1.19E-4	8.95E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.27E-3	4.57E-3	3.44E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.65E-5	2.29E-5	1.89E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.12E-2	2.10E-2	2.16E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	9.01E-3	9.60E-3	7.68E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.88E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	3.19E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	2.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	2.83E-3	2.87E-3	2.76E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.54E-2	1.81E-2	9.20E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.11E-3	1.10E-3	1.13E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.30E-4	5.26E-4	5.39E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	1.95E-1	2.12E-1	1.57E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.67E-2	2.18E-2	5.32E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.91E-3	3.54E-3	1.50E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	8.78E-4	9.91E-4	6.23E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.60E-5	7.44E-5	4.68E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.62E-4	1.02E-3	8.42E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.64E-3	3.02E-3	1.79E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.51E-4	1.65E-4	1.19E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.22E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.70E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	1.15E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	4.33E-3	4.30E-3	4.41E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.18E-3	4.94E-3	2.44E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	1.91E-2	2.29E-2	1.06E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.85E-4	3.41E-4	1.58E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.16E-6	7.24E-6	3.73E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.68E-3	4.36E-3	2.15E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.47E-3	5.30E-3	2.61E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.18E-2	1.40E-2	6.71E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.19E-3	3.80E-3	1.82E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	8.32E-3	1.06E-2	3.05E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.62E-2	3.08E-2	1.57E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.71E-2	2.14E-2	7.29E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.40E-4	6.47E-4	2.96E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	4.72E-5	5.66E-5	2.59E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.57E-4	8.90E-4	4.58E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.38E-4	8.33E-4	5.22E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.19E-3	1.41E-3	7.14E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.84E-2	3.27E-2	1.87E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.60E-3	5.38E-3	2.83E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.92E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	7.76E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.77E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	9.81E-4	1.02E-3	8.99E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	9.19E-3	1.14E-2	4.23E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.63E-3	3.18E-3	1.37E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.10E-4	9.81E-4	4.22E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.51E-2	2.09E-2	2.11E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.82E-3	3.92E-3	3.13E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.51E-4	3.02E-4	1.37E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.14E-3	1.37E-3	6.24E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.9 Life cycle inventory of the building specific electricity mix, with double size PV system (HP+2PV), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	9.57E-2	7.41E-2	1.53E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.46E-1	1.32E-1	1.84E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.35E-2	1.82E-2	3.75E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.08E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.84E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.71E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	3.02E-3	2.57E-3	4.21E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	1.03E-3	1.04E-3	1.01E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.96E-3	6.47E-3	8.27E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.16E-3	2.01E-3	2.57E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.95E-3	4.60E-3	5.88E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.01E-1	9.61E-2	1.15E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.12E-2	8.64E-2	1.04E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.53E-4	1.42E-4	1.82E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.81E-3	4.47E-3	5.72E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.04E-3	8.40E-3	1.07E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.48E-3	1.93E-3	2.90E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.37E-4	4.36E-4	7.30E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.28E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.66E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	3.03E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	3.59E-4	4.87E-4	2.19E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.41E-3	1.90E-3	9.98E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	3.10E-4	4.14E-4	3.64E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.19E-4	1.58E-4	1.35E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	7.18E-5	9.59E-5	8.19E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	4.19E-3	5.60E-3	4.70E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.48E-3	1.98E-3	1.48E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	6.12E-5	8.22E-5	5.68E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.37E-6	1.84E-6	1.27E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	9.11E-5	1.22E-4	1.04E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.37E-3	4.49E-3	3.89E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.76E-5	2.35E-5	2.15E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.24E-2	2.16E-2	2.46E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	9.32E-3	9.58E-3	8.63E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.76E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	2.98E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	2.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	1.62E-3	1.73E-3	1.32E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.66E-2	1.88E-2	1.08E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.18E-3	1.14E-3	1.30E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.63E-4	5.41E-4	6.21E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	2.08E-1	2.19E-1	1.80E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.72E-2	2.14E-2	5.83E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.96E-3	3.44E-3	1.67E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	9.18E-4	9.93E-4	7.18E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.89E-5	7.46E-5	5.40E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.03E-3	1.05E-3	9.75E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.81E-3	3.12E-3	2.00E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.56E-4	1.65E-4	1.32E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.28E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.68E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	1.21E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	2.05E-3	2.35E-3	1.26E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.50E-3	5.18E-3	2.72E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.09E-2	2.43E-2	1.20E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	3.02E-4	3.49E-4	1.77E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.54E-6	7.43E-6	4.18E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.93E-3	4.51E-3	2.42E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.78E-3	5.48E-3	2.94E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.26E-2	1.45E-2	7.59E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.41E-3	3.93E-3	2.06E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	8.52E-3	1.05E-2	3.29E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.77E-2	3.15E-2	1.76E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.74E-2	2.10E-2	7.80E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.79E-4	6.72E-4	3.32E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	5.06E-5	5.87E-5	2.90E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	8.07E-4	9.17E-4	5.14E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.84E-4	8.68E-4	5.62E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.28E-3	1.46E-3	8.09E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	3.09E-2	3.47E-2	2.08E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.66E-3	5.30E-3	2.98E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.63E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	7.15E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.61E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	5.15E-4	6.08E-4	2.69E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.03E-2	1.23E-2	4.95E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.88E-3	3.38E-3	1.54E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.87E-4	1.04E-3	4.76E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.58E-2	2.12E-2	1.52E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.98E-3	3.99E-3	3.06E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.75E-4	3.21E-4	1.54E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.25E-3	1.46E-3	7.02E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.10 Life cycle inventory of the building specific electricity mix, with double size PV system and double size battery system (HP+2PV+2BAT), Rautistrasse.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	8.63E-2	7.41E-2	1.44E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.33E-1	1.30E-1	1.47E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.12E-2	1.82E-2	3.54E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	1.84E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.81E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.00E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	2.98E-3	2.53E-3	5.08E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	1.05E-3	1.05E-3	1.04E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.85E-3	6.52E-3	8.46E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.13E-3	2.02E-3	2.62E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.87E-3	4.63E-3	6.01E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.01E-1	9.75E-2	1.19E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.11E-2	8.77E-2	1.07E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.51E-4	1.43E-4	1.86E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.74E-3	4.50E-3	5.85E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	8.90E-3	8.46E-3	1.10E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.65E-3	1.95E-3	2.06E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.67E-4	4.36E-4	3.89E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.36E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.62E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	7.39E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	4.05E-4	4.85E-4	2.36E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.63E-3	1.95E-3	9.07E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	3.54E-4	4.22E-4	2.98E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.35E-4	1.61E-4	1.10E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.19E-5	9.77E-5	6.64E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	4.72E-3	5.65E-3	2.66E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.67E-3	2.00E-3	9.89E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	6.91E-5	8.28E-5	4.09E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.55E-6	1.85E-6	9.15E-8	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	1.03E-4	1.23E-4	7.44E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.80E-3	4.54E-3	2.60E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	2.01E-5	2.40E-5	1.76E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.26E-2	2.17E-2	2.71E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	9.33E-3	9.47E-3	8.67E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.57E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	2.84E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	1.30E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	1.60E-3	1.70E-3	1.09E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.77E-2	1.89E-2	1.24E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.19E-3	1.12E-3	1.51E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.65E-4	5.33E-4	7.20E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	2.16E-1	2.18E-1	2.06E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.86E-2	2.12E-2	6.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	3.06E-3	3.29E-3	1.96E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	9.58E-4	9.87E-4	8.15E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	7.19E-5	7.42E-5	6.12E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.06E-3	1.05E-3	1.12E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	3.01E-3	3.15E-3	2.38E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.58E-4	1.61E-4	1.43E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.26E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.52E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	9.84E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	2.27E-3	2.38E-3	1.73E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.83E-3	5.19E-3	3.08E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.28E-2	2.45E-2	1.44E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	3.26E-4	3.50E-4	2.11E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.98E-6	7.43E-6	4.86E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	4.23E-3	4.52E-3	2.87E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.14E-3	5.49E-3	3.48E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.36E-2	1.46E-2	8.94E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.68E-3	3.94E-3	2.42E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	9.26E-3	1.04E-2	3.68E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.96E-2	3.15E-2	2.04E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.85E-2	2.06E-2	8.30E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	6.23E-4	6.70E-4	4.02E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	5.45E-5	5.85E-5	3.51E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	8.66E-4	9.20E-4	6.09E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	8.34E-4	8.77E-4	6.33E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.37E-3	1.46E-3	9.77E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	3.31E-2	3.49E-2	2.49E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.83E-3	5.17E-3	3.17E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	5.83E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	6.80E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.20E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	5.63E-4	6.09E-4	3.46E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.12E-2	1.23E-2	5.89E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.12E-3	3.38E-3	1.86E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	9.61E-4	1.04E-3	5.75E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.81E-2	2.15E-2	1.45E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	3.33E-3	3.95E-3	3.52E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.97E-4	3.20E-4	1.86E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.35E-3	1.45E-3	8.46E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.11 Life cycle inventory of the building specific electricity mix, base case (HP), ARE Ittingen.

	Name	Location	Infrastructure Process	Unit	electricity mix, office building ARE, ENTSO, 2018, at plant	electricity mix, office building ARE, ENTSO, winter 2018, at plant	electricity mix, office building ARE, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, office building ARE, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, office building ARE, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, office building ARE, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, office building ARE, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, office building ARE, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	1.04E-1	7.40E-2	1.54E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.75E-1	1.54E-1	2.09E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.55E-2	1.82E-2	3.79E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.72E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	2.34E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	3.35E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	2.39E-2	9.83E-3	4.80E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	8.84E-4	8.79E-4	8.94E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	6.95E-3	6.31E-3	8.04E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.15E-3	1.96E-3	2.49E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	4.94E-3	4.48E-3	5.71E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	9.94E-2	9.25E-2	1.11E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	8.94E-2	8.31E-2	1.00E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.53E-4	1.39E-4	1.77E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.80E-3	4.36E-3	5.55E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.02E-3	8.19E-3	1.04E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.34E-3	2.02E-3	1.93E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	3.46E-4	5.19E-4	4.94E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	1.17E-4	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.77E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	1.42E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	1.08E-3	1.61E-3	1.84E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.13E-3	1.75E-3	7.70E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	2.62E-4	4.01E-4	2.67E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	9.89E-5	1.51E-4	9.58E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.99E-5	9.16E-5	5.80E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	3.99E-3	6.12E-3	3.57E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.27E-3	1.95E-3	1.07E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	5.49E-5	8.43E-5	4.73E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.23E-6	1.88E-6	1.06E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	7.95E-5	1.22E-4	6.60E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	3.11E-3	4.75E-3	3.00E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.48E-5	2.25E-5	1.59E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, office building ARE, ENTSO, 2018, at plant	electricity mix, office building ARE, ENTSO, winter 2018, at plant	electricity mix, office building ARE, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, office building ARE, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, office building ARE, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, office building ARE, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, office building ARE, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, office building ARE, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.82E-2	1.97E-2	1.58E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	8.07E-3	9.48E-3	5.66E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	3.01E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	3.66E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	1.90E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	5.06E-3	4.64E-3	5.78E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.30E-2	1.66E-2	6.86E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	9.76E-4	1.05E-3	8.54E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.65E-4	4.99E-4	4.07E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	1.69E-1	1.99E-1	1.18E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.58E-2	2.24E-2	4.50E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.79E-3	3.71E-3	1.23E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	7.86E-4	9.78E-4	4.60E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	5.91E-5	7.34E-5	3.46E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	8.21E-4	9.42E-4	6.16E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.44E-3	2.81E-3	1.81E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.51E-4	1.66E-4	1.27E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	2.13E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.80E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	9.93E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	1.00E-2	7.87E-3	1.36E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	3.67E-3	4.49E-3	2.27E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	1.64E-2	2.04E-2	9.45E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.59E-4	3.19E-4	1.57E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	5.67E-6	6.80E-6	3.76E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.34E-3	4.06E-3	2.12E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.06E-3	4.93E-3	2.57E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.07E-2	1.31E-2	6.64E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	2.90E-3	3.54E-3	1.80E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	8.12E-3	1.09E-2	3.34E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.43E-2	2.93E-2	1.57E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.72E-2	2.24E-2	8.47E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.00E-4	6.16E-4	3.03E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	4.37E-5	5.39E-5	2.65E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	6.87E-4	8.27E-4	4.48E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	6.98E-4	7.52E-4	6.06E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.08E-3	1.31E-3	6.82E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.53E-2	2.90E-2	1.89E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.70E-3	5.60E-3	3.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	6.64E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	9.30E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	2.10E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	2.15E-3	1.79E-3	2.77E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	7.54E-3	9.66E-3	3.92E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.31E-3	2.85E-3	1.39E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	7.12E-4	8.77E-4	4.30E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.45E-2	2.04E-2	4.46E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.70E-3	4.02E-3	4.49E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.22E-4	2.70E-4	1.40E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.01E-3	1.23E-3	6.38E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.12 Life cycle inventory of the Swiss electricity mix based on domestic production and commercial trade

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Production CH	electricity, hydropower, at run-of-river power plant	CH	0	kWh	1.08E-1	7.32E-2	1.55E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, net, at reservoir power plant	CH	0	kWh	1.51E-1	1.28E-1	1.83E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / CH; ENTSO Transparency Platform
	electricity, hydropower, at small hydropower plant	CH	0	kWh	2.64E-2	1.80E-2	3.81E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	CH	0	kWh	2.14E-2	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	CH	0	kWh	0	1.77E-2	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	CH	0	kWh	0	0	2.65E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	CH	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / CH; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	CH	0	kWh	1.70E-2	6.32E-3	3.17E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / CH; ENTSO Transparency Platform
	electricity, at wind power plant	CH	0	kWh	9.75E-4	9.93E-4	9.49E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / CH; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	7.22E-3	6.48E-3	8.25E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, agricultural covered, alloc. exergy	CH	0	kWh	2.24E-3	2.01E-3	2.56E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, methane 96%-vol allocation exergy	CH	0	kWh	5.13E-3	4.61E-3	5.86E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	CH	0	kWh	1.03E-1	9.52E-2	1.14E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	CH	0	kWh	9.28E-2	8.56E-2	1.03E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / CH; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.59E-4	1.43E-4	1.82E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / CH; ENTSO Transparency Platform
	electricity, at cogen 500kWe lean burn, allocation exergy	CH	0	kWh	4.99E-3	4.48E-3	5.70E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / CH; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.38E-3	8.41E-3	1.07E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / CH; ENTSO Transparency Platform
Import IT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	1.26E-3	2.00E-3	2.26E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / IT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	2.85E-4	4.50E-4	5.67E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	IT	0	kWh	9.33E-5	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	IT	0	kWh	0	1.47E-4	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	IT	0	kWh	0	0	1.87E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	IT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / IT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	IT	0	kWh	6.12E-4	9.70E-4	1.15E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.20E-3	2.01E-3	8.55E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / IT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	2.76E-4	4.54E-4	2.99E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / IT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.05E-4	1.73E-4	1.10E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	6.37E-5	1.05E-4	6.64E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / IT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	IT	0	kWh	3.62E-3	5.96E-3	3.81E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / IT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	IT	0	kWh	1.30E-3	2.15E-3	1.19E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / IT; ENTSO Transparency Platform
	electricity, oil, at power plant	IT	0	kWh	5.46E-5	9.05E-5	4.82E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	1.22E-6	2.02E-6	1.08E-7	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	8.25E-5	1.36E-4	8.47E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / IT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	IT	0	kWh	2.95E-3	4.84E-3	3.19E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / IT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.57E-5	2.57E-5	1.76E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / IT; ENTSO Transparency Platform

cont.

	Name	Location	Infrastructure Process	Unit	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	Uncertainty Type	Standard Deviation 95%	General Comment
	Location				CH	CH	CH			
	Infrastructure Process				0	0	0			
	Unit				kWh	kWh	kWh			
product	electricity mix, MFH Rautistrasse, ENTSO, 2018, at plant	CH	0	kWh	1	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, winter 2018, at plant	CH	0	kWh	0	1	0			
	electricity mix, MFH Rautistrasse, ENTSO, summer 2018, at plant	CH	0	kWh	0	0	1			
	electricity mix, MFH Rautistrasse, ENTSO, 25.02.2018, at plant	CH	0	kWh	0	0	0			
	electricity mix, MFH Rautistrasse, ENTSO, 28.02.2018, at plant	CH	0	kWh	0	0	0			
Import FR	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.08E-2	2.10E-2	2.04E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / FR; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	8.24E-3	9.18E-3	6.92E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	FR	0	kWh	2.25E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	FR	0	kWh	0	2.75E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	FR	0	kWh	0	0	1.55E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	FR	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / FR; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	FR	0	kWh	3.83E-3	3.14E-3	4.78E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / FR; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	1.44E-2	1.86E-2	8.71E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / FR; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	1.13E-3	1.16E-3	1.08E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	5.38E-4	5.53E-4	5.17E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / FR; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	FR	0	kWh	1.90E-1	2.18E-1	1.50E-1	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / FR; ENTSO Transparency Platform
	electricity, natural gas, at power plant	FR	0	kWh	1.47E-2	2.17E-2	4.87E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / FR; ENTSO Transparency Platform
	electricity, hard coal, at power plant	FR	0	kWh	2.69E-3	3.66E-3	1.35E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / FR; ENTSO Transparency Platform
	electricity, oil, at power plant	FR	0	kWh	8.34E-4	1.00E-3	6.01E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	6.26E-5	7.52E-5	4.51E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / FR; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	9.53E-4	1.05E-3	8.19E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / FR; ENTSO Transparency Platform
Import DE	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.65E-3	3.11E-3	2.00E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / DE; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, non alpine regions	RER	0	kWh	1.56E-4	1.71E-4	1.35E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	DE	0	kWh	1.77E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	DE	0	kWh	0	2.38E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	DE	0	kWh	0	0	9.22E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	DE	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / DE; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	DE	0	kWh	7.09E-3	5.17E-3	9.74E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / DE; ENTSO Transparency Platform
	electricity, at wind power plant 2MW, offshore	OCE	0	kWh	4.02E-3	5.09E-3	2.54E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Offshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	1.82E-2	2.34E-2	1.10E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / DE; ENTSO Transparency Platform
	electricity, at wind power plant 800kW	RER	0	kWh	2.76E-4	3.51E-4	1.73E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other renewable / DE; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	6.08E-6	7.50E-6	4.10E-6	1	1.31	(4,2,1,1,3,3,BU:1.05); Geothermal / DE; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	3.62E-3	4.52E-3	2.38E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	4.41E-3	5.50E-3	2.89E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant pressure water reactor	DE	0	kWh	1.16E-2	1.45E-2	7.48E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, nuclear, at power plant boiling water reactor	DE	0	kWh	3.13E-3	3.93E-3	2.03E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Nuclear / DE; ENTSO Transparency Platform
	electricity, natural gas, at power plant	DE	0	kWh	7.56E-3	1.06E-2	3.32E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / DE; ENTSO Transparency Platform
	electricity, lignite, at power plant	DE	0	kWh	2.57E-2	3.18E-2	1.71E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Brown coal/Lignite / DE; ENTSO Transparency Platform
	electricity, hard coal, at power plant	DE	0	kWh	1.59E-2	2.18E-2	7.81E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / DE; ENTSO Transparency Platform
	electricity, oil, at power plant	DE	0	kWh	5.32E-4	6.80E-4	3.25E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, at cogen 200kWe diesel SCR, allocation exergy	CH	0	kWh	4.65E-5	5.95E-5	2.84E-5	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Oil / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.46E-4	9.21E-4	5.03E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Coal-derived gas / DE; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	DE	0	kWh	7.30E-4	8.48E-4	5.67E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / DE; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.18E-3	1.47E-3	7.73E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / DE; ENTSO Transparency Platform
Import AT	electricity, hydropower, at run-of-river power plant	RER	0	kWh	2.88E-2	3.43E-2	2.10E-2	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Run-of-river and poundage / AT; ENTSO Transparency Platform
	electricity, hydropower, at reservoir power plant, alpine region	RER	0	kWh	4.28E-3	5.15E-3	3.07E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Water Reservoir / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 2018	AT	0	kWh	4.62E-3	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, winter 2018	AT	0	kWh	0	6.88E-3	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, summer 2018	AT	0	kWh	0	0	1.49E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 25.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, hydropower, at pumped storage plant, ENTSO, 28.02.2018	AT	0	kWh	0	0	0	1	1.31	(4,2,1,1,3,3,BU:1.05); Hydro Pumped Storage / AT; ENTSO Transparency Platform
	electricity, production mix photovoltaic, at plant	AT	0	kWh	1.56E-3	1.24E-3	2.00E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Solar / AT; ENTSO Transparency Platform
	electricity, at wind power plant	RER	0	kWh	8.99E-3	1.21E-2	4.63E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Wind Onshore / AT; ENTSO Transparency Platform
	electricity, at cogen 6400kWth, wood, emission control, allocation exergy	CH	0	kWh	2.66E-3	3.44E-3	1.58E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, at cogen with biogas engine, allocation exergy	CH	0	kWh	8.20E-4	1.06E-3	4.88E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Biomass / AT; ENTSO Transparency Platform
	electricity, natural gas, at power plant	AT	0	kWh	1.35E-2	2.10E-2	3.18E-3	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Gas / AT; ENTSO Transparency Platform
	electricity, hard coal, at power plant	AT	0	kWh	2.56E-3	4.16E-3	3.32E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Fossil Hard coal / AT; ENTSO Transparency Platform
	electricity, industrial gas, at power plant	AT	0	kWh	2.56E-4	3.26E-4	1.59E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Other / AT; ENTSO Transparency Platform
	electricity from waste, at municipal waste incineration plant	CH	0	kWh	1.17E-3	1.48E-3	7.25E-4	1	1.31	(4,2,1,1,3,3,BU:1.05); Waste / AT; ENTSO Transparency Platform

Tab. A.2.13 Technology shares of the future average Swiss electricity mix 2020-2050

	2020			2025			2030			2035			2040			2045			2050		
	Winter	Sommer	Jahr	Winter	Sommer	Jahr	Winter	Sommer	Jahr	Winter	Sommer	Jahr	Winter	Sommer	Jahr	Winter	Sommer	Jahr	Winter	Sommer	Jahr
Technologie	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
Einheit	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Inlandproduktion	**86.0%**	**85.8%**	**85.9%**	**88.0%**	**87.8%**	**87.9%**	**87.8%**	**87.5%**	**87.7%**	**96.2%**	**96.1%**	**96.1%**	**98.1%**	**98.0%**	**98.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Erneuerbare Energien	**49.2%**	**57.0%**	**53.1%**	**53.9%**	**63.5%**	**58.6%**	**58.7%**	**70.7%**	**64.6%**	**63.7%**	**89.7%**	**75.5%**	**71.7%**	**92.3%**	**81.6%**	**79.0%**	**94.7%**	**86.8%**	**85.0%**	**95.0%**	**90.1%**
Wasserkraft	**45.6%**	**54.0%**	**49.9%**	**47.6%**	**58.0%**	**52.8%**	**49.2%**	**61.3%**	**55.1%**	**50.5%**	**71.1%**	**59.9%**	**54.0%**	**67.8%**	**60.6%**	**56.3%**	**64.4%**	**60.3%**	**57.9%**	**60.7%**	**59.4%**
Laufwasserkraft	13.8%	17.4%	15.6%	14.5%	18.8%	16.6%	15.0%	19.9%	17.4%	15.5%	23.2%	19.0%	16.7%	22.2%	19.3%	17.5%	21.2%	19.4%	18.1%	20.1%	19.1%
Speicherwasserkraft	20.3%	25.5%	22.9%	21.1%	27.2%	24.1%	21.8%	28.5%	25.0%	22.2%	32.7%	27.0%	23.7%	30.8%	27.1%	24.4%	28.7%	26.6%	25.0%	26.8%	25.9%
Kleinwasserkraft	3.6%	4.7%	4.2%	3.9%	5.2%	4.5%	4.1%	5.7%	4.9%	4.4%	6.9%	5.5%	4.8%	6.8%	5.8%	5.3%	6.9%	6.1%	5.6%	6.7%	6.2%
Pumpspeicherkraft	7.9%	6.4%	7.2%	8.1%	6.9%	7.5%	8.3%	7.3%	7.8%	8.4%	8.4%	8.4%	8.8%	8.0%	8.4%	9.0%	7.6%	8.3%	9.2%	7.1%	8.1%
Andere erneuerbare Energien	**3.6%**	**2.9%**	**3.3%**	**6.2%**	**5.5%**	**5.9%**	**9.5%**	**9.5%**	**9.5%**	**13.1%**	**18.6%**	**15.6%**	**17.8%**	**24.5%**	**21.0%**	**22.7%**	**30.3%**	**26.5%**	**27.0%**	**34.3%**	**30.8%**
Sonne	0.4%	1.0%	0.7%	0.7%	1.9%	1.3%	1.4%	3.9%	2.6%	3.2%	10.5%	6.5%	4.9%	14.6%	9.6%	6.8%	18.6%	12.7%	8.3%	21.2%	15.0%
Wind	1.0%	0.7%	0.8%	1.5%	1.0%	1.3%	2.3%	1.6%	2.0%	2.9%	2.3%	2.6%	4.2%	3.1%	3.7%	5.7%	3.8%	4.7%	7.1%	4.4%	5.7%
Holz	1.0%	0.5%	0.8%	1.7%	0.8%	1.3%	2.2%	1.1%	1.7%	2.2%	1.3%	1.8%	2.3%	1.2%	1.7%	2.3%	1.1%	1.7%	2.3%	1.1%	1.7%
Biogas Landwirtschaft	0.2%	0.1%	0.2%	0.4%	0.3%	0.4%	0.6%	0.4%	0.5%	0.7%	0.6%	0.7%	0.8%	0.5%	0.7%	0.8%	0.5%	0.7%	0.8%	0.5%	0.6%
Biogas Industrie	0.5%	0.3%	0.4%	1.0%	0.6%	0.8%	1.5%	1.0%	1.2%	1.7%	1.3%	1.5%	1.8%	1.2%	1.5%	1.9%	1.2%	1.5%	1.9%	1.1%	1.5%
Biomasse KVA	0.2%	0.2%	0.2%	0.3%	0.2%	0.3%	0.4%	0.3%	0.4%	0.5%	0.4%	0.4%	0.5%	0.4%	0.4%	0.5%	0.3%	0.4%	0.5%	0.3%	0.4%
Geothermie	0.3%	0.3%	0.3%	0.5%	0.5%	0.5%	1.0%	1.1%	1.1%	1.9%	2.3%	2.1%	3.3%	3.6%	3.4%	4.8%	4.8%	4.8%	6.1%	5.7%	5.9%
Nicht erneuerbare Energien	**33.7%**	**26.3%**	**30.0%**	**30.6%**	**21.3%**	**26.0%**	**25.2%**	**13.4%**	**19.5%**	**28.6%**	**2.5%**	**16.7%**	**22.4%**	**2.1%**	**12.7%**	**17.0%**	**2.0%**	**9.5%**	**11.0%**	**1.9%**	**6.3%**
Kernenergie	**30.4%**	**24.5%**	**27.4%**	**23.0%**	**19.3%**	**21.2%**	**12.9%**	**11.2%**	**12.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Druckwasserreaktor	16.0%	12.9%	14.4%	12.1%	10.2%	11.1%	6.8%	5.9%	6.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Siedewasserreaktor	14.4%	11.6%	13.0%	10.9%	9.1%	10.0%	6.1%	5.3%	5.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fossile Energieträger	**3.3%**	**1.9%**	**2.6%**	**7.6%**	**2.0%**	**4.8%**	**12.3%**	**2.3%**	**7.4%**	**28.6%**	**2.5%**	**16.7%**	**22.4%**	**2.1%**	**12.7%**	**17.0%**	**2.0%**	**9.5%**	**11.0%**	**1.9%**	**6.3%**
Erdöl	0.4%	0.2%	0.3%	0.7%	0.2%	0.4%	0.9%	0.2%	0.5%	0.9%	0.1%	0.5%	0.9%	0.1%	0.5%	0.8%	0.1%	0.5%	0.7%	0.1%	0.4%
Erdgas	2.9%	1.6%	2.3%	4.0%	1.8%	2.9%	4.8%	2.1%	3.5%	5.4%	2.4%	4.0%	5.1%	2.0%	3.6%	5.0%	1.9%	3.4%	4.7%	1.7%	3.2%
Erdgas-Kombikraftwerke	0.0%	0.0%	0.0%	2.9%	0.0%	1.4%	6.6%	0.0%	3.4%	22.3%	0.0%	12.2%	16.4%	0.0%	8.5%	11.1%	0.0%	5.6%	5.6%	0.0%	2.7%
Steinkohle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Braunkohle	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Abfälle	**3.1%**	**2.5%**	**2.8%**	**3.6%**	**3.0%**	**3.3%**	**3.9%**	**3.3%**	**3.6%**	**3.9%**	**3.9%**	**3.9%**	**4.0%**	**3.6%**	**3.8%**	**4.0%**	**3.3%**	**3.7%**	**4.1%**	**3.1%**	**3.6%**
Nicht überprüfbare Energieträger	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Pumpenstrombedarf	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Importe	**14.0%**	**14.2%**	**14.1%**	**12.0%**	**12.2%**	**12.1%**	**12.2%**	**12.5%**	**12.3%**	**3.8%**	**3.9%**	**3.9%**	**1.9%**	**2.0%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Erneuerbare Energien																					
Wasserkraft																					
Laufwasserkraft																					
Speicherwasserkraft																					
Kleinwasserkraft																					
Andere erneuerbare Energien																					
Sonne																					
Wind																					
Holz																					
Biogas Landwirtschaft																					
Biogas Industrie																					
Biomasse KVA																					
Geothermie																					
Nicht erneuerbare Energien	**14.0%**	**14.2%**	**14.1%**	**12.0%**	**12.2%**	**12.1%**	**12.2%**	**12.5%**	**12.3%**	**3.8%**	**3.9%**	**3.9%**	**1.9%**	**2.0%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Kernenergie	**14.0%**	**14.2%**	**14.1%**	**12.0%**	**12.2%**	**12.1%**	**12.2%**	**12.5%**	**12.3%**	**3.8%**	**3.9%**	**3.9%**	**1.9%**	**2.0%**	**2.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**
Druckwasserreaktor	14.0%	14.2%	14.1%	12.0%	12.2%	12.1%	12.2%	12.5%	12.3%	3.8%	3.9%	3.9%	1.9%	2.0%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Siedewasserreaktor																					
Fossile Energieträger																					
Erdöl																					
Erdgas																					
Steinkohle																					
Braunkohle																					
Abfälle																					
Nicht überprüfbare Energieträger (EAM)																					
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**