

The relevance of energy storages for an autarky of electricity supply in Austria up to 2050

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by

Ao.Univ.Prof. Dipl.-Ing. Dr.techn. Reinhard Haas

Mag. (FH) Victoria Hala

Student ID: 0352433

Vienna, 28th of February 2012

Affidavit

I, **Mag. (FH) Victoria Hala**, hereby declare

1. that I am the sole author of the present Master Thesis, The relevance of energy storages for an autarky of electricity supply in Austria up to 2050, 62 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master Thesis as an examination paper in any form in Austria or abroad.

Vienna, _____

Date

Signature

Abstract

This Master Thesis raises the question, which storage capacity is needed for different scenarios to reach Electricity Autarky 2050 in Austria. The resulting objectives for the paper are to calculate storage demand on daily, monthly and yearly level, taking into account the typical supply curve of solar electricity. Furthermore, additional demand for hydro and other storages is assessed.

Pumped Hydroelectric Storage, Compressed Air Energy Storage and Hydrogen Storage are discussed by explaining their technology and comparing usual parameters. The main part of this paper compares derived values for electricity demand and supply for 2050 in two different scenarios, in order to finally calculate demand for energy storage in detail.

Findings show that the demand for energy storage amounts to 5.3 TWh per year in the Constant scenario and 7.2 TWh in the Growth scenario. During summer months (from April until September) electricity is fed into the storage and discharged during winter months (from October until March), whereas daily storage demand shifts from midday to morning and evening hours, as the increased share of solar electricity produces more electricity for the high demand during midday. The current storages in Austria provide 1.9 TWh electricity and are, therefore, insufficient to conserve enough electricity from summer to winter months. It can be concluded that for 100 % electricity from renewable energy carriers a long-term, a comprehensive concept for load management and load shifting is necessary, not only including Pumped Hydroelectric Energy Storage, but also other storage technologies like CAES and Hydrogen. With an increased share of electricity from REN, further development in the following areas can be attained: a strong electricity grid in Europe, Smart Grids that are able to converge demand and supply, and increasing diffusion of small storage units.

Table of contents

Affidavit.....	ii
Abstract.....	iii
List of tables.....	vi
List of figures	vi
Acronyms	vii
1 Introduction.....	1
1.1 Motivation.....	2
1.2 Core objectives.....	3
1.3 Structure of work.....	4
1.4 Basic assumptions and main literature	5
2 Description of method of approach applied.....	7
3 Electricity Grid.....	9
3.1 Balanced Management of Renewable Energy.....	9
3.2 Demand and Supply	10
3.2.1 Demand Side	10
3.2.2 Supply Side	14
4 Energy Storage.....	15
4.1 Storage demand.....	16
4.1.1 Long-Term or Seasonal Storage.....	16
4.1.2 Daily and Weekly Storage	16
4.2 Evaluation Criteria	17
4.3 Storage Technologies	18

4.4	Pumped Hydroelectric Storage	19
4.4.1	Technical description.....	19
4.4.2	Key figures	20
4.4.3	Advantages/Disadvantages	22
4.4.4	Pumped Hydroelectric Storage in Austria	22
4.5	Hydrogen Storage.....	25
4.5.1	Technical description.....	25
4.5.2	Key figures	30
4.5.3	SWOT Analysis.....	32
4.6	Compressed Air Energy Storage (CAES).....	33
4.6.1	Technical description.....	33
4.6.2	Key figures	36
4.6.3	Advantages/Disadvantages	37
4.7	Energy storage of pressurized gas.....	38
4.8	Comparison of key figures.....	40
5	Derived electricity demand & supply 2050 in Austria.....	41
5.1	Annual values.....	43
5.2	Derived storage demand	45
5.3	Daily values	49
5.4	Derived daily storage demand.....	52
6	Conclusions.....	55
7	Acknowledgements.....	59
8	References.....	60
	Appendix	63

List of tables

Table 4.1: Requirements for electrical storage systems for different purposes (Neupert, 2009)	16
Table 4.2: Main Pumped Hydroelectric Storage Power Plants in Austria (Part I)	23
Table 4.3: Main Pumped Hydroelectric Storage Power Plants in Austria (Part II)	24
Table 4.4: Comparison of Hydrogen Storage alternatives (Züttel, 2008)	30
Table 4.5: SWOT Analysis for H ₂ production from RES (Lymberopoulos, 2007; Alamri, 2009)	32
Table 4.6: Comparison of storage technologies	40
Table 5.1: Annual storage demand 2050 – Constant scenario	47
Table 5.2: Annual storage demand 2050 – Growth scenario	48
Table 5.3: Daily storage demand 2050 – Constant scenario	54
Table 5.4: Daily storage demand 2050 – Growth scenario	54

List of figures

Figure 3.1: Daily electricity demand in Austria, 2010 (e-control, 2010)	11
Figure 3.2: Weekly electricity demand in Austria, 2010 (e-control, 2010)	12
Figure 3.3: Annual electricity demand in Austria, 2010 (e-control, 2010)	13
Figure 3.4: Total electricity supply Austria, 2010 (e-control, 2010)	14
Figure 4.1: Schematic illustration of a pumped-hydro system (Quaschnig, 2009)	19
Figure 5.1: Hofmann Voltameter (schematic illustration from author)	26
Figure 5.2: Schematic illustration of a hydrogen fuel cell	28
Figure 5.3: Layout of Compressed Air Energy Storage (CAES) unit (Daneschi, 2010)	34
Figure 6.1: Annual electricity demand 2050, Constant scenario	44
Figure 6.2: Annual electricity demand 2050, Growth scenario	44
Figure 6.3: Daily comparison of demand and supply for the year 2050: December, March, July, October – Constant scenario	50
Figure 6.4: Daily comparison of demand and supply for the year 2050: December, March, July, October – Growth scenario	51
Figure 7.1: Electricity supply in Austria 2010 (e-control)	57

Acronyms

AC	_____	Alternating current
AHP	_____	Analytic Hierarchy Process
CAES	_____	Compressed Air Energy Storage
DC	_____	Direct current
J (kJ, MJ, GJ)	_____	Joule (Kilo-, Mega-, Gigajoule)
MCFC	_____	Molten carbonate fuel cells
PAFC	_____	Phosphoric acid fuel cells
PEM	_____	Proton Exchange Membrane Hydrogen Fuel cells
PV	_____	Photovoltaic
PV-GIS	_____	Photovoltaic Geographical Information System
Q_{Dd}	_____	Daily electricity demand
Q_{Dh}	_____	Hourly electricity demand
Q_{Dm}	_____	Monthly electricity demand
Q_{EleCHP}	_____	Electricity production from combined heat and power
Q_{Elegeo}	_____	Geothermal electricity production
Q_{ElePV}	_____	Electricity production from Photovoltaic
$Q_{EleRun-off}$	_____	Electricity production from Run-off river Hydropower
$Q_{ElestoredHP}$	_____	Electricity production from stored hydropower
$Q_{Elewind}$	_____	Electricity production from windpower
Q_{RES-Ed}	_____	Quantity of electricity daily produced by renewable energy carriers
Q_{RES-Eh}	_____	Quantity of electricity hourly produced by renewable energy carriers
Q_{RES-Em}	_____	Quantity of electricity monthly produced by renewable energy carriers
$Q_{STO-Ain}$	_____	Quantity of electricity fed into annual storage plants
$Q_{STO-Aout}$	_____	Quantity of electricity supplied from annual energy storage
$Q_{STO-Din}$	_____	Quantity of electricity fed into daily storage plants
$Q_{STO-Dout}$	_____	Quantity of electricity supplied from daily energy storage
$Q_{STO-Hout}$	_____	Hourly electricity demand from daily energy storage
RES	_____	Renewable Energy Resources
s	_____	second
SOFC	_____	Solid oxide fuel cells
SPE	_____	Solid-polymer Electrolysis
TACAS	_____	Thermal And Compressed-Air Storage
W (kW, MW, GW, TW)	_____	Watt (Kilo-, Mega-, Giga-, Terawatt)
Wh (kWh, MWh, GWh, TWh)	_____	Watt-hours (Kilo-, Mega-, Giga-, Terawatt-hours)

1 Introduction

The steady increase in consumption of fossil fuels, which are becoming scarcer at the same time is a major reason for global warming, air pollution and political instabilities. To cope with these problems, Renewable Energy Ressources can constitute a clean alternative for producing electricity. These ressources can be classified into two major groups. The controllable (like biomass, hydrualic electric plants) can easily be integrated, as they use conventional technologies. Non-controllable (mainly wind and solar) can cause problems such as haramonics, flicker, voltage dip, over voltage and phenomeons like islanding. Storage systems, in this context, can act as power regulator, as the intermitten and unpredictable sources would consequently lead to power quality and reliability issues. (Goyena, 2009)

Energy storage is defined as the conversion of electric energy into a form in which it can be stored until converted back to electrical energy. (Nigim, 2009) With the input of energy or energy carriers, the energy content of energy storage increases (charge). Afterwards it stores the energy content without many losses over a certain amount of time to supply energy or energy carriers whenever there is demand for it, leading to a decreasing energy content within the energy storage (discharge). When fully charged, the storage contains the maximum energy content, when completely discharged, the usable energy or mass of the energy carrier is zero. (Rummich, 2009)

Electricity supply has to be matched to the consumption, regardless how it changes. Reserve capacity or storage systems can be used to guarantee reliable supply. In this context a large distribution network (grid) as well can handle efficiently the fluctuation of demand for short interruption events. But storage systems are not only used to balance fluctuations, peak demand during noon and afternoon can also be covered by such plants. Peak demand lasts for a few minutes to a couple of hours in the day. (Nigim, 2009)

Energy storage plants not only act as power generator but also as consumer within the electricity system, depending on whether there is a lack or oversupply in electricity production. According to that fact, storags systems provide electricity

security, optimise the grid infrastructure and reduce the level of required investment for cost-intensive reserve capacity. (Taylor, 2010)

Due to the mountainous geological structure, Austria has the advantage of having good potentials for Pumped Hydroelectric Power plants. Two-thirds of the total estimated potential is currently developed. Pumped Hydroelectric Power plants are only one technology to conserve energy for later. Other energy storage systems are ultracapacitors, superconducting magnetic storage systems, flywheels, batteries, compressed air, fuel cells and flow batteries.

This paper focuses on the variable electricity production of solar power and evaluates which amount of energy storage is necessary to realise two different scenarios for Electricity Autarky in 2050 in Austria. Consequently it is of interest, which share of electricity can be stored, regarding current storage capacities. How much capacity can be extended? What are alternative storage technologies to Pumped Hydroelectric Storage.

1.1 Motivation

In December 2010 the study Energie Autarkie 2050 für Österreich, commissioned by Klima & Energie Fonds, was published. The study sets up several scenarios and delivers possible solutions, how electricity demand in 2050 could be served with 100 % renewable energy carriers. Thus, storage options, political measurements required and detailed assessment of smart grids are some of the themes that are not discussed in detail and are available for further assessment. This Master Thesis deals with the assessment and evaluation of storage technologies and should be a useful and valuable contribution within the discussion on electricity autarky for Austria 2050.

1.2 Core objectives

Basis for the above-mentioned assessment of the topic energy storage for Electricity Autarky 2050 in Austria are the following objectives and questions:

The objectives to obtain adequate results of this Master Thesis are to ...

- ... calculate storage demand on daily, monthly and yearly level, taking into account the typical supply curve of solar electricity.
- ... analyse additional demand for hydro and other storages.

Following scientific questions constitute the framework for the Master Thesis:

Core question

- Which storage capacity is needed for different scenarios to reach Electricity Autarky 2050 in Austria?

Questions of second order

- What are current storage technologies for electricity and what is their status of maturity?
- How much storage-capacity is needed, when the supply curve changes due to solar irradiation, to enable different Electricity Autarky scenarios in Austria in 2050?
- How much storage capacity can be gained through upgrading of existing electricity storage plants?
- How much electricity storage capacity has to be constructed additionally?
- How does the electricity demand from storage plants change during the course of the day?

1.3 Structure of work

This paper is structured into six chapters, acknowledgements, references and appendix.

Chapter one, "Introduction", serves as general introduction into the topic. Objectives and scientific questions are raised and the relevance of the theme is discussed. *Chapter two, "Method of approach",* describes the chosen method in details and how the author proceeds in order to gain significant results. *Chapter three, "Electricity grid"* explains the electricity grid, balanced management as well as typical patterns of demand and supply curves. *Chapter four, "Energy storage",* discusses energy storage in detail. What is the use of energy storage, why is it necessary to have energy storage, which types of storages exist and for what purpose are they used, are examples of questions that are answered within this chapter. Terms such as long-term storage, seasonal storage, daily and weekly storage are explained. Finally the storage technologies Pumped Hydroelectric Storage, Compressed Air Energy Storage and Hydrogen Storage are introduced. *Chapter five, "Derived electricity demand & supply 2050 in Austria",* analyses the results of the author's calculations. The derived demand values for 2050 are compared with the given electricity supply data in 2050, refined with radiation data for Austria. This chapter furthermore discusses the derived storage demand and explains it in detail. It also deals with questions of lack in supply or demand as well as oversupply or overdemand. *Chapter six, "Conclusions",* summarizes the main findings of this Master Thesis and gives food for thought for further research on this and related topics. All detailed calculations, tables and graphs can be found in the *Appendix*.

1.4 Basic assumptions and main literature

Several basic assumptions are underlying the feasibility study „Energy Autarky for Austria 2050“ and therefore are also the basis for this Master Thesis. The most important in regards of RES-E supply 2050 are summerised below:

- Austria will have to store electricity seasonally for other EU-countries in the future, and will only be able to source out storage to foreign countries on a temporary basis. In this paper it is assumed that Austria only has to store electricity for its own purpose and does not have to provide further storage capacities for foreign storage demand. (Streicher, 2010)
- The assessment of storage demand underlies a systemic view. Therefore, economic externalities like fluctuating market prices due to changes in demand are not included into the analysis.
- It is assumed that demand curves can be 20 % better adjusted to the supply curves with more widespread installed Smart-Grids.
- Energy exchange with neighbouring EU-countries is accepted on a daily and weekly basis. Given that the yearly average of import and export is zero.
- Only idle agricultural excess area is considered usable for renewable energy. It is assumed that the area necessary for food production remains constant. This assumption could be unrealistic if population grows or cultivation changes.
- It is assumed that technologies like smart metering and smart grids will reduce transmission losses and net instabilities. Losses due to distribution and storage, which on an average represent 10% of total losses, are already included. (Taking into consideration that roof-mounted PV plants will have lower losses than windparks with longer distribution).

- This Thesis is a theoretic analysis, assuming that the plants are storing the electricity from summer to winter months, excluding economic effects; therefore, the assessment of the current capacity of Pumped Hydroelectric Storage Plants in Austria is based on the energy content of the storage basins.
- The comparison and assessment of the storage technologies does not include costs, as there would be too much room for interpretation until the year 2050.

Main sources

Citations and calculations of current electricity demand are based on data provided by e-control Data for electricity demand and energy mix on the supply side for 2050 are used from the feasibility study Energie Autarkie 2050. Radiation data for the calculation of electricity from PV are taken from PV-GIS¹. All other sources are quoted below the citation.

¹ <http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php#>, 25.01.2012

2 Description of method of approach applied

The applied method for this Master Thesis can be described in five steps, as follows.

1. Criteria for assessment of storage technologies

At the beginning, several criteria are raised which are commonly used to assess different storage technologies.

2. Description and assessment of storage technologies

In the second step, the storage technologies (Pumped Hydroelectric Storage, Compressed Air Energy Storage, Hydrogen Storage) are compared, using criteria raised (see chapter 4.2 Evaluation Criteria).

3. Comparison Demand Side/Supply Side

Demand side

In the third step, load curves for the constant and the Growth scenario for the electricity demand in 2050 are calculated. For this calculation e-control data for the year 2010 are used and allocated to 2050 values from the feasibility study Energie Autarkie 2050. The result is annual, monthly, and daily data on electricity demand for 2050 and corresponding load curves.

Supply Side

The feasibility study Energie Autarkie 2050 provides annual and monthly values of the electricity mix for both scenarios, Constant and Growth. These values are insufficient for comparison of demand and supply on a daily basis. Therefore, daily data are based on average values, except the electricity for photovoltaic.

As electricity supply from photovoltaic varies between summer and winter as well as during day and night, it is necessary to calculate the precise curves of electricity production from this energy carrier as it has a high impact on the storage demand during the course of a year and of a day. Due to the fact that no detailed daily electricity supply curves for photovoltaic are provided by the feasibility study, these values have to be calculated by the author within the

following procedure: Daily radiation data from the PV-GIS² (calculated as average for Austria from the easternmost, westernmost, northernmost and southernmost point in Austria) are multiplied with the given average efficiency of the modules and multiplied with the given data on used area for PV from the feasibility study.

4. Comparison

In the fourth step, the demand and supply curves are compared to derive daily and annual storage demand.

5. Final assessment

The last step compares the capacity for 2050 of Pumped Hydroelectric Storage with the total demand of electricity storage, to define how much storage capacity has to be gained additionally.

² <http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php#>, 25.01.2012

3 Electricity Grid

The electricity grid is divided into four different voltage levels. The high voltage grid with 220 kV and 380 kV is used to transport electricity within the country as well as within the European interconnection of electricity produced in large power plants. In switchyards, the high voltage mentioned is reduced to 110 kV, which is transported to large industrial enterprises as well as other switchyards, where voltage again is reduced to 20 kV or 10 kV. Through the medium-voltage power grid electricity is then transported through cities, villages and other industrial enterprises. With another reduction to 400/230 V electricity can finally be transported through a low-voltage power grid to households and smaller enterprises. (Neupert, 2009)

3.1 Balanced Management of Renewable Energy

In general, energy consumption and production, primarily from PV and wind, in Central European countries does not progress linearly, as the highest energy consumption occurs during winter months when PV contributes less to the electricity production. Furthermore, a higher amount of REN leads to a stronger delocalized production over the territory. Therefore, the grid has to be well-balanced. To overcome these problems one strategy would be *load shifting*, i.e. energy needs are shifted from times when overall demand is large to periods in which other needs are reduced. Smart Grids, in this context, will be of high importance in the future. *Load management*, in contrast, means to constantly adjust the combination of actual energy production and stored energy to current energy and power requirements. In general, no more than 20 % of intermittent energy can be connected to the grid without disturbing the grid operability. As the electricity grid does not have any storage capacity, the consequence of an increased share of REN is the need to balance electricity production and demand with the help of storage technologies to avoid any interference, which can occur on the demand side (e.g. less demand during night or on weekends) as well as on the supply side (e.g. wind conditions for wind energy, breakdown of plants). Generally the electricity system should be well designed, as on one hand the storage of energy is accompanied with high investment

costs, and losses also cause high costs. On the other hand over capacity of RES is very expensive. With energy storage technologies electrical energy can be conserved when it is available and inexpensive and be supplied when the demand and prices are higher.³ (Neupert, 2009; Huggins, 2010; Edison, 2011; Fechner, 2007)

3.2 Demand and Supply

Electricity demand and supply follow different curves, dependent on the ability to produce electricity and on times when electricity is needed.

3.2.1 Demand Side

Electrical load varies significantly with location, time of the day and time of the year due to e.g. lighting, air conditioning, cooking appliances or electric water heaters. Additionally, electricity demand varies between workdays and weekends. Figure 3.1 shows an example of the time dependence of the daily electrical power demand in Austria, whereas Figure 3.3 shows the typical pattern of annual energy use. (Huggins, 2010; Edison, 2011)

³ http://www.eurosolar.org/new/pdfs_neu/Main/IRES2006_Bossel.pdf, 01.10.1011

As can be seen in Figure 3.1, the daily electricity demand reaches its lowest point at around 4.00 am, increasing dramatically afterwards to reach its peak at 12.00 noon. Afterwards the demand decreases again, staying relatively constant from 4.00 pm to 8.00 pm and decreasing constantly until 4.00 am the next day.

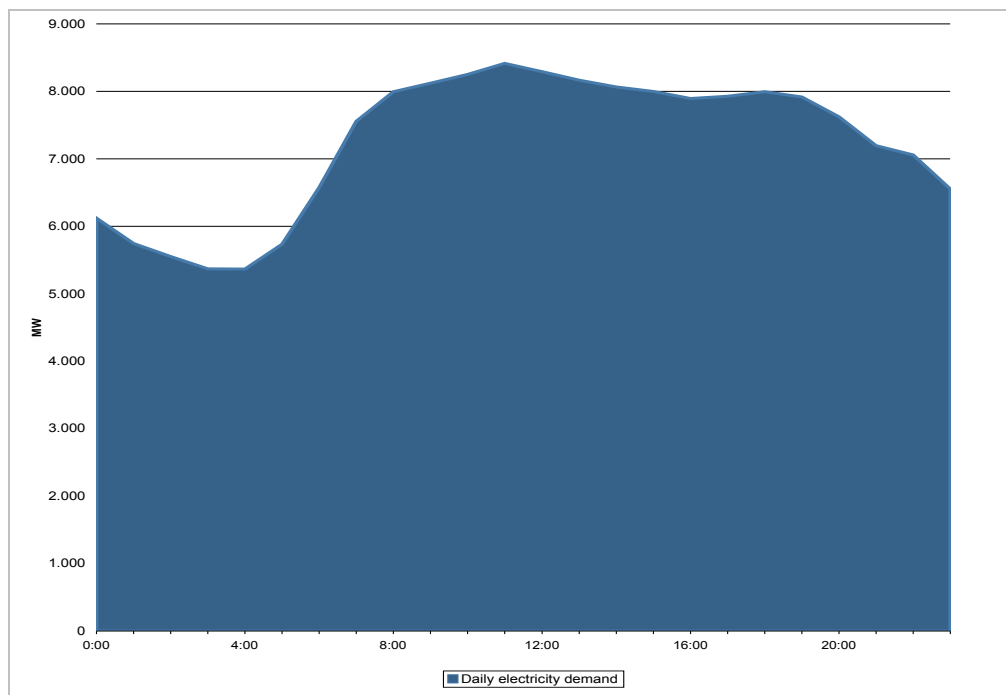


Figure 3.1: Daily electricity demand in Austria, 2010 (e-control, 2010)

Figure 3.2 shows that during the week the electricity demand remains relatively constant from Monday until Friday and decreases during the weekend. This phenomenon can be explained by the fact that the electricity demand is higher during a usual working week in Austria. Furthermore, all shops are closed in Austria on Sundays leading to an onward decrease.

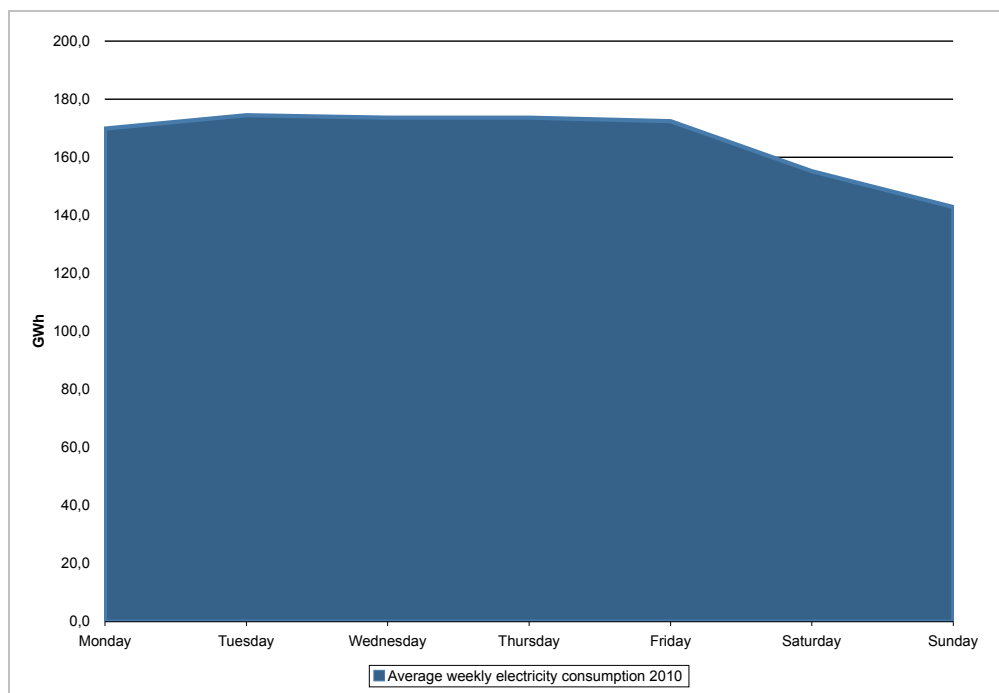


Figure 3.2: Weekly electricity demand in Austria, 2010 (e-control, 2010)

Regarding the electricity demand during the course of the year, Figure 3.3 shows that consumption is higher in winter than in summer. This can be explained due to lower temperatures and less sunny hours, resulting in a higher demand for electric lightening throughout the day.

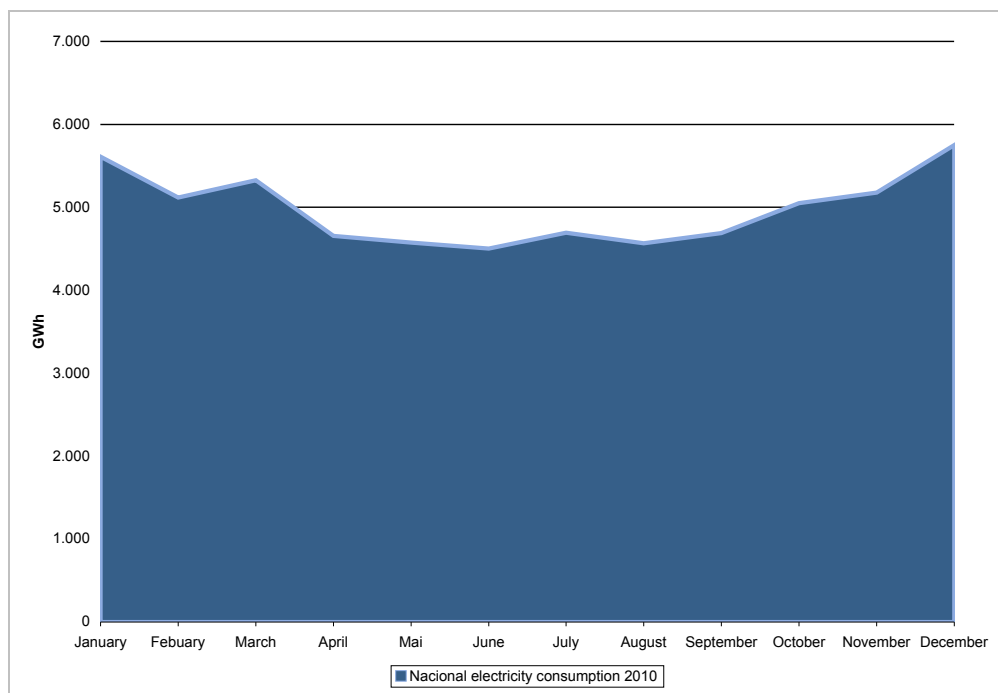


Figure 3.3: Annual electricity demand in Austria, 2010 (e-control, 2010)

These variations during time and in magnitude are almost always present and constitute a serious challenge for electric utility firms that supply and manage the transmission and distribution electric power grid. To hold the load level typically different technologies exist. *Operating reserves* are available to the system operator within a modest amount of time. Two different types exist: The *spinning reserve* can be made available by relatively simple modifications, e.g. with the operation of major turbines. *Supplemental or non-spinning reserve* name capacity, which is currently not connected to the system but can be brought online after a short delay (around 10 minutes). It includes fast-start generators or importing power from other interconnected power systems. (Huggins, 2010)

3.2.2 Supply Side

Which storage power plant is used to provide electricity depends on the purpose and the lifetime of the plant. In this context, the electricity production is differentiated to serve a certain demand: Base load, intermediate load or peak load. *Base load* covers a certain demand, which is independent from fluctuations and therefore produces continuously, almost 24 hours a day. This usually amounts to 30 – 50 % load of installed capacity. Base load is mainly covered by hydropower in Austria. *Intermediate load* covers demand above base load, which varies partly. Therefore, the produced electricity from intermediate load has to be adjusted up to a certain amount. 20 – 30 % of load of installed capacity amounts to this part. A sudden increase in demand above that is served by *peak load* plants, which have to deliver electricity very fast (10 – 20 %). The remaining 10 – 20 % are *reserve load*. (Neupert, 2009; Edison, 2011)

Each country has a specific energy mix. As can be seen in the figure below, the biggest part of electricity supply in Austria comes from hydropower, followed by fossil fuels. In total, renewable energy carriers including hydropower and biogenic energy carriers constitute to around 60 % of Austria's electricity supply.

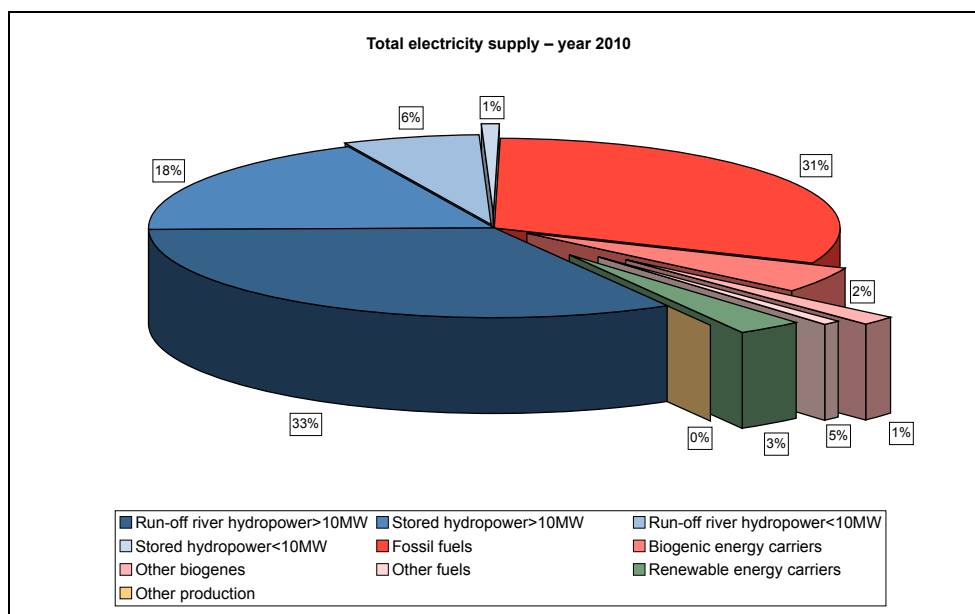


Figure 3.4: Total electricity supply Austria, 2010 (e-control, 2010)

4 Energy Storage

At present, the availability of intermittent renewable energy sources like solar and wind is well below conventional central power generation. The availability of wind energy is estimated at around 15 – 30 % and that of Photovoltaic at around 60 % (to match the peak load). Therefore, these renewable sources currently have to be supported with other utility generation resources. To increase the share of renewable energy, utilities need to have costly reserve capacity online. To overcome this problem, energy storage technologies can help to increase the availability of the renewable source dramatically and make this energy dispatchable when needed. (Nasiri, 2008)

Integrating energy storage with renewables has many advantages (Nasiri, 2008; Rummich, 2009; Alamri, 2009):

- Shifting the peak demand using charging and discharging schemes.
- Storing renewable energy as well as lower cost utility energy during weekends and holidays.
- Creating operator controlled load/generation by combining load, renewable generation and energy storage.
- Improved reliability and power quality for consumers.
- Mitigating renewable energy intermittency.
- Lowering the power generation and capacity cost by displacing the expensive peaking power plants and reserve capacity.
- Lowering the transmission and distribution costs by increasing the confidence in renewable distributed generation.
- Lowering emission by peaking and reserve units.
- Helping to reduce power flickers, harmonics and improve voltage stability.
- Better balancing of load or peak loads
- More efficient use of renewable energy
- Maximization of renewable energy contribution
- Better demand and generation match
- Reducing the cost in building new transmission assets
- Usage of power systems in more efficient way

4.1 Storage demand

Energy storage options are commonly split up into daily, weekly and annual balancing. For each technology, different requirements have to be taken into account (see also Table 4.1). Reserve power, for example, not only has to be accessible very fast but also has to be able to deal with a high amount of storage cycles. Uninterruptible power supply needs to have low losses. Daily, weekly and yearly storage need to have high energy content – in regard to dimensioning this means, that as longer the time frame, as higher the energy content has to be. In addition to a longer timeframe, the self-discharging rate should be lower. (Neupert, 2009)

	Reserve Power	Uninterruptible Power	Daily Storage	Weekly Storage	Yearly Storage
Fast access time	++	++	-	-	-
High energy content	-	-	+	+	++
High energy density	-	-	-	-	+
Low self-discharge rate	-	+	-	+	++
Long calendrical life-time	-	+	+	+	+
Long lifecycle	+	-	+	+	-
Typical operating time	10 s	10 min	10 min – 1 day	1 – 7 days	1 week – 1 year
++ very important + important - less important					

Table 4.1: Requirements for electrical storage systems for different purposes (Neupert, 2009)

4.1.1 Long-Term or Seasonal Storage

Seasonal Storage involves mainly large installations like reservoirs and dams that accumulate water primarily during the rainy (or snowy) season. By passing water through large turbines, electricity can be produced. (Huggins, 2010)

4.1.2 Daily and Weekly Storage

Energy from sources that produce on a daily cycle like solar, wind or tidal energy needs to be temporarily stored when not needed to be available later. These sources can be affected by changes in weather and therefore vary over the year. (Huggins, 2010)

4.2 Evaluation Criteria

Following criteria can be used to assess storage technologies (Neupert, 2009):

Rated power (W)

Rated power describes the maximum available energy per unit of time.

Energy content of the system (Wh)

Theoretical energy content in Joule or Watt hours does not include losses due to technical execution, which are considered within the practical energy content. Furthermore, the dischargeable energy content accounts for energy, which has to stay in the storage to secure functionality.

Energy density (kWh/l or kWh/kg or kWh/m³)

Energy density describes the usable energy content related to mass or volume. It can refer to the system or only to the storage.

Self-discharge rate/losses

Losses can occur during loading and unloading or time-dependent as self-discharge rates expressed in percentage per time interval.

Availability/Response time

The availability of a system describes the timeframe within it is possible to produce 50 % of the power.

Efficiency

To evaluate the efficiency of energy storage technologies the whole system including conversion steps has to be considered. Useful energy from a storage system is the result of renewable energy input minus operational energy minus energy losses

4.3 Storage Technologies

Several types of energy storage provide different characteristics like energy and power density, efficiency, cost, lifetime and response time. Examples of energy storage systems are ultracapacitors, superconducting magnetic storage systems, flywheel, batteries, compressed air, pumped hydro, fuel cells and flow batteries. Some of these technologies are proper to deal with transient and short-term issues like power quality, frequent moment-to-moment charges and discharges, as they have a quick response time and high power density. Suitable for this purpose are for example ultracapacitors and superconducting magnetic energy storage systems. In contrast, compressed air, hydrogen or Pumped Hydroelectric Storage systems are useful for high energy, long-term applications, as well as for daily or periodic uses like alleviating grid congestion, energy management and frequency regulation. As this Master Thesis focuses on large-scale and longer-term storage, the last-mentioned technologies are further assessed in this paper. (Nasiri, 2008; O-Malley, 2009)

4.4 Pumped Hydroelectric Storage

In general, hydropower is most useful to cover the base load and to store excess electricity (e.g. from wind energy). It is used in load management and when there is no need for very quick response. Pumped Hydroelectric Storage is the most common technology to store electricity. (Neupert, 2009; Alamri, 2009) The current potential for Pumped Hydroelectric Storage is 7.000 MW in Austria. Due to a study of Booz & Company, it can be increased by around 60 % or 4.300 MW until the year 2020.⁴

4.4.1 Technical description

Pumped Hydroelectric Storage can either be natural or artificially constructed. It can include underground caverns, old mine shafts, volumes formerly occupied by oil or newly excavated volume. Electricity is produced when water runs from the upper basin to the lower through turbines. At times, when there is over-supply usually during night, electricity prices are lower and water can be pumped up to the storage area at the higher level, recharging the system. In some cases so-called two-way turbines are used for such installations. (Rummich, 2009; Edison, 2011) A schematic illustration can be seen in Figure 4.1.

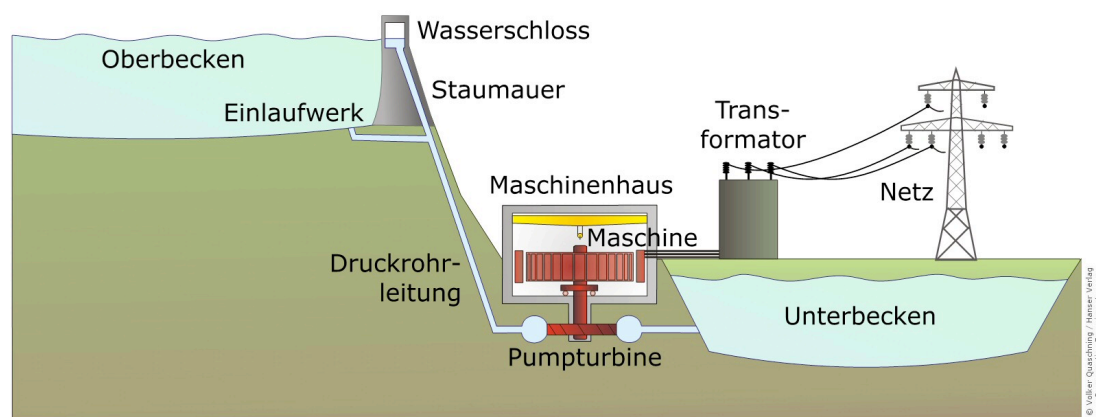


Figure 4.1: Schematic illustration of a pumped-hydro system (Quaschnig, 2009)

⁴ <http://relevant.at/wirtschaft/energie/154528/pumpspeicher-kws-oesterreich-gruene-batterie.story>, 17.01.2012

A disadvantage of Pumped Hydroelectric Storage is that it is dependent from topographic circumstances to have enough head. This means, that the location is currently restricted to mountainous regions, where many countries do not have much potential left. Therefore the main focus nowadays is to improve existing plants. In the future, plants with the lower reservoir underground could be constructed (e.g. from caves, former mines or artificial holes). The upper reservoir could be a natural or artificial lake. With this technology, the landscape would not be that drastically changed and the storage plant could be built more closely to the place, where the electricity is produced or consumed. Furthermore, the need for transmission, which can cause losses, would be decreased. At the moment investment costs for such storage plants are very high – thus is not likely that such plants are realized within the next ten years. (Neupert, 2009)

Pumped Hydroelectric Storage is useful for daily peak shaving, load levelling and for weekly and seasonal variations in the energy demand. Electricity is available very fast, which is one major advantage of this system. The full power of the plant is available only after about one minute and it only takes several minutes to get pumping into operation. Furthermore, power can be adjusted flexible to the demand. Pumped hydro is available at almost any scale with discharge times ranging from several hours to a few days. (Huggins, 2010; Neupert, 2009)

4.4.2 Key figures

Rated power

The rated power from Pumped Hydroelectric Storage ranges from 20 – 2100 MW. (Alamri, 2009) The power of such plants in Austria currently ranges up to 750 MW.

Energy content of the storage

The stored energy of Pumped Hydroelectric Storage is proportional to the volume of the higher reservoir and the head. In Austria head is between 340 m and 1250 m^{5,6,7}. Equation (1) and Equation (2) show how energy content and power can be calculated

⁵ <http://www.verbund.com/cc/de/ueber-uns/unsere-kraftwerke/kraftwerkstypen/pumpspeicherkraftwerk>, 07.10.2011

$$(1) \quad E = V \cdot \rho \cdot g \cdot h_p \cdot \eta_{RTG}$$

$$(2) \quad P = Q \cdot \rho \cdot g \cdot h_p \cdot \eta_{RTG}$$

Variables: Volume (V), density of water ($\rho \approx 1,000 \text{ kg/m}^3$), normal acceleration of free fall ($g = 9.81 \text{ m/s}^2$), potential energy head (h_p), efficiency of pipes, turbines, generators at discharging (η_{RTG}), discharge (Q) (Quaschnig, 2009)

Energy density (kWh/l oder kWh/kg oder kWh/m³)

The energy density – up to 1 kWh/m^3 – is in general relatively low. (Neupert, 2009)

Self-discharge/losses

Losses come from water evaporation from the reservoirs, leakage around the turbine and losses due to friction of the moving water. (Huggins, 2010; Edison, 2011)

Availability

Pumped Hydroelectric Storage plants can be available within a timeframe of 98 seconds, for example at the power plant Goldisthal. (Quaschnig, 2009)

Efficiency

The efficiency of Pumped Hydroelectric Storage is typically between 70 – 80 %. Losses come from water evaporation from the reservoirs, leakage around the turbine and losses due to friction of the moving water. (Huggins, 2010; Edison, 2011)

⁶ <http://www.tiroler-wasserkraft.at/de/hn/stromerzeugung/kraftwerkspark/index.php>, 07.10.2011

⁷ <http://www.illwerke.at/inhalt/at/189.htm>, 07.10.2011

4.4.3 Advantages/Disadvantages

- + Huge energy and large power capacity (over 2000 MW)
 - + Very effective storage technology
 - + Ability to store energy for a very long time (up to more than six months)
 - + Electricity is available very fast
 - + Power can be adjusted flexible to the demand
 - + Available at almost any scale
-
- Pumped hydro requires a high construction cost. The capital cost is estimated to be \$ 1000/kW.
 - It should be located in a suitable location with specific geographic, geologic and environmental topography.
 - Long-lead times and national political procedures are required.

(Alamri, 2009)

4.4.4 Pumped Hydroelectric Storage in Austria

Austria's largest Pumped Hydroelectric Storage plants are mainly situated in the western region of Austria, where the mountainous landscape constitutes perfect preconditions for this type of plant. The power ranges from around 100 MW until 750 MW and the capacity of the storage lakes ranges from 2 GWh to 520 GWh. Two thirds of the total potential is already developed, upgrading and extension is constantly going on.⁸ Table 4.3 summarizes the main figures of the plants.

⁸ <http://www.verbund.com/at/de/haushalte/verbund-hilft-fragen-antworten/wasserkraft-atomstrom-oekostrom>, 23.01.2012

Utility	Plant	Power (Turbine) ⁹	Storage basins	Energy Content	Notes
Verbund	Kaprun- Oberstufe, Limberg II	124 MW, 480 MW	Mooserboden (upper) Wasserfall- boden (lower)	70 GWh ¹⁰	
Verbund	Kaprun- Hauptstufe		Wasserfall- boden	160 GWh ¹¹	
Austrian Hydro Power (Verbund)	Roßhag	341 MW	Schlegeis (upper) Stillupp (lower)	186 GWh ¹¹	
Austrian Hydro Power (Verbund)	Häusling	360 MW	Zillergründl (upper) Stillupp (lower)	147 GWh ¹¹	
Austrian Hydro Power (Verbund)	Mayrhofen		Stillupp	7 GWh ¹¹ (only Stillupp) 97 GWh¹¹ (total from Zillergründl) 142 GWh¹¹ (total from Schlegeis)	
Verbund	Malta Oberstufe	120 MW	Kölnbrein (upper) Galgenbichl + Gößkar (lower)	58 GWh ¹¹	
Verbund	Malta Hauptstufe	730 MW	Galgenbichl + Gößkar (upper) Rottau (lower)	16 GWh ¹¹ (only Galgenbichl) 520 GWh¹¹ (total from Kölnbrein)	
Verbund	Reißeck II	430 MW	Großer Mühldorfer See (upper)		under construction
Tiwag	Sellrain-Silz	500 MW	Finstertal Längental	231 GWh ¹¹ 9 GWh ¹²	
Tiwag	Sellrain-Silz	130 MW	Kühtai	90 GWh ¹³	planned extension

Table 4.2: Main Pumped Hydroelectric Storage Power Plants in Austria (Part I)

⁹ <http://www.wirtschaftsblatt.at/home/schwerpunkt/greeneconomy/oesterreich-baut-pumpspeicherkraftwerke-aus-478387/index.do>, 17.01.2012

¹⁰ Data from Verbund (see also in Appendix)

¹¹ http://www.tiroler-wasserkraft.at/de/hn/oeffentlichkeitsarbeit/aktuelle_meldungen/news/data/03569/index.php, 17.01.2012

¹² Personal information from Tiwag

¹³ Personal information from Tiwag

Utility	Plant	Power (Turbine) ¹⁴	Storage basins	Energy Content	Notes
Verbund	Limberg III	480 MW	Mooserboden	–	extension, approval stage
Illwerke	Kopswerk II	450 MW	Kopssee	127 GWh ¹⁵	
Illwerke	Rodundwerk	276 MW	Latschau	2 GWh ¹⁶	
Verbund	Sum small storage plants			41 GWh ¹¹	
Sum				1,880 GWh	

Table 4.3: Main Pumped Hydroelectric Storage Power Plants in Austria (Part II)

¹⁴ <http://www.wirtschaftsblatt.at/home/schwerpunkt/greeneconomy/oesterreich-baut-pumpspeicherkraftwerke-aus-478387/index.do>, 17.01.2012

¹⁵ http://www.kopswerk2.at/downloads/090505_Vorstand_OK_KOWII_Prospekt.pdf, 17.01.2012

¹⁶ Personal information from Illwerke

4.5 Hydrogen Storage

In 2011, the worldwide first Wind-Hydrogen hybrid power plant started, which produces hydrogen when electricity demand is low. Enertrag has constructed the plant, which is located in Prenzlau, Germany. Hydrogen is then either sold as fuel or it is mixed with biogas to produce electricity with a gas turbine. Another project in Germany, HyWindBalance, analyzes the functionality of hydrogen production from excess electricity and reconversion by hydrogen fuel cells.^{17,18} In Fusina, Italy, the first hydrogen power plant was taken into operation in 2010. The plant uses hydrogen, which is a waste product of a nearby chemical plant and produces electricity through a gas turbine.¹⁹

4.5.1 Technical description

Hydrogen can be produced from natural gas, oil, coal or water. Hydrogen in the context of this paper is considered as storage medium for REN, which excludes fossil fuels for the assessment of hydrogen production. Only a small amount of the hydrogen production (3 % worldwide) is produced via water electrolysis, which has the advantage of not producing CO₂. Furthermore, it can be produced in smaller units, for example at places where it is used or where excess electricity is produced. (Wittstadt, 2008; Huggins, 2010)

Water electrolysis

Hydrogen can be produced through several procedures. The most interesting in regard to electricity storage is the electrolytic production of hydrogen. In water a voltage between two electrodes is imposed which exceeds the thermodynamic stability range. The result is the evolution of hydrogen gas at the negative electrode and oxygen gas at the positive electrode (see figure Figure 4.2 and equations below). Both gases are stored separately to be available fast, if electricity is produced from fuel cells.

¹⁷ <https://www.enertrag.com/projektentwicklung/hybridkraftwerk.html#>, 17.01.2012

¹⁸ <http://derstandard.at/1319181179212/Deutschland-Weltweit-erstes-Wind-Wasserstoff-Hybridkraftwerk-gestartet>, 17.01.2012

¹⁹ <http://www.kraftwerkforschung.info/weltweit-erstes-wasserstoffkraftwerk-in-betrieb/>, 17.01.2012

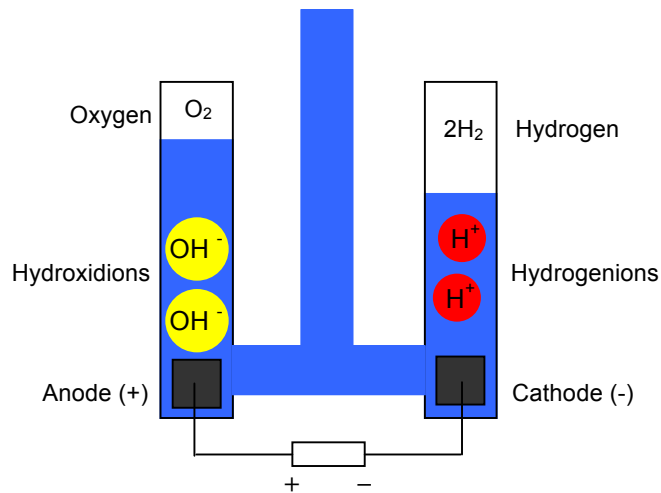
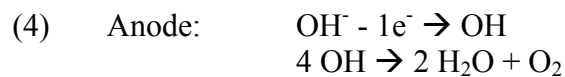
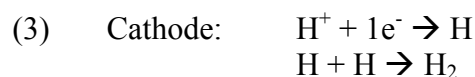


Figure 4.2: Hofmann Voltmeter (schematic illustration from author)



Alkaline water electrolysis is a mature technique and widely used. 20 – 40 % potassium hydroxide aqueous solution is most commonly used as electrolyte. Electrolytes increase the efficiency of the facility to about 75 %. Typical operating temperatures are between 80°C and 100°C. Most industrial electrolyzers have a bipolar connection of the cells where one electrode serves as anode and cathode at the same time. This is called a stack, where currents are low but high voltages have to be handled. *Solid-polymer Electrolysis (SPE)* names a technology, which replaces liquid alkaline or acidic solutions with solid electrolytes. Reduced corrosion, a constant electrolyte concentration and the ability to use the electrolyte simultaneously as a diaphragm are advantages of this technology. Possible materials are ion exchange membranes. Compared to alkaline electrolysis, material costs are high for SPE electrolyzers. On the other hand, a higher gas quality can be produced

out of this technique and a higher pressure is possible. Nevertheless, nowadays SPE electrolyser systems cover only low production capacity and are mainly applied on-site or for aerospace. The efficiency of SPE is currently lower than the advanced alkaline technique. Electrolysis of 1t of water results in 111.5 kg of hydrogen (1237 m³) and 888.5 kg of oxygen (618 m³). Electrolysis is a mature technology. Under current market conditions about 50 kWh of electricity are consumed to produce 1kg of (compressed) hydrogen. (Huggins, 2010; Rummich, 2009; Ellison, 2011; Wittstadt, 2008; Neupert, 2009) To reconvert hydrogen into electricity it can be burned as “Turbogas” in a gas turbine or used for hydrogen fuel cells.

Hydrogen Fuel cells

To produce electricity directly out of hydrogen, fuel cells can be used. At the negative anode hydrogen is oxidized, leading to a loss of electrons. The electrons from the hydrogen flow through an electric circuit to the positive anode, where oxygen is split into positive H⁺-Ions (see Figure 4.3 and equation below). Fuel cells, which are operated with pure hydrogen, have a simple system and high efficiency, which is e.g. 1.5 – 2 times higher than hydrogen-powered gas turbines. This means that the energy conversion in fuel cells is ideally adapted for hydrogen. The product of the combustion of hydrogen with oxygen is water, rather than CO or CO₂. The electricity generated is direct current (DC), which means that it has to be changed into altering current (AC) by using a transformer. (Rummich, 2009; Tetzlaff, 2005; Ellison, 2011; Friedrich et al., 2008)

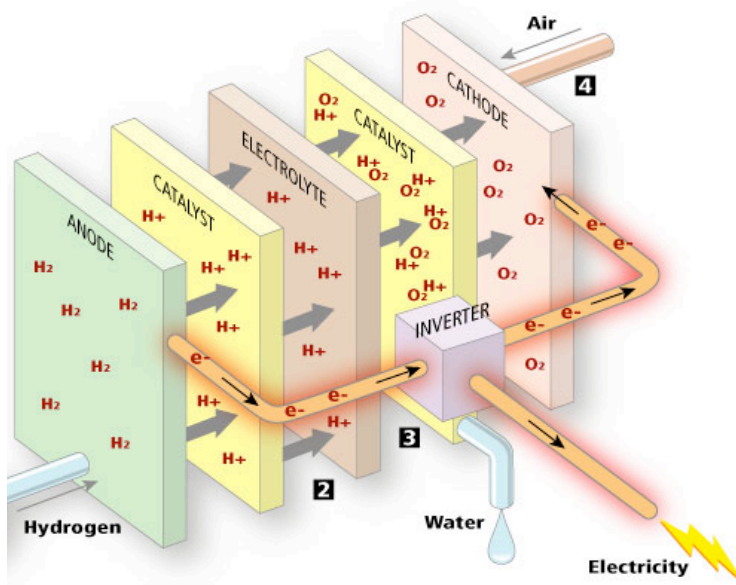
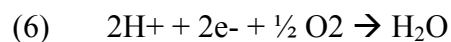


Figure 4.3: Schematic illustration of a hydrogen fuel cell²⁰



The output of fuel cells is electricity and water or water vapour. The core of the fuel cell is a thin polymer film, which is permeable to protons when saturated with water, but does not conduct electrons. PEM fuel cells have high power density, operate at fairly low temperature (70 – 85° C), and thus can start up almost immediately. A typical fuel cell produces a voltage from 0.6 V to 0.7 V, so that many cells must be stacked together to generate sufficient power. (Rummich, 2009; Ellison, 2011)

PEM (Polymer electrolyte membrane) fuel cells have been limited to 200 KW level. Therefore, stationary fuel cells are typically high temperature fuel cells such as PAFC, MCFC or SOFC. *Phosphoric acid fuel cells (PAFC)* use liquid phosphoric acid as electrolyte at an operating range of 150 – 200° C. *Molten carbonate fuel cells (MCFC)* operate at temperatures of 600° C and above. Therefore, non-precious metals can be used as catalysts, reducing costs. A major drawback of this type is the durability because of the high operational temperature and the corrosive action of the electrolyte. *Solid oxide fuel cells (SOFC)* are promising for stationary power

²⁰ <http://www.newmango.com/infographics/inf/fuel-cell.jpg>, 17.10.2011

generation, but novel materials are needed to reduce the temperature of operation. Stationary fuel cells are suitable for distributed power generation sited close to the customer load. Furthermore, costly investments in transmission and distribution system upgrades can be eliminated. (Barbir, 2007; Ellison, 2011)

Storage

Hydrogen has an enormous volume of 11 m³ per kg at ambient temperature. To increase density, it has to be either compressed or the temperature has to be decreased below the critical temperature or repulsion is reduced by interaction with another material. Hydrogen has a good energy density by weight (33.3 – 38 Wh/kg) but poor energy density by volume (2.5 Wh/l). Therefore, under normal conditions it requires about 3000 times more space than gasoline for an equivalent amount of energy. Hydrogen can be stored in several different ways: as gaseous hydrogen in high-pressure tanks, as liquid hydrogen in insulated tanks or as protons in solids. Traditionally *high pressure storage tanks* have been made out of steel but recently new fibre reinforced composite materials have been developed that can withstand internal pressures up to 5,000 – 10,000 PSI. Even at such high pressures hydrogen has a relatively large volume, about twice that of liquid hydrogen. Hydrogen can be stored liquid in thermally insulated containers at a temperature below 20.3 K. *Liquid hydrogen* has the huge disadvantage that the process of liquefaction requires about 30 – 40 % of the final energy content of the hydrogen. Furthermore, liquid hydrogen has to be consumed in rather a short time, as it continuously boils-off. Hydrogen can, furthermore, be stored in solids, which are called *metal hydrides*. The hydrogen is stored as protons (H⁺) ions in this case. As the electrical charge in solids must always be balanced, an equal number of extra electrons exist. The capacity depends upon the amount of hydrogen the material can absorb in their crystal structures. Normally heat arises during loading, which has to be removed to avoid a reduction of the storage capacity. Adding heat or lowering the pressure can afterwards extract hydrogen from the solid. Table 4.4 summarizes the main figures of different storage media. (Huggins, 2010; Rummich, 2009; Ellison, 2011; Züttel, 2008)

Storage Media	Volume	Mass	Pressure	Temperature
Composite cylinder (established)	max. 33 kg H ₂ per m ³	13 mass%	800 bar	298 K
Liquid hydrogen	71 kg H ₂ per m ³	100 mass%	1 bar	21 K
Metal hydrides	max. 150 kg H ₂ per m ³	2 mass%	1 bar	298 K
Physisorption	20 kg H ₂ per m ³	4 mass%	70 bar	65 K
Complex hydrides (reversibility?)	150 kg H ₂ per m ³	18 mass%	1 bar	298 K
alkali + H₂O	>100 kg H ₂ per m ³	14 mass%	1 bar	298 K

Table 4.4: Comparison of Hydrogen Storage alternatives (Züttel, 2008)

4.5.2 Key figures

Rated power

16 MW (Hydrogen power plant in Fusina, Italy)

Energy density (kWh/l or kWh/kg or kWh/m³) (Karamanolis, 2009)

Average energy density: 36 kWh/kg

$$(7) \quad 1 \text{ Nm}^3 = 0,09 \text{ kg H}_2 (20^\circ\text{C}, 1\text{bar}) \rightarrow 3,24 \text{ kWh/m}^3 (20^\circ\text{C}, 1\text{bar})$$

$$(8) \quad 1 \text{ kg gaseous H}_2 \text{ with pressure of 240 bar in 60 l} \rightarrow 0,6 \text{ kWh/l} (20^\circ\text{C}, 240 \text{ bar})$$

$$(9) \quad 1 \text{ kg liquid H}_2 \text{ with pressure of 1 bar, temperature } -250^\circ\text{C} \text{ in 14 l} \rightarrow 2,35 \text{ kWh/l}$$

Compared to gasoline: 9 kg gasoline in 14 litre

Energy content of the system

- *Pore-space storage (see chapter 4.7 Energy storage of pressurized gas):*

The volume of pore-space storage ranges from hundred million cubic meters up to some billion cubic meters. About half of the volume can be discharged. The maximum pressure in pore-space amounts to 60 – 80 bar.

Average energy density of hydrogen: 36 kWh/kg

Weight of hydrogen at 70 bar = 20 kg H₂/m³

$$(10) \quad 36 \text{ kWh/kg} * 20 \text{ kg} = 720 \text{ kWh/m}^3 \text{ at a pressure of 70 bar}$$

$$(11) \quad 50 \text{ mil. m}^3 * 720 \text{ kWh/m}^3 \text{ at a pressure of 70 bar} = 36 \text{ TWh}$$

$$(12) \quad 1 \text{ bil. m}^3 * 720 \text{ kWh/m}^3 \text{ at a pressure of 70 bar} = 720 \text{ TWh}$$

- *Cavern storage (see chapter 4.7 Energy storage of pressurized gas):*

The volume of cavern storage can amount up to 800,000 m³. As the maximum volume of this storage system is much smaller than the volume of pore-space storage, the energy content of this system is even with very high pressure much lower. Therefore, the calculated figures from the pore-space storage will be used as upper values for further assessment.

Self-discharge rate/losses

Salty walls of caverns are leak-proof for gas; therefore, no losses occur. (See chapter 4.7 Energy storage of pressurized gas)

Efficiency

Large electrolyzers with about 30 bar pressure and a temperature of 80° C have energy efficiencies of 80 – 90 %. The efficiency of fuel cells can be as high as 60 %. Compared to that, fossil fuel systems are about 34 % efficient. Cogeneration fuel cells use the heat generated in the fuel cells, which increases overall efficiency up to 80 %. Regarding the whole process of input and output of electricity, the overall efficiency is less than 50 %, which is much less than e.g. conventional batteries. Other resources state that efficiency can range between 60 % and 85 % – but it depends on the operating pressure and efficiency of the electrolyser-fuel cell combination. (Huggins, 2010; Neupert, 2009; Barbir, 2007; Alamri, 2009)

4.5.3 SWOT Analysis

Strengths	Weaknesses
+ Existing experience in handling compressed gases + Seasonal energy storage without energy loss over time + Able to handle poor fluctuations and therefore ideal for integration with intermittent renewable energy sources + Renewables can become “dispatchable” (guaranteed power from renewables) + Potential for low and predictable O&M costs + Reduced environmental impact compared to conventional energy systems + Cheaper storage for a longer period of time + High energy density by weight (Wh/kg) + Easy to be implemented in different capacity size ranges from KW to several MW + Can provide surplus hydrogen off-gas for road transportations	– Technology immaturity of fuel cells and PEM electrolyzers – Low availability and high cost of small electrolyzers – Lack of component and system lifetime experience – Low component efficiency – Missing codes and standards – Lack of after sales support – Weak supply network (providers, installers, etc.) – Lack of public awareness – Lack of recycling and reuse schemes for hydrogen technology – Hydrogen is highly flammable – High construction cost at present – Relatively low round trip efficiency
Opportunities	Threats
+ Emergence of large-scale markets for hydrogen energy applications + Already existing Stand-Alone Power Systems driven by Renewable Energy Sources in which hydrogen technologies can be incorporated as a replacement of batteries + New job opportunities + Diversification of companies involved in the energy sector	– Limited practical experience due to few true Stand-Alone Power Systems with hydrogen as an energy carrier (H-SAPS) installed – Competing technologies have proved to be perfectly adequate – Potential end users have no experience in H₂ technologies – Inadequate legislative framework (standards, regulations, permissions of installation)

Table 4.5: SWOT Analysis for H₂ production from RES (Lymberopoulos, 2007; Alamri, 2009)

4.6 Compressed Air Energy Storage (CAES)

Compressed Air Energy Storage has been in use as a peak shaving option since 1970s. It is a low cost technology for storing large quantities of electrical energy in the form of high-pressure air. The first CAES plant (290 MW) was started in Germany in 1978. It was designed and built to provide black-start services to nuclear units near the North Sea and provide peak power. It has the storage capacity to generate power for up to four hours. In 1991 a 110 MW plant was taken into operation in McIntosh, Alabama. It made improvements compared to the Hantdorf plant, as waste heat from the turbines is used to preheat air from the cavern. This plant is used for peak shaving and load following but could be used for wind integration as well. The plant is able to generate electricity for 26 hours per charge. In Norton, Ohio, a 2700 MW plant, which is going to use an idle limestone mine as storage reservoir, is under development. In Dallas Centre, a CAES project is developed by the Iowa Association of Municipal Utilities, which plans to couple a 268 MW CAES plant to 75 to 100 MW of wind farm. (Neupert, 2009; Edison, 2011; Alamri, 2009; Daneshi, 2010)

4.6.1 Technical description

With Compressed Air Energy Storage, energy can be stored on a scale similar to pumped-water energy systems. An electric engine compresses the gas under ground in one or two stages with a pressure of 40 – 70 bar. By doing so, electrical energy is transformed into kinetic energy of the air molecules. During the process of compression heat is produced, which makes cooling necessary. To convert compressed air back into electricity, it is fed into a burning chamber of a gas turbine, where it is mixed with fuel (e.g. natural gas). By doing so the air is heated up and expands in the turbine that drives the generator, producing electricity. (See Figure 4.4) While expanding the air cools down very fast causing the risk of icing the engine. Therefore, additional fuel is needed to compensate for the energy loss from cooling. (Neupert, 2009; Edison, 2011; Alamri, 2009)

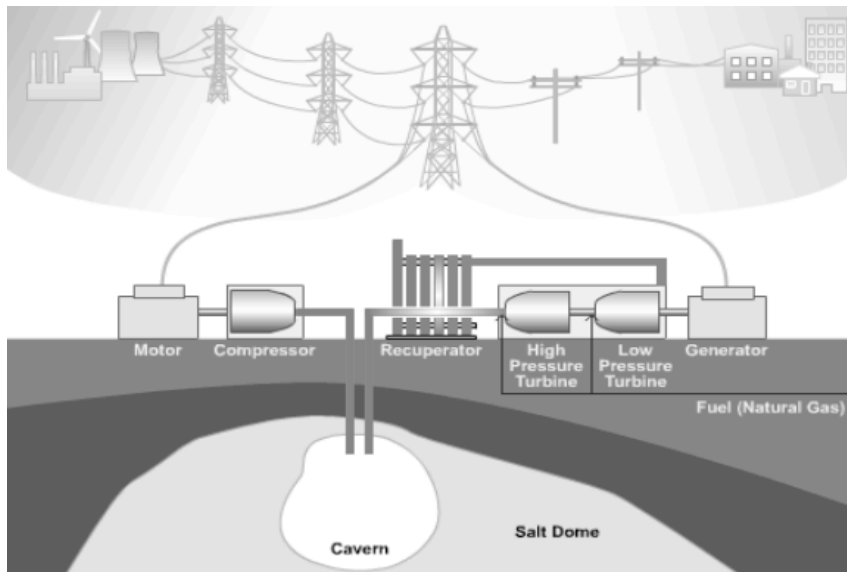


Figure 4.4: Layout of Compressed Air Energy Storage (CAES) unit (Daneshi, 2010)

For storing compressed air, free space in geological underground like salt caverns, aquifer structures or former groves can be used (see chapter 4.7 Energy storage of pressurized gas). Such plants are able to reach their full power within about ten minutes. Another advantage is that CAES plants normally only show very small losses due to leakage. Small CAES plants could store the air in smaller storage tanks or pipelines under higher pressure (100 – 140 bar) having the advantage of building CAES plants independent from geologic conditions. Such plants contribute to approximately 10 MW and can provide electricity for about three to five hours. (Neupert, 2009)

To produce compressed air, many different compressors, which are operated with different energy carriers, can be used. Many different technologies with diverse volume and pressure exist. (Rummich, 2009)

If exhaust gases are used for preheating air, CAES plants can reach efficiencies up to 55 %. Other sources quote that efficiency of such plants range from 73% to 79%. (Neupert, 2009; Alamri, 2009)

Advanced Adiabatic-CAES

To increase overall efficiency, with a new type of plant, heat can be extracted during compression and stored separately. Instead of fossil fuels, the heat from the storage is used for expansion. In this case efficiency can be increased to about 70 %, reaching similar values to those of pumped hydropower. Compressors of these types of power plants have to deal with temperatures of about 650° C and pressures of 100 – 200 bar. In addition, they have to operate fast, to convert excess electricity as quickly as possible. The thermal component of this type of plant has to have a capacity of around 120 – 1200 MWh, high discharge rates, a constant outgoing temperature and 4 – 12 hours discharge duration. Research currently evaluates the use of solid matters like natural stone, concrete and liquid storage with oils or liquid salts. Air turbines have to start-up fast and be able to adjust to varying conditions of operations like pressure differences. It is assumed (expected) that such turbines will not be available on the market before 2015. (Neupert, 2009)

Thermal and Compressed-Air Storage (TACAS)

This system works with a similar principle like the advanced adiabatic-CAES but on a smaller scale (about 80 kW). It is commercially available and should replace lead-acid batteries. (Neupert, 2009)

Isotherm CAES

With isotherm CAES, the air temperature stays almost the same during the whole process. The heat produced during compression is given off to the ambience, while taken from the ambience during expansion. This technique can be applied with a reciprocating engine. (Neupert, 2009)

4.6.2 Key figures

Rated power

Sizes of CAES plants are available from 20 to 350 MW. (Neupert, 2009; Alamri, 2009)

Energy density (kWh/l or kWh/kg or kWh/m³)

The energy density for CAES is about 2 – 5 kWh/m³.^{21, 22}

Energy content of the system

- *Pore-space storage (see chapter 4.7 Energy storage of pressurized gas):*

The volume of pore-space storage ranges from hundred million cubic meters up to some billion cubic meters. About half of the volume can be discharged. The maximum pressure in pore-space amounts to 60 – 80 bar.

Average energy density of CAES: 3.5 kWh/m³

$$(13) \quad 50 \text{ mil. m}^3 * 3.5 \text{ kWh/m}^3 = 175 \text{ GWh}$$

$$(14) \quad 1 \text{ bil. m}^3 * 3.5 \text{ kWh/m}^3 = 3.5 \text{ TWh}$$

- *Cavern storage (see chapter 4.7 Energy storage of pressurized gas):*

The volume of cavern storage can amount up to 800,000 m³. As the maximum volume of this storage system is much smaller, the energy content of this system is also much lower.

Self-discharge rate/losses

As with hydrogen the salty walls of caverns are leak-proof for gas; therefore, no losses occur. (see chapter 4.7 Energy storage of pressurized gas)

Availability

CAES plants are able to reach their full power within about ten minutes. (Neupert, 2009)

²¹ <http://bravenewclimate.com/2009/08/31/solar-thermal-questions/>, 20.10.2011

²² <http://www.nrel.gov/docs/fy10osti/47547.pdf>, 20.10.2011

Efficiency

The efficiency of Advanced Adiabatic CAES is about 70 %, reaching similar values to those of pumped hydropower.

4.6.3 Advantages/Disadvantages

- + High storage capacity and high output depending on the size of reservoir
- + Quick start up time
- + Easy geological requirements, which make CAES easy to be implemented in many locations
- + Very small losses due to leakage
- + Mature technique
- + No effects on the environment (no emissions or harmful substances with adiabatic CAES)
- + Compressed air is not flammable and not toxic
- + No cooling is necessary

- Needs high energy input during the power production process
- Production of greenhouse gasses emissions as a result of using natural gas in energy production (can be neglected, with advanced adiabatic CAES)

(Alamri, 2009; Neupert, 2009; Rummich, 2009)

4.7 Energy storage of pressurized gas

To store energy, gas can be stored pressurized and afterwards converted into electricity again, through different procedures. Due to a constant volume, the pressure is proportional to the amount of gas that has been pumped into the storage tank. This can be expressed through the following equation

$$(15) \quad PV = nRT$$

whereas P is the absolute pressure of the gas, V is the volume, n the number of moles, R the gas constant and T the absolute temperature. As the gas constant, the temperature and the volume stay constant, the pressure automatically increases with the amount of gas (n) that has been pumped into a tank. Gas can be stored in simple mechanical tanks as long as the pressure is not so large to cause mechanical damage. Larger amounts can be stored in salt caverns, depleted oil wells or underground aquifers. The process of compressing gas rapidly is close to adiabatic. Heat is given off during compression and there is cooling during expansion. For that reason some sort of heat transfer system must be employed for such facilities. (Huggins, 2010)

The amount of one third up to one half of the maximum storage capacity is necessary to hold a constant pressure in the tank, to make input and output easier and to ensure stability in the storage. The remaining part can be stored and discharged continuously. Generally it can be differentiated between pore-space storage and cavern storage. (Neupert, 2009)

Pore-space storage

Pore-space storage is either former *natural gas* or *petroleum deposit*, having the advantage to be already known in their utilisation. Another option is to use *aquifers* structure in sediment, which consist of a porous rock formation like sandstone, chalk or dolomite, filled with water. With the input of gas, the water is pressed out of the pores, building a blowhole. When gas is taken out, the water pushes the gas back into the drill-hole. Those storage options are only usable for non-volatile gas but have a high storage capacity. Pore-space storage is mainly used for seasonal base-load, as

they have large capacities and react slowly on discharge rates. Depending on the size of the geological structure, physical conditions and depth such storages can have capacities between hundred cubic meters and some billion cubic meter – around half of it can be discharged. The maximum pressure for these storages are 60 – 80 bar. Aquifer storage is considered to be the most cost effective. (Neupert, 2009; Rummich, 2009; Alamri, 2009)

Cavern storage

Caverns are big natural or artificial underground holes, which are used to store natural gas or liquid hydrocarbon. Artificial caverns in rock salt are most common, as they do not need any further sealing. Water is pumped into it, which transports the natural brine to the surface. Nowadays it is possible to reach a depth of 3000 m, a diameter of 60 – 100 m, heights of some hundreds of meters and a volume of about 800,000 m³. Liquids or liquid gas is filled into it and the brine is pumped out from the basement. Due to the low specific weight, liquid hydrocarbons are always on top of the brine and do not undermine the salt dome. To discharge the liquid, again brine is pumped into the cavern. To store gas, the natural brine is first pumped out completely. Afterwards the gas is pumped into it under certain pressure. To discharge gas, the overpressure in the cavern is used. Contrary to the pore-space storage, the pressure in the cavern is changing with the filling level. As the salty walls of the caverns are also leak-proof for gas, no losses occur. The maximum pressure depends on the depth of the storage and can be higher than the hydrostatic head. Nevertheless, it should not exceed the rock pressure at the given depth. Holes from the mining industry are usable for liquids or liquid gas. (Neupert, 2009; Rummich, 2009)

4.8 Comparison of key figures

The comparison of the key figures in Table 4.6 of the assessed storage technologies show that Hydrogen Storage and Compressed Air Energy Storage could constitute a reasonable completion of the storage portfolio in Austria in the future.

	Pumped Hydroelectric Storage	Hydrogen Storage	Compressed Air Energy Storage
Rated power	20 – 2100 MW	16 MW (plant in Italy)	20 – 350 MW
Energy content of the storage/capacity	up to 588,3 GWh	36 – 720 TWh	175 GWh – 3.5 TWh
Energy density	1 kWh/m ³	3,24 kWh/m ³	2 – 5 kWh/m ³
Self-discharge /losses	yes, partly	no, negligible	no, negligible
Availability in	about 1 minute	na data available	around 10 minutes
Efficiency	70 – 80 %	50 – 85 %	70 %

Table 4.6: Comparison of storage technologies

5 Derived electricity demand & supply 2050 in Austria

The following chapters describe the calculated values for the electricity demand and supply in 2050 and, therefore, constitute the basis for the conclusions of this thesis. Basis for the calculations are two scenarios provided by the feasibility study Energy Autarky 2050. (Streicher, 2010)

In the **Constant scenario** the level of the energy demand in mobility and buildings as well as the gross value of industry remains the same in 2050 as in 2008. However, the **Growth scenario** assumes a constant growth of energy demand in mobility, buildings and gross value of industry until 2050 with 0.8 % p.a., resulting in 40 % higher energy demand in 2050 compared to 2008.

National fuel production should be used for road freight transport, forestry and farming; therefore, 95 % of air transportation has to be transferred to railway. In regard to passenger transportation it is assumed that the structure of urban development is improved and the public transport grid is extended, as well as, a higher percentage of non-car users can be obtained. These assumption are relevant for both scenarios. In the Constant scenario two-thirds of the transport of goods have to be switched from road freight transport to railway freight and 98 % of railway transport has to be electrified. Contrary to that, in the Growth scenario transport of goods has to be transferred to railway and Danube up to almost 95 %. Passenger transportation is decreased to 40 %. About 80 % of passenger transportation are electric vehicles, which start to be competitive due to rising prices of fossil fuels. Furthermore, both scenarios claim an increase of 20 % of electric machines for forestry and agriculture and 30 % of mobile industrial machines, as the available amount of fuels would be insufficient for all internal combustion machines and diesel vehicles. Thus, both scenarios seem unrealistic at today's political framework as current trends have to be reversed – small cars instead of bigger and more powerful cars, slower speed of travelling instead of growth and faster traffic and increased share of public transport, non-car users and railway transport. Nevertheless, if population growth remains modest in Austria, mobility would not be limited

(kilometers per person or per tonne would be the same) but severe changes in transportation behaviour and, therefore, also in infrastructure would have to be undertaken (public transport would increase four times at the Growth scenario, almost zero use of fuels for air transport).

It is assumed that electricity for *buildings* will decrease by 10 % due to higher efficiencies (excluding heating and cooling). This results in decreased electricity consumption of 20 % in the Constant scenario and of 7 % in the Growth scenario. In addition, the share of cooling units in buildings will decrease from 99 % to 90 % due to a higher diffusion of solar cooling and district cooling networks.

Within the *production* industry an increased efficiency of 1 % per year is assumed.

For both scenarios the typical load curves, which are discussed in chapter 3.2.1 Demand Side, remain the same.

5.1 Annual values

During the course of a year, the demand curve is generally lower in the summer months than in winter.

Contrary to the daily perspective, Figure 5.1 and Figure 5.2 show, therefore, that yearly considered PV does not correspond to the electricity demand. An increased share of PV in electricity production, therefore, requires more storage during the summer months. In contrast, wind energy has to be partially stored, as the electricity supply is linked to the weather pattern. Hydropower from flowing water is commonly used for the base load, whereas storage lakes can be used for balancing the wind power. (Neupert, 2009; Edison, 2011)

In the Constant scenario Hydropower and PV produce more electricity in the summer months (February until November). Geothermal energy carriers constitute only a small amount but steadily deliver the same amount of electricity during the year. Combined heat and power produces more electricity during the winter months, as in the winter season heat demand is higher. The supply of wind is higher in winter therefore the supply-curve of wind energy also shows lower values during the summer months than in winter. Electricity demand within the Growth scenario is much higher. To provide enough electricity, REN potentials in Austria have to be almost completely utilized. Furthermore, to be able to cover energy demand, it will be necessary to develop deep geothermal energy. From a today's point of view, this strategy is questionable, as the technology is very cost intensive. (Streicher, 2010)

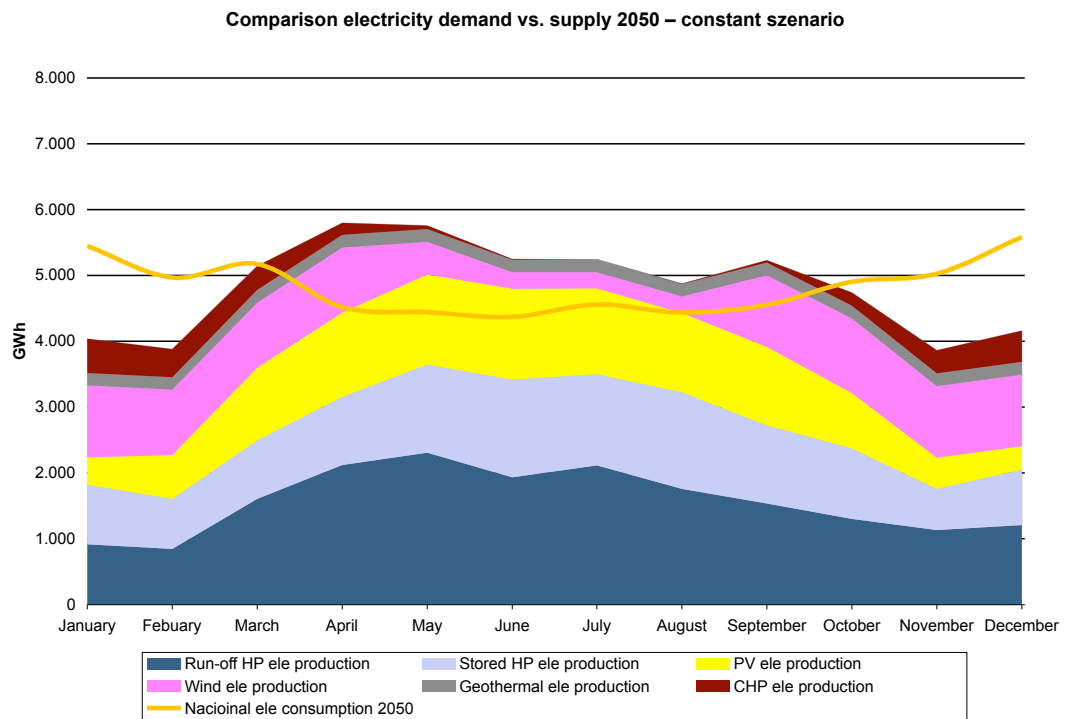


Figure 5.1: Annual electricity demand 2050, Constant scenario

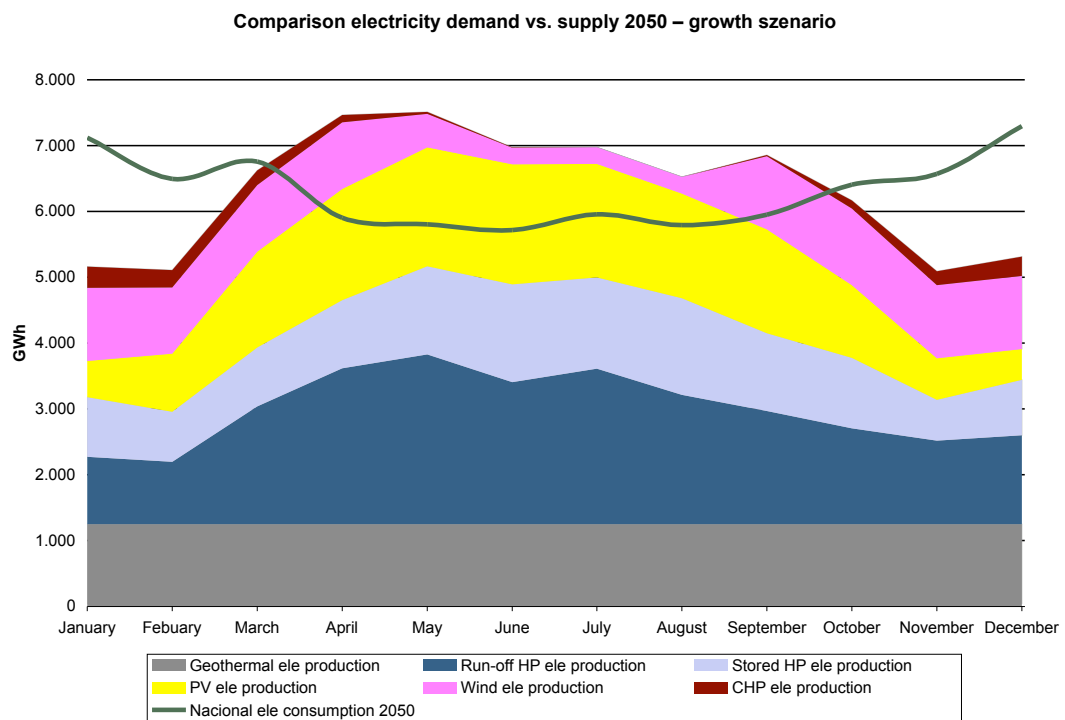


Figure 5.2: Annual electricity demand 2050, Growth scenario

5.2 Derived storage demand

Figure 5.1: Annual electricity demand 2050, Constant scenario, Figure 5.2: Annual electricity demand 2050, Growth scenario, Table 5.2: Annual storage demand 2050 – Growth scenario and Table 5.2: Annual storage demand 2050 – Growth scenario provide visualisations for the following explanations. All detailed calculations and graphs are included in the appendix.

The storage demand is calculated with the use of certain equations. Annual storage is charged ($Q_{STO-A_{in}}$) at times, when electricity supply (GWh) within the assessed month (Q_{RES-E_m}) exceeds electricity demand (Q_{D_m}) in that month (GWh) – see Equation (17). Contrary to that annual storage is discharged ($Q_{STO-A_{out}}$) at times when electricity demand (Q_{D_m}) in one month (GWh) is higher than electricity supply (Q_{RES-E_m}) – see Equation (18). 10 % of grid losses (lg) are taken into account with the electricity demand.

$$(16) \quad Q_{RES-E} = Q_{EleGeo} + Q_{ElePV} + Q_{EleRun-off} + Q_{Elewind} + Q_{EleStoredHP} + Q_{EleCHP}$$

$$(17) \quad \text{If } Q_{RES-E_m} > Q_{D_m} (1+lg) \rightarrow Q_{STO-A_{in}} = Q_{RES-E_m} - Q_{D_m} (1+lg)$$

$$(18) \quad \text{If } Q_{RES-E_m} < Q_{D_m} (1+lg) \rightarrow Q_{STO-A_{out}} = Q_{D_m} - Q_{RES-E_m} (1+lg)$$

Results of the above mentioned equations show, that the electricity supply from April until September is higher than the demand. Therefore, electricity can be fed into annual storage plants, to be available during the winter months. Within both scenarios most electricity can be stored in April (1.3 TWh constant/1.6 TWh Growth) and May (1.3 TWh Constant/1.7 TWh Growth), as the electricity supply is going down and electricity demand is going up the following months.

From October until March the electricity production is lower than the demand. Therefore electricity has to be provided from annual storage. Both scenarios show, that demand for electricity from storage is highest in December (1.4 TWh Constant/2.0 TWh Growth) and January (1.4 TWh Constant/2.0 Growth).

During the course of the year, 5.3 TWh/7.2 TWh (Constant/Growth scenario) have to be stored in summer for the winter months.

Constant scenario (GWh)

month	Nat. ele consumption	Supply						Sum ele. supply	into annual storage	from annual storage
		PV	Wind	Run-off HP	Stored HP	CHP	Geothermal			
January	5.451	417	1.089	915	910	519	192	4.041		1.409
February	4.973	669	990	849	759	423	192	3.881		1.092
March	5.175	1.101	990	1.606	894	361	192	5.144		31
April	4.522	1.279	990	2.121	1.039	181	192	5.801	1.278	
May	4.444	1.372	495	2.313	1.334	52	192	5.758	1.314	
June	4.376	1.383	248	1.933	1.487	7	192	5.249	873	
July	4.560	1.307	248	2.114	1.386	1	192	5.247	687	
August	4.437	1.205	248	1.759	1.470	1	192	4.874	437	
September	4.557	1.193	1.089	1.541	1.183	34	192	5.231	674	
October	4.905	838	1.139	1.304	1.073	199	192	4.744		161
November	5.029	476	1.089	1.136	622	351	192	3.865		1.164
December	5.584	356	1.089	1.211	842	471	192	4.161		1.423
Jahr	58.015	11.595	9.702	18.800	13.000	2.600	2.300	57.997	5.263	5.280

legend:
 data from feasibility study energy autarky 2050
 calculated from given data (constant scenario)

Table 5.1: Annual storage demand 2050 – Constant scenario

Growth scenario (GWh)

month	Nat. ele consumption	PV	Wind	Run-off HP	Stored HP	CHP	Geothermal	Sum ele. supply	into annual storage	from annual storage
January	7.122	550	1.111	1.022	910	319	1.250	5.163		1.959
February	6.498	882	1.010	948	759	260	1.250	5.110		1.387
March	6.761	1.453	1.010	1.793	894	222	1.250	6.623		138
April	5.909	1.687	1.010	2.369	1.039	111	1.250	7.467	1.558	
May	5.807	1.810	505	2.583	1.334	32	1.250	7.515	1.709	
June	5.717	1.825	253	2.159	1.487	4	1.250	6.978	1.261	
July	5.958	1.725	253	2.361	1.386	0	1.250	6.975	1.017	
August	5.797	1.591	253	1.964	1.470	0	1.250	6.529	731	
September	5.954	1.575	1.111	1.721	1.183	21	1.250	6.860	906	
October	6.409	1.106	1.162	1.457	1.073	123	1.250	6.169		240
November	6.571	629	1.111	1.269	622	216	1.250	5.096		1.474
December	7.296	470	1.111	1.352	842	290	1.250	5.316		1.981
Jahr	75.799	15.303	9.898	21.000	13.000	1.600	15.000	75.801	7.182	7.180

legend: ■ data from feasibility study energy autarky 2050
■ calculated from given data (growth scenario)

Table 5.2: Annual storage demand 2050 – Growth scenario

5.3 Daily values

During the course of the day, the electricity demand curve has its lowest point in the early morning hours and increases steadily until morning, remaining relatively steady during the day. Afterwards the electricity demand is again steadily decreasing until the early morning hours.

Photovoltaic electricity is almost synchronous with the daily electricity demand as can be seen in Figure 5.3 and Figure 5.4. Storage needs in this regard are modest. Therefore, it is very useful to provide peak and intermediate power electricity demand, which are highest during the central hours of the day. (Neupert, 2009; Edison, 2011)

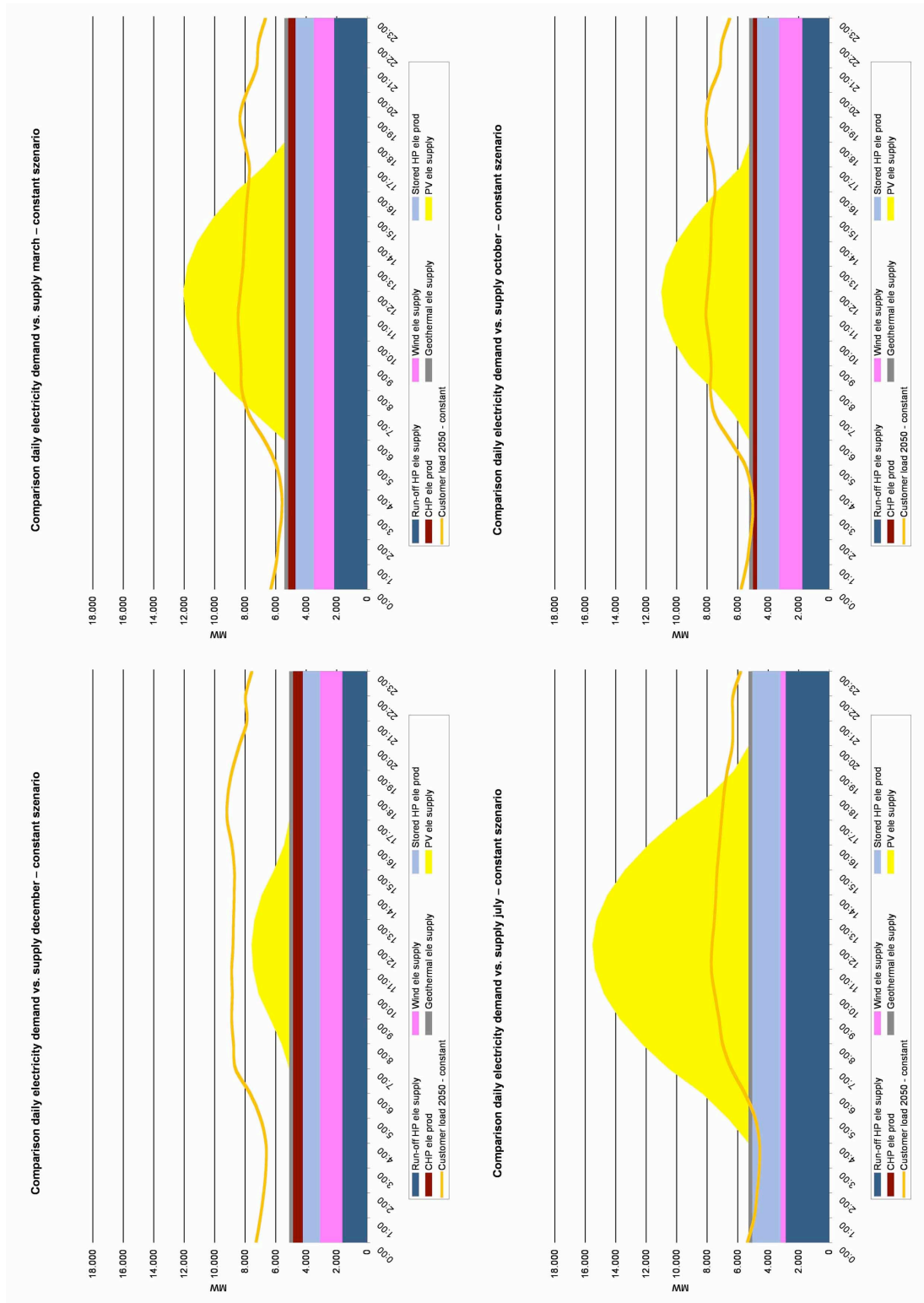


Figure 5.3: Daily comparison of demand and supply for the year 2050: December, March, July, October – Constant scenario

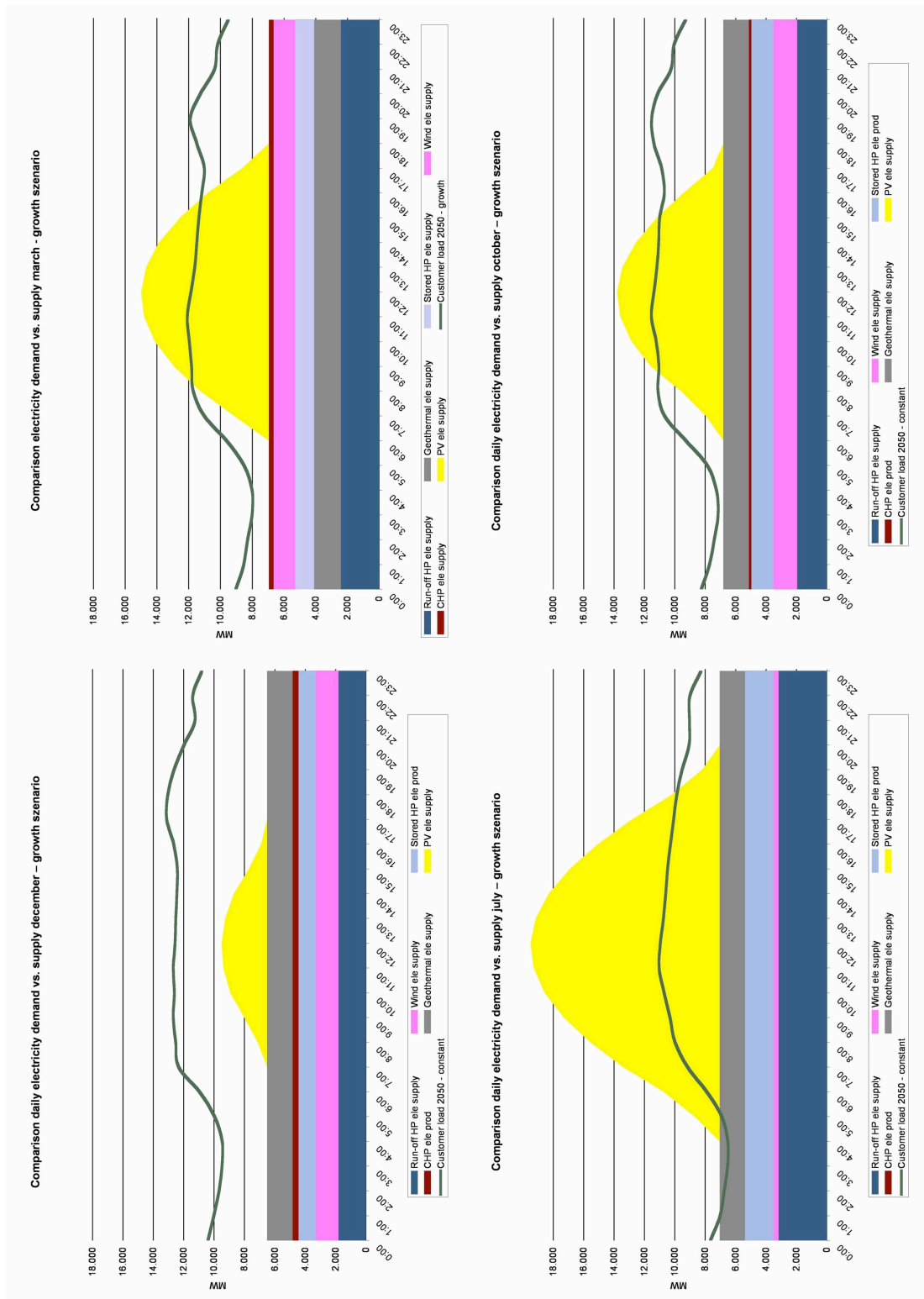


Figure 5.4: Daily comparison of demand and supply for the year 2050: December, March, July, October – Growth scenario

5.4 Derived daily storage demand

The main visualisations for the following explanations are Figure 5.1: Annual electricity demand 2050, Constant scenario, Figure 5.2: Annual electricity demand 2050, Growth scenario, Table 5.3: Daily storage demand 2050 – Constant scenario and Table 5.4: Daily storage demand 2050 – Growth scenario. All detailed calculations and graphs are included in appendix.

Daily storage is not needed in winter months, as electricity demand is higher than electricity production over the course of the whole day. Therefore the difference between demand and supply is taken out of annual storage during these months. To be able to feed into daily energy storage during the course of one day ($Q_{STO-Din}$), daily electricity supply (Q_{RES-Ed}) has to exceed daily electricity demand (Q_{Dd}); see Equation (19).

$$(19) \quad \text{If } Q_{RES-Ed} > Q_{Dd} (1+lg) \rightarrow Q_{STO-Din}$$

During the summer months, from April until September more electricity is produced than consumed. Therefore, oversupply occurs and energy is fed into annual storage. However, a small amount has to be stored in daily storage for the evening, when demand is higher than supply (approx. 6.00 pm – approx. 1.00 am), which is due to a lack of electricity from PV.

To calculate the exact amount of electricity needed from daily storage during the course of a day ($Q_{STO-Dout}$), hourly electricity demand (Q_{Dh}) and supply (Q_{RES-Eh}) are compared. Every time demand exceeds supply, electricity is taken out of daily energy storage – see Equation (20). The total daily electricity demand from energy storage ($Q_{STO-Dout}$) is calculated by adding up hourly values ($Q_{STO-Hout}$) – see Equation (21), where demand (Q_{Dh}) exceeds supply (Q_{RES-Eh}) – see Equation (22).

$$(20) \quad \text{If } Q_{Dh} (1+lg) > Q_{RES-Eh} \rightarrow Q_{STO-Dout}$$

$$(21) \quad Q_{STO-Dout} = [Q_{STO-Hout}]^1 + [Q_{STO-Hout}]^2 + [Q_{STO-Hout}]^3 + [Q_{STO-Hout}]^n$$

$$(22) \quad Q_{STO-Hout} = Q_{Dh} (1+lg) - Q_{RES-Eh}$$

The daily storage demand (MWh) steadily increases from 1.8 MWh/6.6 MWh (Constant/Growth scenario) in April to 7.2 MWh/15.3 MWh in September, as electricity demand during the evening is slightly increasing from month to month. During the course of the day, from April until September, a minimum of 24 MW/28 MW and a maximum of 1.8 GW/3.3 GW are needed.

During the winter months, November until February, electricity demand is higher than in summer. At the same time electricity production is lower due to less radiation in winter in Europe. Therefore, the supply is insufficient and the lack in electricity must be somehow balanced, for example with annual storage. The highest demand occurs during the evening hours, as no PV-electricity is available at this time, but electricity demand only slightly decreases from 5.00 pm until 3.00 am the next day. The gap between demand and supply is higher in the Growth scenario.

March and October are turning points. During midday more electricity is produced than demanded, but this surplus is not enough to fill the gaps in the morning and in the evening. Therefore, electricity is fed into daily storage during midday and taken out in morning and evening. The demand from energy storage (MWh) for the whole day shows the largest figures in these months, as electricity has to be partly provided from annual storage, as the oversupply during midday is insufficient to fulfill the demand during evening and night time. In March the storage demand amounts to minimum 175 MW/371 MW and maximum 2.9 GW/5 GW (Constant/Growth scenario). In October the minimum storage demand is 83 MW/342 MW and maximum is 2.8 GW/4.7 GW during the course of a day.

Constant szenario

month	Daily storage demand (MWh)	Daily storage MIN (MW)	Daily storage MAX (MW)
January	–	–	–
February	–	–	–
March	18.514	175	2.908
April	1.752	138	636
May	2.642	107	1.032
June	2.391	170	1.003
July	4.173	72	1.049
August	7.033	171	1.710
September	7.277	24	1.836
October	19.147	83	2.824
November	–	–	–
December	–	–	–
Year MIN	1.752	24	
Year MAX	19.147		2.908

legend:  calculated from given data (constant szenario)

Table 5.3: Daily storage demand 2050 – Constant szenario

growth szenario

month	Daily storage demand (MWh)	Daily storage MIN (MW)	Daily storage MAX (MW)
January	–	–	–
February	–	–	–
March	36.991	371	4.961
April	6.640	342	1.893
May	6.412	264	2.223
June	5.648	298	1.985
July	8.448	608	2.001
August	12.296	28	2.845
September	15.281	97	3.266
October	36.696	342	4.722
November	–	–	–
December	–	–	–
Year MIN	5.648	28	
Year MAX	36.991		4.961

legend:  calculated from given data (growth szenario)

Table 5.4: Daily storage demand 2050 – Growth szenario

6 Conclusions

This chapter summarizes and discusses the main findings of the Master Thesis and derives questions and fields for further research.

In regard to daily storage demand it was found out that the maximum demand during the course of a day amounts to 2.9 MW within the Constant scenario and 5 MW for the Growth scenario. The largest plants in Austria range nowadays from 113 MW to 750 MW, which means that there is enough power installed in Austria. Furthermore, Austria's power plants have enough capacity to serve the maximum total energy demand of 7.2 MWh/15.3 MWh (Constant/Growth scenario) during the course of one day. Due to the high share of electricity from Photovoltaics, the supply curve changes. Therefore, higher demand during midday can be covered by higher electricity production due to increased radiation within these hours. Consequently, the electricity supply decreases in the afternoon and the demand for energy storage is highest in the afternoon/evening.

From an annual perspective, the comparison of storage capacity and storage demand shows a different picture. The storage basins of Austria's largest Pumped Hydroelectric Storage plants sum up to 1.9 TWh. With the given energy mix of Renewable Energy Carriers for the study Energie Autarkie 2050 and load curves, which show a similar scheme like today, the storage demand amounts to 5.3 TWh/7.2 TWh (Constant/Growth scenario) annually. This means that only 36 %/26 % of the storage demand can be served with the current capacity of Pumped Hydroelectric Power Plants in Austria. Both scenarios show that demand for electricity from storage is highest in December (1.4 TWh Constant/2.0 TWh Growth) and January (1.4 TWh Constant/2.0 TWh Growth). Consequently, the currently developed potential will be depleted within approximately one month. In total, this means that Austria lacks 3.4 TWh/5.3 TWh (Constant/Growth scenario) of energy storage to serve the electricity demand in winter. The current degree of development of Pumped Hydroelectric

Power in Austria is two thirds.²³ Therefore, the Austria's potential sums up to approximately 2.9 TWh. As a result the storage technology is insufficient to conserve the electricity produced during the summer months in order to provide enough electricity in winter, when the electricity supply curve from REN is lower than the demand curve.

In detail, the supply and demand curves follow certain trends over the year. Due to the increased radiation, supply exceeds demand from April until September. Hence, storage plants are charged during these months. Most electricity is fed into the storage plants in April and May, as the electricity supply is going down and electricity demand is going up the following months. March and October are turning points. Within these months, supply exceeds demand during midday but fails to balance over-demand in the evening hours. As a consequence, electricity has to be partly used from annual storage. As the Renewable Energy Carriers do not produce enough electricity from October until March, energy has to be taken from the annual storage to serve the demand.

As the potential for further development of Pumped Hydroelectric Storage is limited and the maximum potential is insufficient to serve storage demand in 2050, several other storage technologies have been assessed. Based on the parameters compared the Compressed Air Energy Storage and Hydrogen Storage constitute possible alternatives for storing electricity on a large scale. Currently only a limited number of these types of plants exist worldwide. Therefore, further development will help the technologies to become mature. To calculate the exact potential of CAES and Hydrogen in Austria further assessment, including geological analysis, would be necessary.

Figure 6.1 from 2010 shows, that a surplus in supply or demand is partly regulated by import and export. A higher share of thermal power in the winter months balances Hydropower, which produces more electricity during the summer months. One can see that the solar energy has only a small share in the total electricity production in

²³ <http://www.verbund.com/at/de/haushalte/verbund-hilft-fragen-antworten/wasserkraft-atomstrom-oekostrom>, 23.01.2012

2010, but a higher share in 2050. Therefore, 2010 figures are more balanced during the course of a year, compared to 2050 figures.

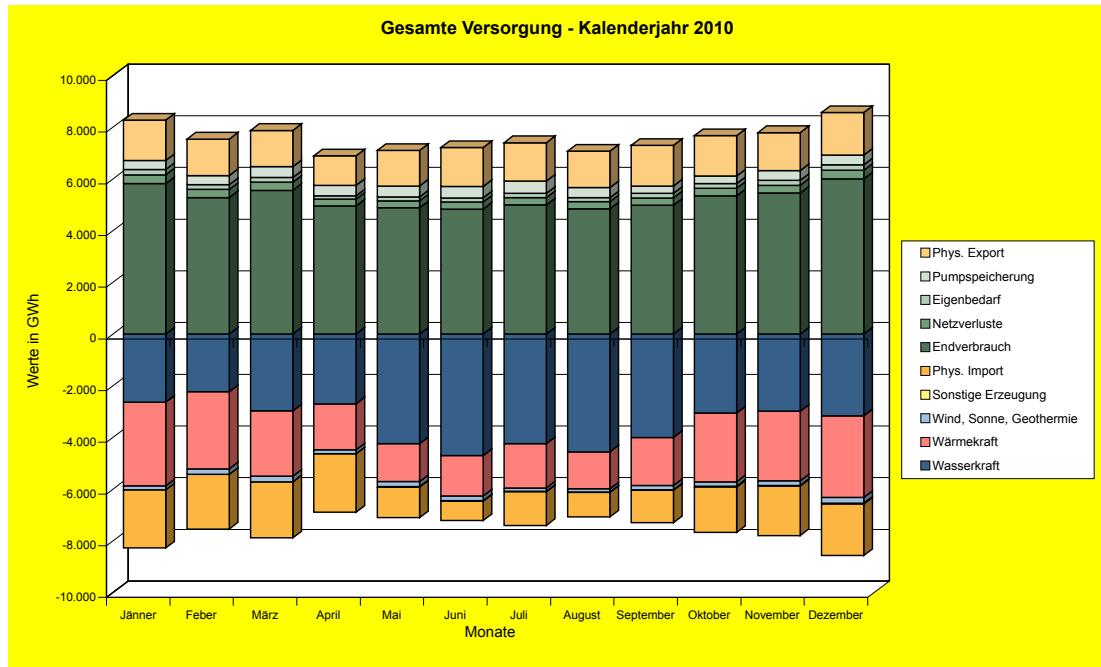


Figure 6.1: Electricity supply in Austria 2010 (e-control)

Several options exist to deal with the problem of a lack in storage. One possibility would be to export excess electricity and import electricity in case of higher demand. This is also discussed in the general assumptions for this thesis and would be accepted, if the annual sum of import and export is zero. Nevertheless, this idea should be considered in the long run. The share of Renewable Energy carriers is likely to increase in other European countries as well, probably leading to a Europe-wide surplus in supply or lack in demand at the same time. Import and export should, therefore, not be considered as the only long-term solution. At the same time import and export would enable EU-wide load levelling and a perfect use of different energy storages in Europe.

The greater use of Smart Grids would enable a better adjustment of the demand-curve to the supply-curve. The feasibility-study Energie Autarkie 2050 estimates that a 20 % adjustment would be possible. This measure would decrease the storage

demand by 1.1 TWh from 5.3 TWh to 4.2 TWh within the Constant scenario and by 1.4 TWh from 7.2 TWh to 5.8 TWh within the Growth scenario.

Storing electricity in huge storage facilities like Pumped Hydroelectric Storage, CAES or Hydrogen Storage are only some options. With an increased diffusion of PV in households and on office buildings, also small scale storage units like batteries could become more interesting. These could not only be used to store electricity from the own PV system. With the help of Smart Grids, these small storage units could also be fed with excess electricity from the grid, if storage space is available. A similar scheme is also discussed for electric vehicles, which will become increasingly important and competitive in 2050 within personal transport according to the feasibility study. With Smart Grids the batteries of these cars could also be used to store excess electricity. Extensive research is done on the option of combining wind power and hydrogen production to store energy. HyWindBalance, for example, a German project, has its focus on this topic.

The results of this Master Thesis can be used for further assessment into several other directions. A detailed evaluation could assess the realistic potential for additional Hydropower Storage (how many new storage basins, which dimensions, which capacity, where) or the potential for Hydrogen storage and CAES storage (based on geological information for storage options like caverns). Another question could assess, which share of the storage demand could be reduced with Smart Grids and small scale storage units. Finally, it has to be again stated that this evaluation has a systemic approach and therefore does not include economic aspects like market prices for electricity. Further assessment could also focus on costs for infrastructure or on economic aspects regarding the market. A EU-wide assessment of the energy storage discussion could also deliver new interesting insights.

To sum up, this Master Thesis shows that energy storage plays an important role, but can only be one part of a well-thought-out Load Management and Load Shifting System with Smart Grids and strong grids across the borders, if the share of electricity from Renewable Energy Carriers is constantly increasing in the future.

7 Acknowledgements

Writing this Master Thesis would not have been possible and much more difficult without the support of several people. First of all I want to thank Raiffeisenlandesbank Niederösterreich-Wien for granting me a scholarship. Without that I would have not been able to do this study. I furthermore like to thank Mag. Robert Maier, who gave me the freedom to choose a topic of my personal interest for this Master Thesis. I want to thank Ao.Univ.Prof. Dipl.-Ing. Dr.techn. Reinhard Haas for the great confidence he had in me. He had the ability to give me hints and input when needed but let me develop my own ideas and concepts without restrictions. Furthermore it has to be stated that without the help of my sister, Mag. (FH) Kathrin Hala-Grünwald, this masterpeace of excel-work including 63 tables and 28 graphs, which I developed on my own, would have never been that professional and efficient. She provided me with the knowledge of a controller, taught me important functions and helped me whenever it was necessary to find creative solutions and procedures to gain results. Now I am an excel expert too. I want to thank my grandmother Gertrude Schauer, for being my private bank, giving me an interest-free loan to finance the remaining part of the fees. Thank you to Ines Glatz-Deuretzbacher and Christoph Glatz as my employers at november design & pr gmbh for respecting my needs as a student, supporting me all the time, showing interest in my study and becoming my friends. I want to thank my friend Mag. Elisabeth Jaklitsch, for correcting my Master Thesis, using her knowledge from the Academic Writing Class – now we both know why it made sense to attend the course. Thank you to the funny people from the Dachboden of the 25hours hotel, which became my living room during the last months. This place offered me the inspiring atmosphere to develop ideas and at the same time I felt like being with friends there all the time. Finally I want to thank Verbund, Tiwag and Illwerke for offering me data about the energy content of storage basins in Austria, which where essential to gain significant results. Thank you to all my family and friends for fortifying me in my decisions and ideas and for all the interesting and inspiring conversations.

8 References

Books/Journals

- Alamri, B.R.: Technical review of energy storage technologies when integrated with intermittent renewable energy. SUPERGEN '09, 2009.
- Barbir, F.: Fuel cells for clean power generation: Status and Perspectives. In: Assessment of Hydrogen Energy for Sustainable Development, Springer, 2007, pp. 113-122.
- Edison, T.: Electricity. In: Energy for a Sustainable World, Wiley-VCH, 2011, pp. 253-277
- Ellison, H.: Hydrogen. In: Energy for a Sustainable World, Wiley-VCH, 2011, pp. 279-299
- Fechner, H. et al.: Technologie-Roadmap für Photovoltaik in Österreich. Bundesministerium für Verkehr, Innovation und Technologie, 2007
- Friedrich, K. et al.: Fuel Cells Using Hydrogen, In: Hydrogen as a future energy carrier, Wiley-VCH, 2008, pp. 335-364
- Grimes, C.: Light, Water, Hydrogen, The Solar Generation of Hydrogen by Water Photoelectrolysis. Springer Science+Business Media, 2008.
- Huggins, R.: Energy storage. Springer, 2010.
- Karamanolis, S.: Photovoltaik, Schlüsseltechnologie der Solarenergie. E. Karamanolis Verlag, 2009.
- Lymberopoulos, N.: Hydrogen from Renewables. In: Assessment of Hydrogen Energy for Sustainable Development, Springer, 2007, pp. 51-58.
- Neupert, U.: Energiespeicher. Fraunhofer-IRB-Verl., 2009.
- O'Malley, L.: Financing renewables storage. In: A Renewable World, Energy, Ecology, Equality; A Report for the World Future Council, Green Books, 2009, pp. 91-92.
- Quaschnig, V.: Regenerative Energiesysteme. Hanser, 2009.
- Rummich, E.: Energiespeicher. Expert Verlag, 2009.
- Streicher, W. et al.: Energieautarkie für Österreich 2050. Klima- und Energiefonds, 2010.
- Tetzlaff, K.: Bio-Wasserstoff. Books on Demand, 2005.
- Wittstadt, U.: Electrolysis: Hydrogen Production Using Electricity, In: Hydrogen as a future energy carrier, Wiley-VCH, 2008, pp. 155-164
- Züttel, A.: Hydrogen Storage in Molecular Form, In: Hydrogen as a future energy carrier, Wiley-VCH, 2008, pp. 165-173

Internet

<http://bravenewclimate.com/2009/08/31/solar-thermal-questions/>, 20.10.2011

<http://derstandard.at/1319181179212/Deutschland-Weltweit-erstes-Wind-Wasserstoff-Hybridkraftwerk-gestartet>, 17.01.2012

<http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php#>, 25.01.2012

<http://relevant.at/wirtschaft/energie/154528/pumpspeicher-kws-oesterreich-gruene-batterie.story>, 17.01.2012

<http://www.e-control.at>

<http://www.e-control.at/de/statistik/strom/betriebsstatistik/betriebsstatistik2010>, 27.10.2011

http://www.eurosolar.org/new/pdfs_neu/Main/IRES2006_Bossel.pdf, 01.10.1011

<http://www.illwerke.at/inhalt/at/189.htm>, 07.10.2011

http://www.kopswerk2.at/downloads/090505_Vorstand_OK_KOWII_Prospekt.pdf, 17.01.2012

<http://www.kraftwerkforschung.info/weltweit-erstes-wasserstoffkraftwerk-in-betrieb/>, 17.01.2012

<http://www.newmango.com/infographics/inf/fuel-cell.jpg>, 17.10.2011

<http://www.nrel.gov/docs/fy10osti/47547.pdf>, 20.10.2011

<http://www.terna.it/LinkClick.aspx?fileticket=MgRljSQpbqs%3d&tabid=670&mid=13878>, 11.10.2011

http://www.tiroler-wasserkraft.at/de/hn/oeffentlichkeitsarbeit/aktuelle_meldungen/news/data/03569/index.php, 17.01.2012

<http://www.tiroler-wasserkraft.at/de/hn/stromerzeugung/kraftwerkspark/index.php>, 07.10.2011

<http://www.verbund.com/at/de/haushalte/verbund-hilft-fragen-antworten/wasserkraft-atomstrom-oekostrom>, 23.01.2012

<http://www.verbund.com/cc/de/news-presse/aktuelle-projekte/oesterreich/reisseck-2>, 18.01.2012

<http://www.verbund.com/cc/de/ueber-uns/unsere-kraftwerke/kraftwerkstypen/pumpspeicherkraftwerk>, 07.10.2011

<http://www.wirtschaftsblatt.at/home/schwerpunkt/greeneconomy/oesterreich-baut-pumpspeicherkraftwerke-aus-478387/index.do>, 17.01.2012

<https://www.enertrag.com/projektentwicklung/hybridkraftwerk.html#>, 17.01.2012

Articles

Daneshi, H. et al.: Generation scheduling with integration of wind power and Compressed Air Energy Storage. In: Transmission and Distribution Conference and Exposition, IEEE PES, 2010, pp. 1-6.

Goyena, S.G., et al.: Sizing and analysis of big scale and isolated electric systems based on renewable sources with energy storage. In: Sustainable Alternative Energy (SAE), IEEE PES/IAS Conference, 2009, pp.1-7.

Nasiri, A.: Integrating energy storage with renewable energy systems. In: Industrial Electronics, 2008, IECON, 2008, pp.17-18.

Nigim, K., et al.: Energy storage for renewable energy combined heat, power and hydrogen fuel (CHPH2) infrastructure. In: Electrical Power & Energy Conference (EPEC), IEEE, 2009, pp.1-6.

Taylor, J. et al.: Analysis of Compressed Air Energy Storage. In: PCIC Europe 2010 Conference Record, 2010, pp.1-5.

Appendix

A.1 Data from Verbund.....	64
A.2 Calculations	65

A.1 Data from Verbund

Pumpspeicherkraftwerk	Kraftwerkstyp	mittlere Rohfallhöhe m	Leistung Turbine/Pumpe MW	oberer Speicher	unterer Speicher
Kaprun-Oberstufe	Pumpspeicher	365,0	124/-124	Mooserboden	Wasserfallboden
Kaprun-Limberg II	Pumpspeicher		480/-480		
Roßtag	Pumpspeicher	629,7	240/-240	Schlegels Zillgründl	Stillupp
Hausling	Pumpspeicher	695,5	360/-360	Kölnbrein	Stillupp
Malta Oberstufe	Pumpspeicher	198,0	120/-116	Galgenbichl + Gößkar	
Malta Hauptstufe	Pumpspeicher	1.106,0	730/-290	Galgenbichl + Gößkar	Rottau
Speicher	Bezugskraftwerk	mittlere Rohfallhöhe m	Arbeitswert Kraftwerk kWh/m³	Nutzinhalt	Energie Speicher auf Kraftwerk bezogen MWh
Mooserboden	Kaprun-Oberstufe Kaprun-Limberg II	365,0	0,82	Mio. m3	69.652
Wasserfallboden	Kaprun-Hauptstufe	858,3	1,97	81.171	159.864
Schlegels	Roßtag	629,7	1,47	126.544	186.020
Zillgründl	Hausling	695,5	1,69	86.714	146.547
Stillupp	Mayrhofer	469,7	1,12	6.576	7.365
Mayrhofer von Zillgründl					97.120
Mayrhofer von Schlegels					141.729
Kölnbrein	Malta Oberstufe	198,0	0,43	200.200	85.300
Galgenbichl + Gößkar	Malta Hauptstufe	1.106,0	2,60	6.200	16.100
Malta Hauptstufe von Kölnbrein					519.874
Rottau				0.500	
Seenplateau Reifack	Reifack	1.772,5	4,01	17.100	68.600
Summe Kleinspeicher					40.980

A.2 Calculation

Results

comparison demand & supply – annual analysis

Constant szenario (GWh)

month	Nat. ele consumption	Supply						Sum ele. supply	into annual storage	from annual storage
		PV	Wind	Run-off HP	Stored HP	CHP	Geothermal			
January	5.451	417	1.089	915	910	519	192	4.041		1.409
February	4.973	669	990	849	759	423	192	3.881		1.092
March	5.175	1.101	990	1.606	894	361	192	5.144		31
April	4.522	1.279	990	2.121	1.039	181	192	5.801	1.278	
May	4.444	1.372	495	2.313	1.334	52	192	5.758	1.314	
June	4.376	1.383	248	1.933	1.487	7	192	5.249	873	
July	4.560	1.307	248	2.114	1.386	1	192	5.247	687	
August	4.437	1.205	248	1.759	1.470	1	192	4.874	437	
September	4.557	1.193	1.089	1.541	1.183	34	192	5.231	674	
October	4.905	838	1.139	1.304	1.073	199	192	4.744		161
November	5.029	476	1.089	1.136	622	351	192	3.865		1.164
December	5.584	356	1.089	1.211	842	471	192	4.161		1.423
Jahr	58.015	11.595	9.702	18.800	13.000	2.600	2.300	57.997	5.263	5.280

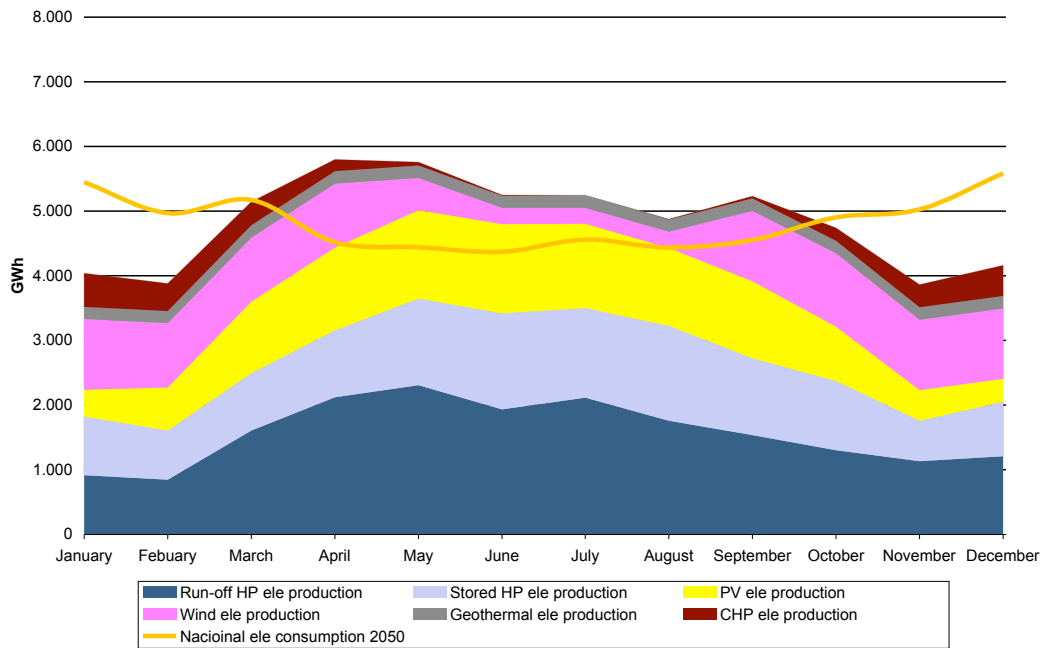
legend: data from feasibility study energy autarky 2050
 calculated from given data (constant szenario)

Growth szenario (GWh)

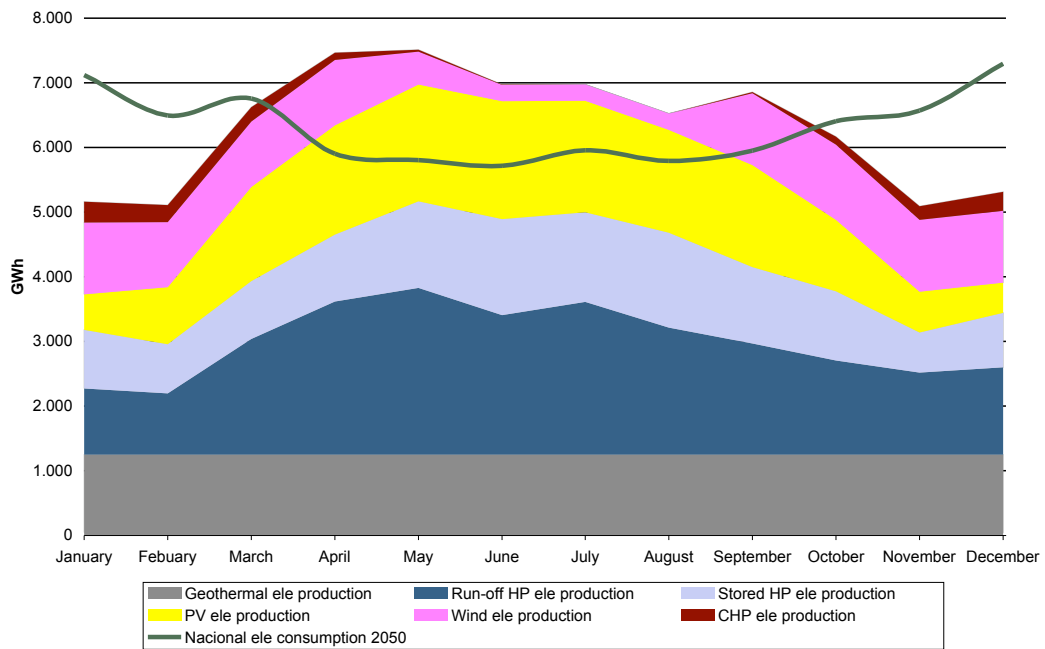
month	Nat. ele consumption	PV	Wind	Run-off HP	Stored HP	CHP	Geothermal	Sum ele. supply	into annual storage	from annual storage
January	7.122	550	1.111	1.022	910	319	1.250	5.163		1.959
February	6.498	882	1.010	948	759	260	1.250	5.110		1.387
March	6.761	1.453	1.010	1.793	894	222	1.250	6.623		138
April	5.909	1.687	1.010	2.369	1.039	111	1.250	7.467	1.558	
May	5.807	1.810	505	2.583	1.334	32	1.250	7.515	1.709	
June	5.717	1.825	253	2.159	1.487	4	1.250	6.978	1.261	
July	5.958	1.725	253	2.361	1.386	0	1.250	6.975	1.017	
August	5.797	1.591	253	1.964	1.470	0	1.250	6.529	731	
September	5.954	1.575	1.111	1.721	1.183	21	1.250	6.860	906	
October	6.409	1.106	1.162	1.457	1.073	123	1.250	6.169		249
November	6.571	629	1.111	1.269	622	216	1.250	5.096		1.474
December	7.296	470	1.111	1.352	842	290	1.250	5.316		1.980
Jahr	75.799	15.303	9.898	21.000	13.000	1.600	15.000	75.801	7.182	7.180

legend: data from feasibility study energy autarky 2050
 calculated from given data (growth szenario)

Comparison electricity demand vs. supply 2050 – constant szenario



Comparison electricity demand vs. supply 2050 – growth szenario



daily storage demand – monthly values

constant szenario

month	Daily storage demand (MWh)	Daily storage MIN (MW)	Daily storage MAX (MW)
January	–	–	–
Febuary	–	–	–
March	18.514	175	2.908
April	1.752	138	636
May	2.642	107	1.032
June	2.391	170	1.003
July	4.173	72	1.049
August	7.033	171	1.710
September	7.277	24	1.836
October	19.147	83	2.824
November	–	–	–
December	–	–	–
Year MIN	1.752	24	
Year MAX	19.147		2.908

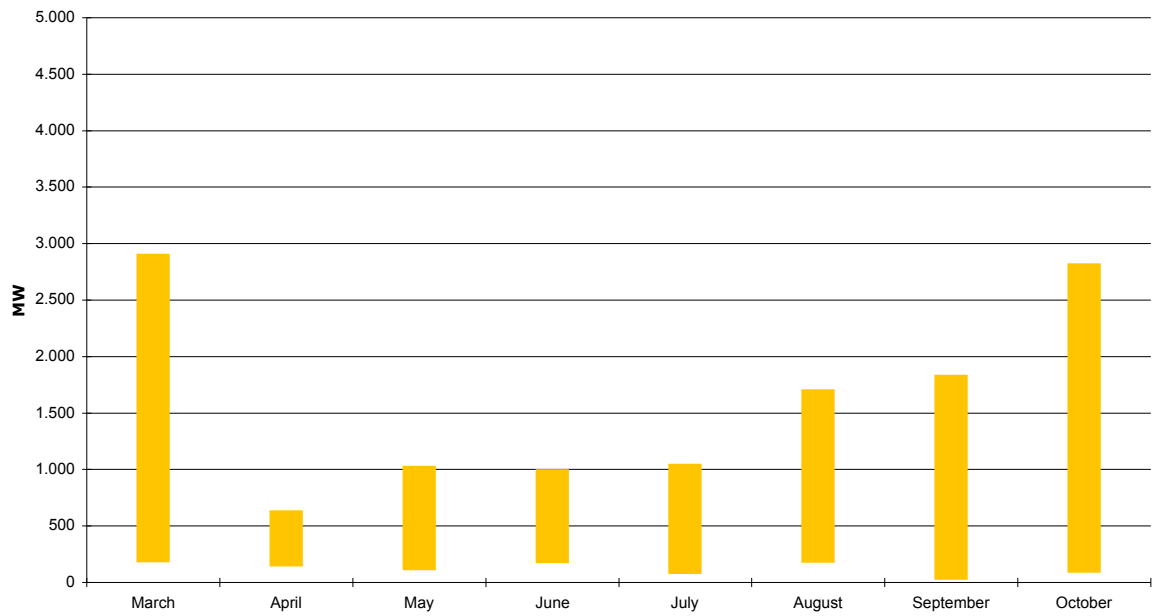
legend: calculated from given data (constant szenario)

growth szenario

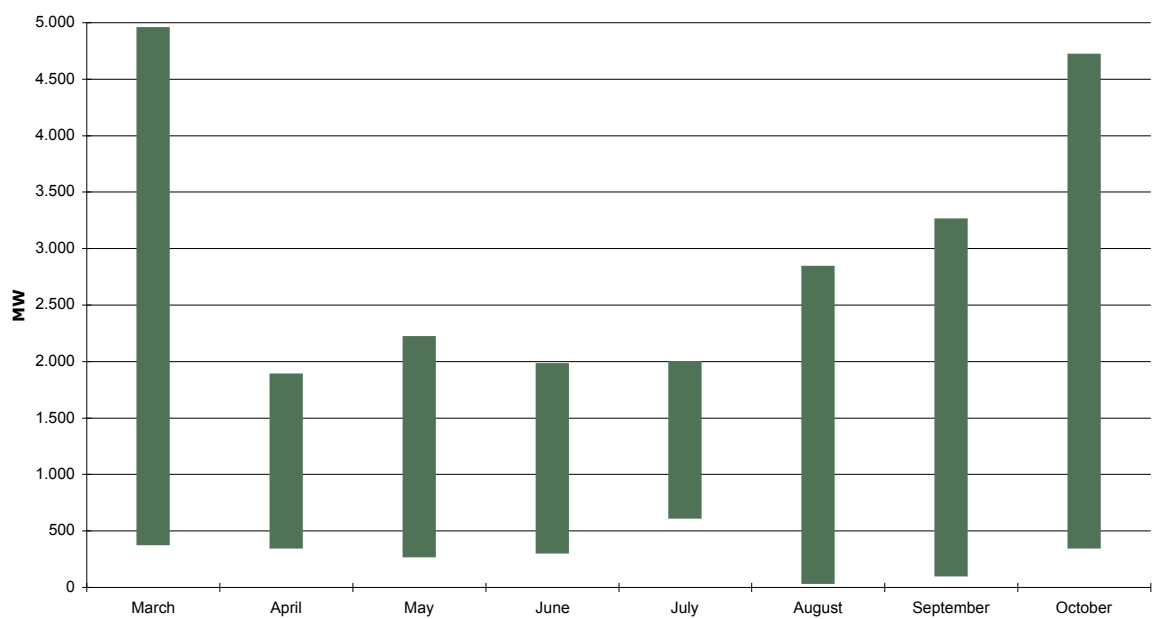
month	Daily storage demand (MWh)	Daily storage MIN (MW)	Daily storage MAX (MW)
January	–	–	–
Febuary	–	–	–
March	36.991	371	4.961
April	6.640	342	1.893
May	6.412	264	2.223
June	5.648	298	1.985
July	8.448	608	2.001
August	12.296	28	2.845
September	15.281	97	3.266
October	36.696	342	4.722
November	–	–	–
December	–	–	–
Year MIN	5.648	28	
Year MAX	36.991		4.961

legend: calculated from given data (growth szenario)

Daily storage demand range, monthly values – constant szenario



Daily storage demand range, monthly values – growth szenario



Comparison demand + supply one day January

Constant szenario (MW) – January

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	6.530	258	697	1.223	1.230	1.464	–	4.872	–	-1.657
1:00	6.210	258	697	1.223	1.230	1.464	–	4.872	–	-1.338
2:00	6.006	258	697	1.223	1.230	1.464	–	4.872	–	-1.134
3:00	5.849	258	697	1.223	1.230	1.464	–	4.872	–	-977
4:00	5.804	258	697	1.223	1.230	1.464	–	4.872	–	-932
5:00	6.153	258	697	1.223	1.230	1.464	–	4.872	–	-1.281
6:00	6.928	258	697	1.223	1.230	1.464	–	4.872	–	-2.056
7:00	8.058	258	697	1.223	1.230	1.464	–	4.872	–	-3.186
8:00	8.472	258	697	1.223	1.230	1.464	711	5.583	–	-2.888
9:00	8.601	258	697	1.223	1.230	1.464	1.758	6.630	–	-1.971
10:00	8.739	258	697	1.223	1.230	1.464	2.544	7.417	–	-1.323
11:00	8.798	258	697	1.223	1.230	1.464	3.017	7.889	–	-909
12:00	8.651	258	697	1.223	1.230	1.464	3.145	8.017	–	-634
13:00	8.523	258	697	1.223	1.230	1.464	2.929	7.801	–	-722
14:00	8.381	258	697	1.223	1.230	1.464	2.377	7.249	–	-1.132
15:00	8.276	258	697	1.223	1.230	1.464	1.361	6.233	–	-2.043
16:00	8.298	258	697	1.223	1.230	1.464	486	5.358	–	-2.940
17:00	8.749	258	697	1.223	1.230	1.464	–	4.872	–	-3.876
18:00	8.878	258	697	1.223	1.230	1.464	–	4.872	–	-4.005
19:00	8.647	258	697	1.223	1.230	1.464	–	4.872	–	-3.775
20:00	8.118	258	697	1.223	1.230	1.464	–	4.872	–	-3.246
21:00	7.519	258	697	1.223	1.230	1.464	–	4.872	–	-2.647
22:00	7.451	258	697	1.223	1.230	1.464	–	4.872	–	-2.579
23:00	7.047	258	697	1.223	1.230	1.464	–	4.872	–	-2.174
MIN										634
MAX										4.005

January	MWh
daily electricity production	135.059
daily electricity consumption	185.615
from annual storage	50.557

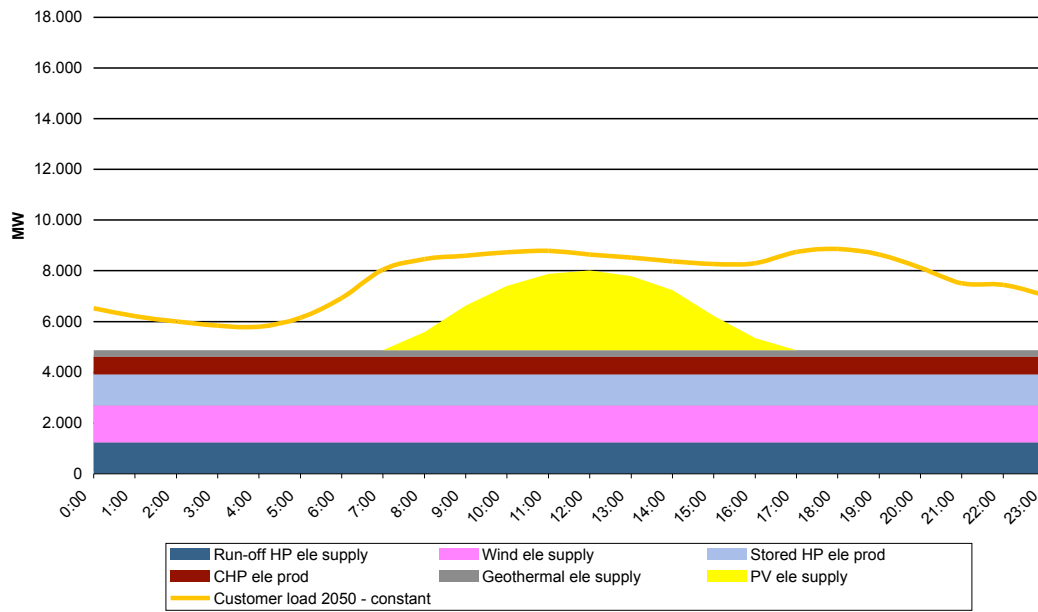
Growth szenario (MW) – January

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	9.323	1.680	429	1.223	1.374	1.493	–	6.200	–	-3.123
1:00	8.867	1.680	429	1.223	1.374	1.493	–	6.200	–	-2.868
2:00	8.575	1.680	429	1.223	1.374	1.493	–	6.200	–	-2.375
3:00	8.351	1.680	429	1.223	1.374	1.493	–	6.200	–	-2.191
4:00	8.287	1.680	429	1.223	1.374	1.493	–	6.200	–	-2.087
5:00	8.785	1.680	429	1.223	1.374	1.493	–	6.200	–	-2.585
6:00	9.891	1.680	429	1.223	1.374	1.493	–	6.200	–	-3.691
7:00	11.504	1.680	429	1.223	1.374	1.493	–	6.200	–	-5.304
8:00	12.095	1.680	429	1.223	1.374	1.493	864	7.064	–	-5.032
9:00	12.280	1.680	429	1.223	1.374	1.493	2.135	8.335	–	-3.945
10:00	12.478	1.680	429	1.223	1.374	1.493	3.090	9.290	–	-3.188
11:00	12.562	1.680	429	1.223	1.374	1.493	3.664	9.864	–	-2.688
12:00	12.352	1.680	429	1.223	1.374	1.493	3.819	10.019	–	-2.333
13:00	12.169	1.680	429	1.223	1.374	1.493	3.556	9.756	–	-2.413
14:00	11.966	1.680	429	1.223	1.374	1.493	2.886	9.086	–	-2.880
15:00	11.816	1.680	429	1.223	1.374	1.493	1.652	7.852	–	-3.954
16:00	11.848	1.680	429	1.223	1.374	1.493	590	6.790	–	-5.058
17:00	12.491	1.680	429	1.223	1.374	1.493	–	6.200	–	-6.291
18:00	12.675	1.680	429	1.223	1.374	1.493	–	6.200	–	-6.475
19:00	12.345	1.680	429	1.223	1.374	1.493	–	6.200	–	-6.145
20:00	11.591	1.680	429	1.223	1.374	1.493	–	6.200	–	-5.391
21:00	10.736	1.680	429	1.223	1.374	1.493	–	6.200	–	-4.836
22:00	10.638	1.680	429	1.223	1.374	1.493	–	6.200	–	-4.438
23:00	10.061	1.680	429	1.223	1.374	1.493	–	6.200	–	-3.891
MIN										2.087
MAX										6.475

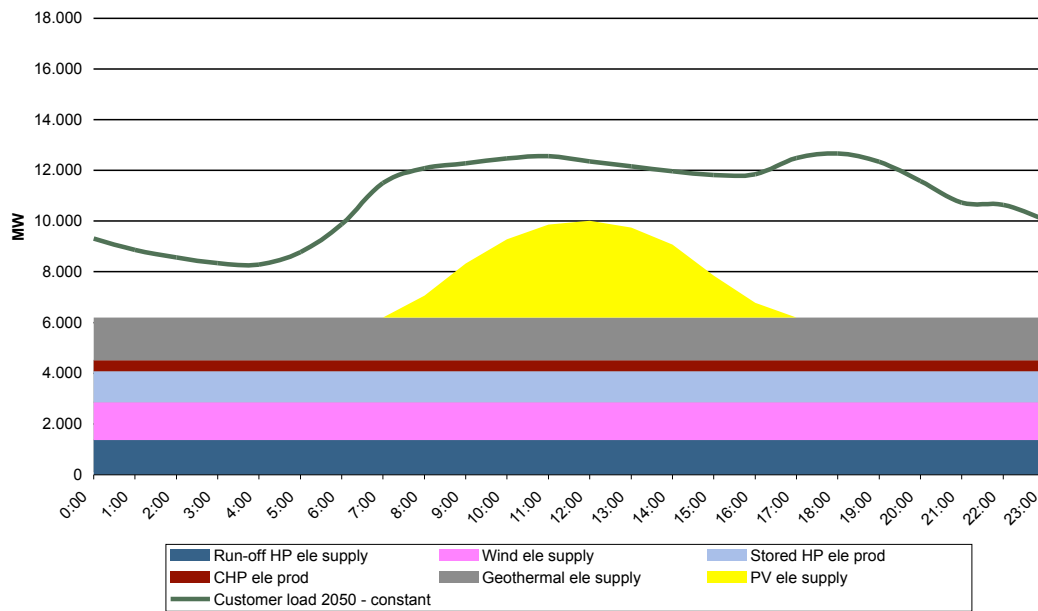
January	MWh
daily electricity production	132.788
daily electricity consumption	242.516
from annual storage	109.728

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply january – constant szenario



Comparison daily electricity demand vs. supply january – constant szenario



Comparison demand + supply one day February

Constant szenario (MW) – February

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	6.581	258	629	1.130	1.263	1.473	–	4.753	–	-1.828
1:00	6.274	258	629	1.130	1.263	1.473	–	4.753	–	-1.521
2:00	6.076	258	629	1.130	1.263	1.473	–	4.753	–	-1.322
3:00	5.856	258	629	1.130	1.263	1.473	–	4.753	–	-1.102
4:00	5.816	258	629	1.130	1.263	1.473	–	4.753	–	-1.062
5:00	6.118	258	629	1.130	1.263	1.473	–	4.753	–	-1.365
6:00	6.785	258	629	1.130	1.263	1.473	–	4.753	–	-2.031
7:00	7.861	258	629	1.130	1.263	1.473	–	4.753	–	-3.108
8:00	8.304	258	629	1.130	1.263	1.473	1.674	6.428	–	-1.876
9:00	8.515	258	629	1.130	1.263	1.473	3.075	7.828	–	-687
10:00	8.553	258	629	1.130	1.263	1.473	4.002	8.756	203	–
11:00	8.682	258	629	1.130	1.263	1.473	4.563	9.317	634	–
12:00	8.523	258	629	1.130	1.263	1.473	4.705	9.458	935	–
13:00	8.342	258	629	1.130	1.263	1.473	4.457	9.211	869	–
14:00	8.188	258	629	1.130	1.263	1.473	3.808	8.561	373	–
15:00	8.121	258	629	1.130	1.263	1.473	2.787	7.541	–	-580
16:00	8.005	258	629	1.130	1.263	1.473	1.383	6.136	–	-1.869
17:00	8.096	258	629	1.130	1.263	1.473	–	4.753	–	-3.342
18:00	8.728	258	629	1.130	1.263	1.473	–	4.753	–	-3.974
19:00	8.563	258	629	1.130	1.263	1.473	–	4.753	–	-3.810
20:00	7.954	258	629	1.130	1.263	1.473	–	4.753	–	-3.200
21:00	7.432	258	629	1.130	1.263	1.473	–	4.753	–	-2.678
22:00	7.345	258	629	1.130	1.263	1.473	–	4.753	–	-2.591
23:00	6.845	258	629	1.130	1.263	1.473	–	4.753	–	-2.091
								MIN	203	580
								MAX	935	3.974

Febuary	MWh
daily electricity production	145.048
daily electricity consumption	188.177
from annual storage	43.129

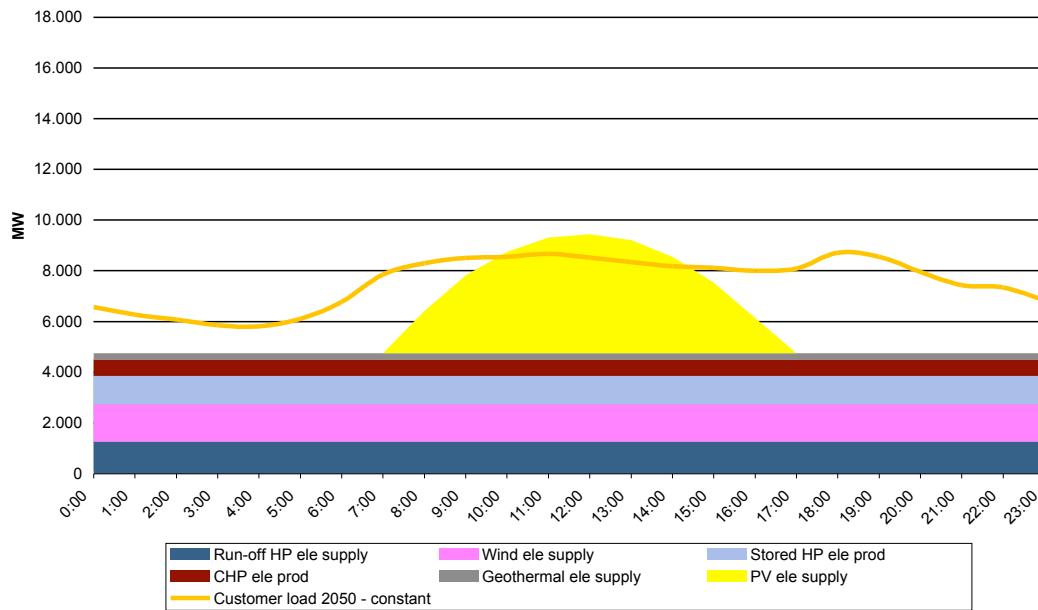
Growth szenario (MW) – February

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	9.396	1.680	362	1.055	1.317	1.403	–	5.816	–	-3.580
1:00	8.958	1.680	362	1.055	1.317	1.403	–	5.816	–	-3.142
2:00	8.675	1.680	362	1.055	1.317	1.403	–	5.816	–	-2.859
3:00	8.360	1.680	362	1.055	1.317	1.403	–	5.816	–	-2.544
4:00	8.303	1.680	362	1.055	1.317	1.403	–	5.816	–	-2.487
5:00	8.735	1.680	362	1.055	1.317	1.403	–	5.816	–	-2.919
6:00	9.687	1.680	362	1.055	1.317	1.403	–	5.816	–	-3.871
7:00	11.224	1.680	362	1.055	1.317	1.403	–	5.816	–	-5.408
8:00	11.856	1.680	362	1.055	1.317	1.403	2.033	7.849	–	-4.007
9:00	12.157	1.680	362	1.055	1.317	1.403	3.733	9.549	–	-3.606
10:00	12.211	1.680	362	1.055	1.317	1.403	4.860	10.676	–	-1.535
11:00	12.396	1.680	362	1.055	1.317	1.403	5.541	11.357	–	-1.036
12:00	12.169	1.680	362	1.055	1.317	1.403	5.713	11.529	–	-641
13:00	11.910	1.680	362	1.055	1.317	1.403	5.412	11.228	–	-601
14:00	11.690	1.680	362	1.055	1.317	1.403	4.624	10.440	–	-1.250
15:00	11.594	1.680	362	1.055	1.317	1.403	3.385	9.201	–	-2.394
16:00	11.429	1.680	362	1.055	1.317	1.403	1.679	7.495	–	-3.934
17:00	11.559	1.680	362	1.055	1.317	1.403	–	5.816	–	-5.743
18:00	12.461	1.680	362	1.055	1.317	1.403	–	5.816	–	-6.645
19:00	12.226	1.680	362	1.055	1.317	1.403	–	5.816	–	-6.410
20:00	11.356	1.680	362	1.055	1.317	1.403	–	5.816	–	-5.540
21:00	10.611	1.680	362	1.055	1.317	1.403	–	5.816	–	-4.795
22:00	10.487	1.680	362	1.055	1.317	1.403	–	5.816	–	-4.671
23:00	9.773	1.680	362	1.055	1.317	1.403	–	5.816	–	-3.837
								MIN		641
								MAX		6.645

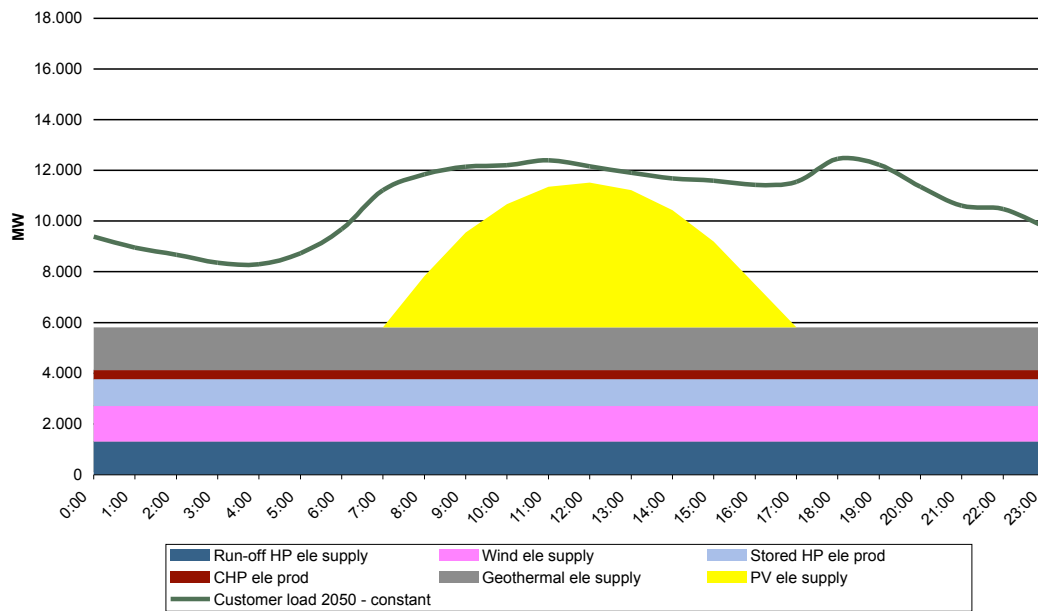
Febuary	MWh
daily electricity production	136.410
daily electricity consumption	245.863
from annual storage	109.454

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply february – constant szenario



Comparison daily electricity demand vs. supply february – constant szenario



Comparison demand + supply one day March

Constant szenario (MW) – March

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	6.326	258	485	1.202	2.158	1.331	–	5.433	–	-892	14,11%	894
1:00	5.979	258	485	1.202	2.158	1.331	–	5.433	–	-546	9,14%	549
2:00	5.806	258	485	1.202	2.158	1.331	–	5.433	–	-373	6,42%	378
3:00	5.608	258	485	1.202	2.158	1.331	–	5.433	–	-175	3,12%	179
4:00	5.613	258	485	1.202	2.158	1.331	–	5.433	–	-180	3,21%	187
5:00	5.968	258	485	1.202	2.158	1.331	–	5.433	–	-535	8,96%	575
6:00	6.740	258	485	1.202	2.158	1.331	–	5.433	–	-1.307	19,39%	1.415
7:00	7.722	258	485	1.202	2.158	1.331	1.802	7.235	–	-486	6,29%	511
8:00	8.208	258	485	1.202	2.158	1.331	3.569	9.002	795	–		
9:00	8.275	258	485	1.202	2.158	1.331	4.934	10.367	2.092	–		
10:00	8.375	258	485	1.202	2.158	1.331	5.915	11.348	2.973	–		
11:00	8.464	258	485	1.202	2.158	1.331	6.480	11.914	3.450	–		
12:00	8.313	258	485	1.202	2.158	1.331	6.635	12.068	3.755	–		
13:00	8.139	258	485	1.202	2.158	1.331	6.379	11.812	3.673	–		
14:00	8.052	258	485	1.202	2.158	1.331	5.712	11.145	3.093	–		
15:00	7.960	258	485	1.202	2.158	1.331	4.625	10.058	2.098	–		
16:00	7.831	258	485	1.202	2.158	1.331	3.181	8.614	782	–		
17:00	7.715	258	485	1.202	2.158	1.331	1.387	6.820	–	-895	11,60%	935
18:00	8.044	258	485	1.202	2.158	1.331	–	5.433	–	-2.611	32,46%	2.754
19:00	8.341	258	485	1.202	2.158	1.331	–	5.433	–	-2.908	34,87%	2.937
20:00	7.902	258	485	1.202	2.158	1.331	–	5.433	–	-2.469	31,25%	2.453
21:00	7.267	258	485	1.202	2.158	1.331	–	5.433	–	-1.834	25,24%	1.824
22:00	7.125	258	485	1.202	2.158	1.331	–	5.433	–	-1.692	23,75%	1.700
23:00	6.660	258	485	1.202	2.158	1.331	–	5.433	–	-1.227	18,42%	1.222

MIN
MAX

782
3.755
22.711

175
2.908

18.514 MWh ele demand from storage

March	MWh
daily electricity production	181.328
daily electricity consumption	174.659
into/from daily storage	18.514
into annual storage	6.670

Growth szenario (MW) – March

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	9.031	1.680	299	1.202	2.410	1.358	–	6.948	–	-2.083	23,06%	1.911
1:00	8.537	1.680	299	1.202	2.410	1.358	–	6.948	–	-1.698	18,61%	1.462
2:00	8.290	1.680	299	1.202	2.410	1.358	–	6.948	–	-1.341	16,18%	1.244
3:00	8.007	1.680	299	1.202	2.410	1.358	–	6.948	–	-1.098	13,22%	990
4:00	8.014	1.680	299	1.202	2.410	1.358	–	6.948	–	-1.066	13,30%	1.013
5:00	8.520	1.680	299	1.202	2.410	1.358	–	6.948	–	-1.672	18,45%	1.547
6:00	9.623	1.680	299	1.202	2.410	1.358	–	6.948	–	-2.675	27,79%	2.651
7:00	11.024	1.680	299	1.202	2.410	1.358	2.189	9.137	–	-1.887	17,12%	1.815
8:00	11.719	1.680	299	1.202	2.410	1.358	4.334	11.283	–	-436	3,72%	412
9:00	11.815	1.680	299	1.202	2.410	1.358	5.992	12.940	1.125	–		
10:00	11.957	1.680	299	1.202	2.410	1.358	7.182	14.131	2.173	–		
11:00	12.084	1.680	299	1.202	2.410	1.358	7.869	14.817	2.733	–		
12:00	11.869	1.680	299	1.202	2.410	1.358	8.057	15.005	3.137	–		
13:00	11.621	1.680	299	1.202	2.410	1.358	7.746	14.694	3.073	–		
14:00	11.496	1.680	299	1.202	2.410	1.358	6.936	13.884	2.388	–		
15:00	11.365	1.680	299	1.202	2.410	1.358	5.616	12.565	1.199	–		
16:00	11.181	1.680	299	1.202	2.410	1.358	3.862	10.810	–	-371	3,32%	347
17:00	11.015	1.680	299	1.202	2.410	1.358	1.684	8.633	–	-3.393	21,63%	2.277
18:00	11.485	1.680	299	1.202	2.410	1.358	–	6.948	–	-4.536	39,50%	4.380
19:00	11.910	1.680	299	1.202	2.410	1.358	–	6.948	–	-4.961	41,66%	4.585
20:00	11.283	1.680	299	1.202	2.410	1.358	–	6.948	–	-4.334	38,42%	3.940
21:00	10.376	1.680	299	1.202	2.410	1.358	–	6.948	–	-3.427	33,03%	3.119
22:00	10.173	1.680	299	1.202	2.410	1.358	–	6.948	–	-3.224	31,70%	2.966
23:00	9.509	1.680	299	1.202	2.410	1.358	–	6.948	–	-2.561	26,93%	2.333

MIN
MAX

1.125
3.137

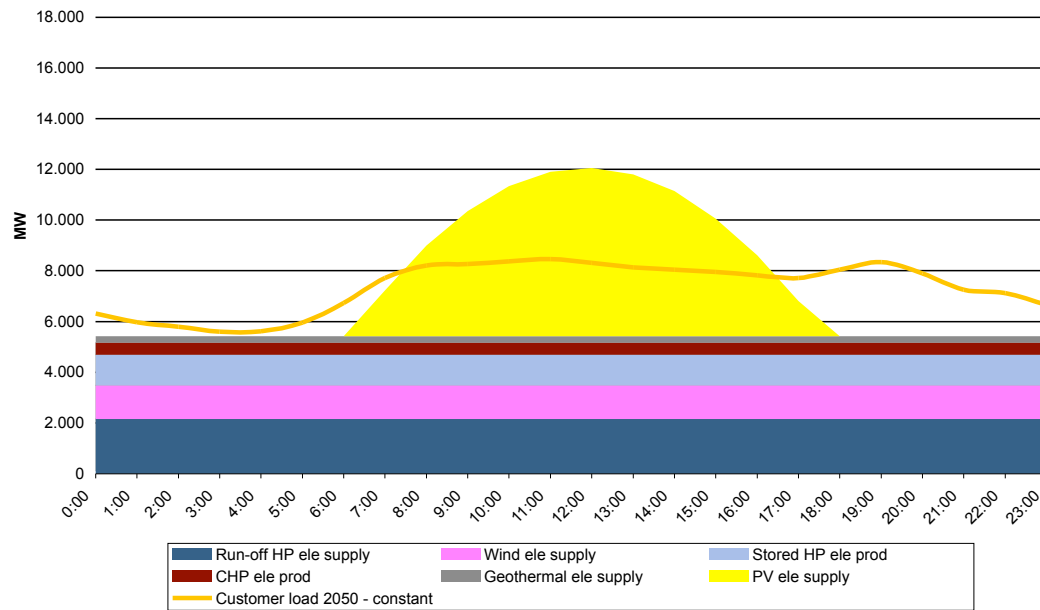
371
4.961

36.991 MWh ele demand from storage

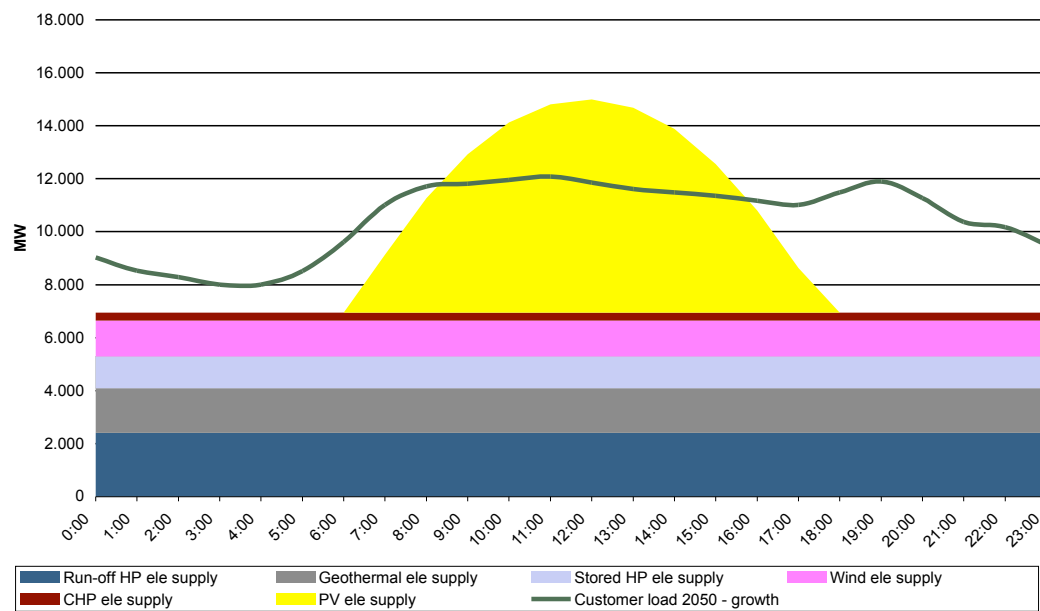
March	MWh
daily electricity production	183.554
daily electricity consumption	228.201
into/from daily storage	36.991
from annual storage	44.646

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply march – constant szenario



Comparison electricity demand vs. supply march - growth szenario



Comparison demand + supply one day April

Constant szenario (MW) – April

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.502	258	251	1.443	2.945	1.375	–	6.272	771	–		
1:00	5.130	258	251	1.443	2.945	1.375	–	6.272	1.143	–		
2:00	4.923	258	251	1.443	2.945	1.375	–	6.272	1.349	–		
3:00	4.771	258	251	1.443	2.945	1.375	–	6.272	1.501	–		
4:00	4.760	258	251	1.443	2.945	1.375	–	6.272	1.513	–		
5:00	5.185	258	251	1.443	2.945	1.375	–	6.272	1.088	–		
6:00	5.998	258	251	1.443	2.945	1.375	1.617	7.889	1.891	–		
7:00	6.902	258	251	1.443	2.945	1.375	3.583	9.855	2.952	–		
8:00	7.257	258	251	1.443	2.945	1.375	5.319	11.591	4.333	–		
9:00	7.360	258	251	1.443	2.945	1.375	6.723	12.996	5.635	–		
10:00	7.413	258	251	1.443	2.945	1.375	7.726	13.998	6.586	–		
11:00	7.589	258	251	1.443	2.945	1.375	8.300	14.573	6.983	–		
12:00	7.511	258	251	1.443	2.945	1.375	8.455	14.727	7.216	–		
13:00	7.291	258	251	1.443	2.945	1.375	8.190	14.462	7.171	–		
14:00	7.277	258	251	1.443	2.945	1.375	7.514	13.786	6.509	–		
15:00	7.168	258	251	1.443	2.945	1.375	6.405	12.678	5.510	–		
16:00	7.048	258	251	1.443	2.945	1.375	4.903	11.176	4.127	–		
17:00	6.894	258	251	1.443	2.945	1.375	3.114	9.387	2.493	–		
18:00	6.840	258	251	1.443	2.945	1.375	1.197	7.469	629	–		
19:00	6.827	258	251	1.443	2.945	1.375	–	6.272	–	-555	8.12%	562
20:00	6.908	258	251	1.443	2.945	1.375	–	6.272	–	-636	9.21%	648
21:00	6.680	258	251	1.443	2.945	1.375	–	6.272	–	-407	6.10%	403
22:00	6.411	258	251	1.443	2.945	1.375	–	6.272	–	-138	2.16%	138
23:00	5.899	258	251	1.443	2.945	1.375	–	6.272	373	–		

MIN
MAX

373
7.216

138
636

1.752 MWh ele demand from storage

April	MWh
daily electricity production	223.468
daily electricity consumption	161.019
into/from daily storage	1.752
into annual storage	62.449

Growth szenario (MW) – April

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.855	1.680	155	1.443	3.290	1.403	–	7.971	115	–		
1:00	7.324	1.680	155	1.443	3.290	1.403	–	7.971	647	–		
2:00	7.029	1.680	155	1.443	3.290	1.403	–	7.971	941	–		
3:00	6.812	1.680	155	1.443	3.290	1.403	–	7.971	1.159	–		
4:00	6.796	1.680	155	1.443	3.290	1.403	–	7.971	1.175	–		
5:00	7.402	1.680	155	1.443	3.290	1.403	–	7.971	568	–		
6:00	8.564	1.680	155	1.443	3.290	1.403	1.963	9.934	1.370	–		
7:00	9.855	1.680	155	1.443	3.290	1.403	4.350	12.321	2.466	–		
8:00	10.362	1.680	155	1.443	3.290	1.403	6.458	14.429	4.067	–		
9:00	10.509	1.680	155	1.443	3.290	1.403	8.164	16.135	5.626	–		
10:00	10.584	1.680	155	1.443	3.290	1.403	9.382	17.352	6.769	–		
11:00	10.836	1.680	155	1.443	3.290	1.403	10.079	18.050	7.214	–		
12:00	10.724	1.680	155	1.443	3.290	1.403	10.267	18.237	7.513	–		
13:00	10.410	1.680	155	1.443	3.290	1.403	9.945	17.916	7.505	–		
14:00	10.390	1.680	155	1.443	3.290	1.403	9.124	17.095	6.704	–		
15:00	10.233	1.680	155	1.443	3.290	1.403	7.778	15.748	5.515	–		
16:00	10.063	1.680	155	1.443	3.290	1.403	5.954	13.925	3.861	–		
17:00	9.842	1.680	155	1.443	3.290	1.403	3.782	11.752	1.910	–		
18:00	9.766	1.680	155	1.443	3.290	1.403	1.454	9.424	–	-342	3.50%	321
19:00	9.747	1.680	155	1.443	3.290	1.403	–	7.971	–	-1.777	18.23%	1.649
20:00	9.863	1.680	155	1.443	3.290	1.403	–	7.971	–	-1.893	19.19%	1.766
21:00	9.537	1.680	155	1.443	3.290	1.403	–	7.971	–	-1.899	16.42%	1.419
22:00	9.153	1.680	155	1.443	3.290	1.403	–	7.971	–	-1.182	12.92%	1.080
23:00	8.423	1.680	155	1.443	3.290	1.403	–	7.971	–	-402	5.37%	405

MIN
MAX

115
7.513

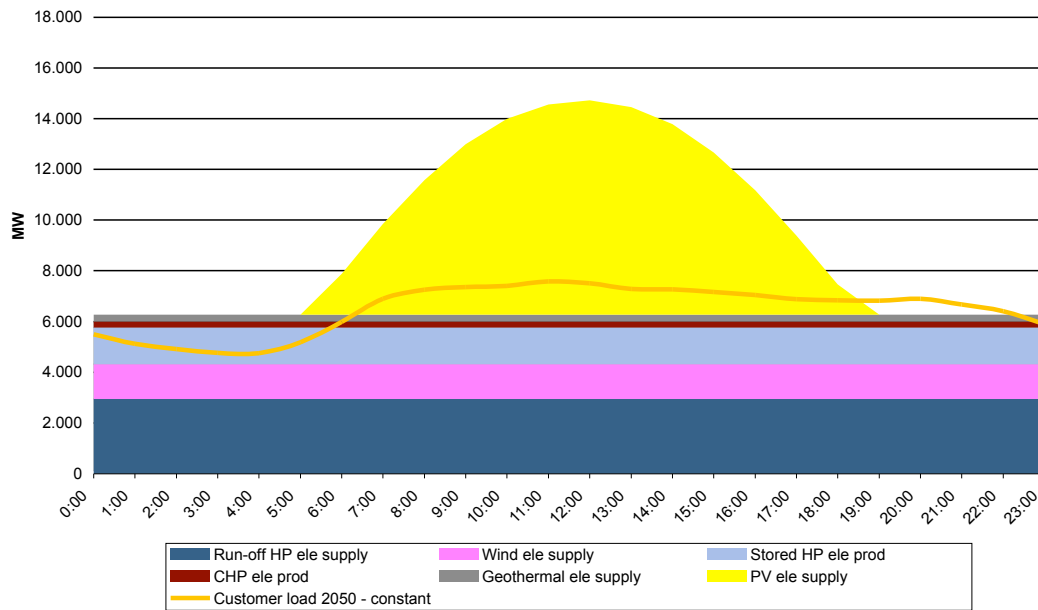
342
1.893

6.640 MWh ele demand from storage

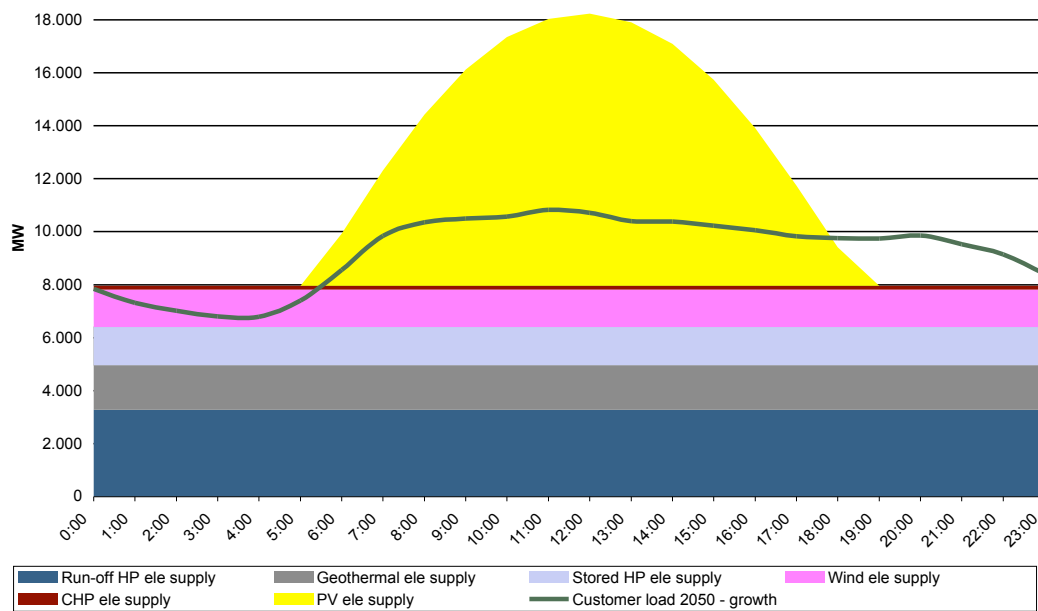
April	MWh
daily electricity production	230.087
daily electricity consumption	210.380
into/from daily storage	6.640
into annual storage	19.707

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply april – constant szenario



Comparison electricity demand vs. supply april - growth szenario



Comparison demand + supply one day May

Constant szenario (MW) – May

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.556	258	70	1.794	3.108	665	–	5.895	339	–		
1:00	5.172	258	70	1.794	3.108	665	–	5.895	723	–		
2:00	4.970	258	70	1.794	3.108	665	–	5.895	925	–		
3:00	4.819	258	70	1.794	3.108	665	–	5.895	1.076	–		
4:00	4.828	258	70	1.794	3.108	665	–	5.895	1.067	–		
5:00	5.244	258	70	1.794	3.108	665	1.104	7.000	1.755	–		
6:00	5.935	258	70	1.794	3.108	665	2.721	8.616	2.681	–		
7:00	6.826	258	70	1.794	3.108	665	4.762	10.657	3.832	–		
8:00	7.267	258	70	1.794	3.108	665	6.414	12.309	5.043	–		
9:00	7.349	258	70	1.794	3.108	665	7.739	13.635	6.286	–		
10:00	7.468	258	70	1.794	3.108	665	8.671	14.567	7.098	–		
11:00	7.661	258	70	1.794	3.108	665	9.210	15.106	7.444	–		
12:00	7.457	258	70	1.794	3.108	665	9.352	15.247	7.790	–		
13:00	7.478	258	70	1.794	3.108	665	9.113	15.008	7.530	–		
14:00	7.381	258	70	1.794	3.108	665	8.477	14.372	6.991	–		
15:00	7.349	258	70	1.794	3.108	665	7.439	13.334	5.985	–		
16:00	7.185	258	70	1.794	3.108	665	6.030	11.925	4.740	–		
17:00	7.113	258	70	1.794	3.108	665	4.311	10.207	3.094	–		
18:00	7.143	258	70	1.794	3.108	665	2.288	8.183	1.040	–		
19:00	7.101	258	70	1.794	3.108	665	707	6.602	–	-499	7.03%	414
20:00	6.928	258	70	1.794	3.108	665	–	5.895	–	-1.032	14.90%	859
21:00	6.671	258	70	1.794	3.108	665	–	5.895	–	-776	11.63%	633
22:00	6.544	258	70	1.794	3.108	665	–	5.895	–	-649	9.91%	652
23:00	6.003	258	70	1.794	3.108	665	–	5.895	–	-107	1.79%	84
								MIN	339	107		
								MAX	7.790	1.032		

May	MWh
daily electricity production	229.789
daily electricity consumption	153.047
into/from daily storage	2.642
into annual storage	76.742

MWh ele demand from storage

Growth szenario (MW) – May

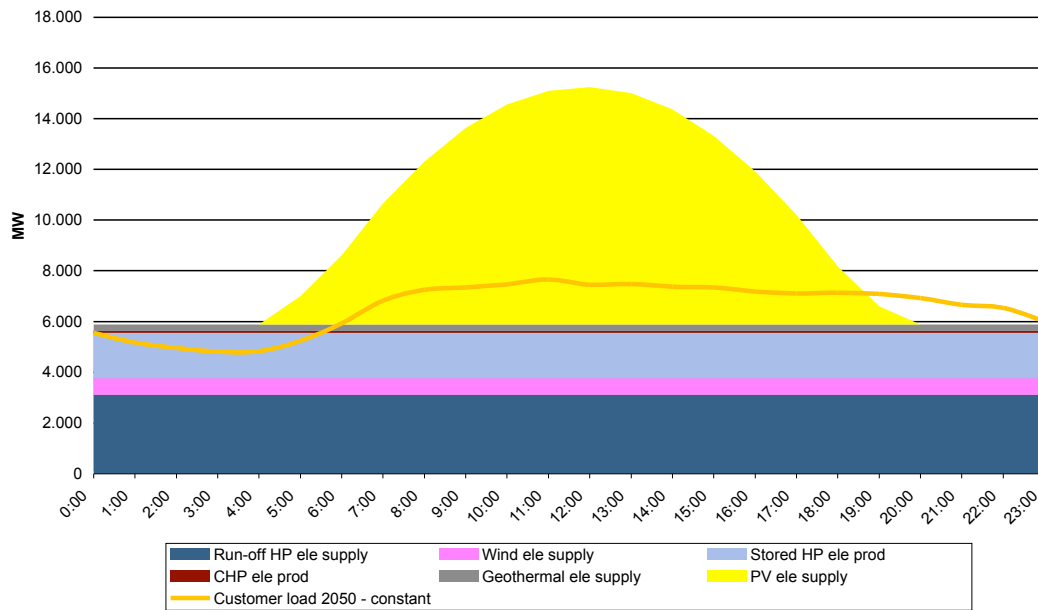
Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.932	1.680	43	1.794	3.472	679	–	7.668	–	-264	3.33%	197
1:00	7.384	1.680	43	1.794	3.472	679	–	7.668	284	–		
2:00	7.096	1.680	43	1.794	3.472	679	–	7.668	572	–		
3:00	6.880	1.680	43	1.794	3.472	679	–	7.668	788	–		
4:00	6.893	1.680	43	1.794	3.472	679	–	7.668	775	–		
5:00	7.488	1.680	43	1.794	3.472	679	1.341	9.009	1.521	–		
6:00	8.474	1.680	43	1.794	3.472	679	3.304	10.972	2.498	–		
7:00	9.745	1.680	43	1.794	3.472	679	5.782	13.450	3.705	–		
8:00	10.375	1.680	43	1.794	3.472	679	7.789	15.456	5.082	–		
9:00	10.492	1.680	43	1.794	3.472	679	9.398	17.066	6.574	–		
10:00	10.663	1.680	43	1.794	3.472	679	10.530	18.197	7.535	–		
11:00	10.939	1.680	43	1.794	3.472	679	11.184	18.852	7.913	–		
12:00	10.646	1.680	43	1.794	3.472	679	11.356	19.024	8.377	–		
13:00	10.677	1.680	43	1.794	3.472	679	11.066	18.734	8.057	–		
14:00	10.539	1.680	43	1.794	3.472	679	10.294	17.961	7.423	–		
15:00	10.492	1.680	43	1.794	3.472	679	9.033	16.701	6.209	–		
16:00	10.258	1.680	43	1.794	3.472	679	7.322	14.990	4.732	–		
17:00	10.155	1.680	43	1.794	3.472	679	5.235	12.903	2.748	–		
18:00	10.198	1.680	43	1.794	3.472	679	2.779	10.446	248	–		
19:00	10.139	1.680	43	1.794	3.472	679	858	8.526	–	-1.613	15.91%	1.223
20:00	9.891	1.680	43	1.794	3.472	679	–	7.668	–	-2.223	22.47%	1.693
21:00	9.524	1.680	43	1.794	3.472	679	–	7.668	–	-1.896	19.49%	1.387
22:00	9.343	1.680	43	1.794	3.472	679	–	7.668	–	-1.675	17.93%	1.245
23:00	8.570	1.680	43	1.794	3.472	679	–	7.668	–	-892	10.53%	667
								MIN	248	264		
								MAX	8.377	2.223		

May	MWh
daily electricity production	238.193
daily electricity consumption	199.964
into/from daily storage	6.412
into annual storage	38.229

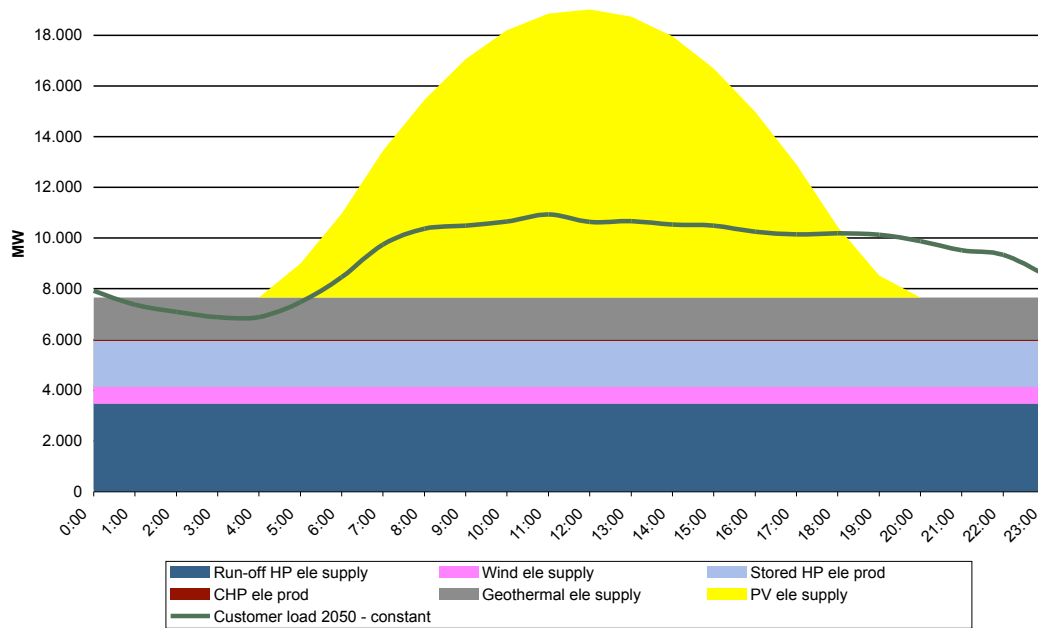
MWh ele demand from storage

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply may – constant szenario



Comparison daily electricity demand vs. supply may – growth szenario



Comparison demand + supply one day June

Constant szenario (MW) – June

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.182	258	10	2.065	2.684	344	–	5.361	179	–		
1:00	4.852	258	10	2.065	2.684	344	–	5.361	509	–		
2:00	4.651	258	10	2.065	2.684	344	–	5.361	710	–		
3:00	4.457	258	10	2.065	2.684	344	–	5.361	903	–		
4:00	4.422	258	10	2.065	2.684	344	–	5.361	939	–		
5:00	4.825	258	10	2.065	2.684	344	1.577	6.938	2.112	–		
6:00	5.665	258	10	2.065	2.684	344	3.172	8.532	2.868	–		
7:00	6.710	258	10	2.065	2.684	344	5.204	10.564	3.855	–		
8:00	7.261	258	10	2.065	2.684	344	6.794	12.155	4.894	–		
9:00	7.440	258	10	2.065	2.684	344	8.071	13.431	5.991	–		
10:00	7.605	258	10	2.065	2.684	344	8.967	14.328	6.723	–		
11:00	7.782	258	10	2.065	2.684	344	9.493	14.854	7.072	–		
12:00	7.646	258	10	2.065	2.684	344	9.634	14.995	7.349	–		
13:00	7.512	258	10	2.065	2.684	344	9.396	14.756	7.244	–		
14:00	7.375	258	10	2.065	2.684	344	8.782	14.142	6.767	–		
15:00	7.302	258	10	2.065	2.684	344	7.784	13.144	5.842	–		
16:00	7.101	258	10	2.065	2.684	344	6.423	11.784	4.682	–		
17:00	6.990	258	10	2.065	2.684	344	4.766	10.127	3.137	–		
18:00	6.851	258	10	2.065	2.684	344	2.730	8.091	1.239	–		
19:00	6.693	258	10	2.065	2.684	344	1.162	6.522	–	-171	2.55%	143
20:00	6.363	258	10	2.065	2.684	344	–	5.361	–	-1.003	15.76%	847
21:00	6.202	258	10	2.065	2.684	344	–	5.361	–	-842	13.57%	703
22:00	6.034	258	10	2.065	2.684	344	–	5.361	–	-674	11.17%	560
23:00	5.530	258	10	2.065	2.684	344	–	5.361	–	-170	3.07%	139
								MIN	179	170		
								MAX	7.349	1.003		
												2.391 MWh ele demand from storage

June	MWh
daily electricity production	223.055
daily electricity consumption	134.303
into/from daily storage	2.391
into annual storage	88.752

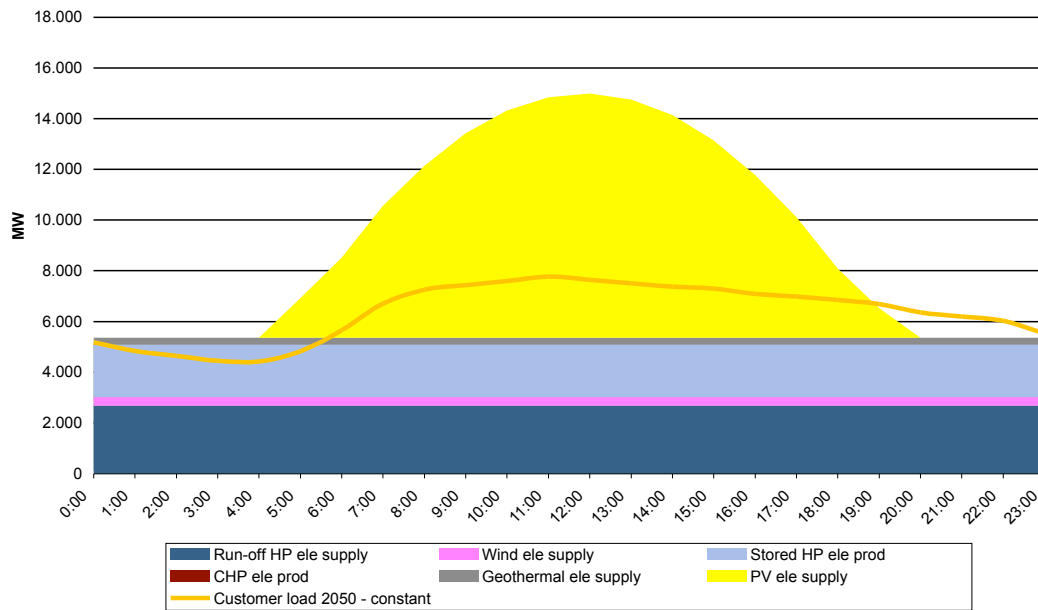
Growth szenario (MW) – June

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.398	1.680	6	2.065	2.999	351	–	7.100	–	-298	4.03%	226
1:00	6.927	1.680	6	2.065	2.999	351	–	7.100	174	–		
2:00	6.640	1.680	6	2.065	2.999	351	–	7.100	460	–		
3:00	6.364	1.680	6	2.065	2.999	351	–	7.100	736	–		
4:00	6.313	1.680	6	2.065	2.999	351	–	7.100	787	–		
5:00	6.889	1.680	6	2.065	2.999	351	1.915	9.015	2.126	–		
6:00	8.088	1.680	6	2.065	2.999	351	3.851	10.952	2.864	–		
7:00	9.580	1.680	6	2.065	2.999	351	6.319	13.419	3.839	–		
8:00	10.367	1.680	6	2.065	2.999	351	8.250	15.350	4.984	–		
9:00	10.623	1.680	6	2.065	2.999	351	9.800	16.900	6.278	–		
10:00	10.858	1.680	6	2.065	2.999	351	10.889	17.989	7.131	–		
11:00	11.110	1.680	6	2.065	2.999	351	11.527	18.628	7.518	–		
12:00	10.916	1.680	6	2.065	2.999	351	11.699	18.799	7.883	–		
13:00	10.726	1.680	6	2.065	2.999	351	11.409	18.510	7.784	–		
14:00	10.530	1.680	6	2.065	2.999	351	10.664	17.764	7.234	–		
15:00	10.425	1.680	6	2.065	2.999	351	9.451	16.552	6.126	–		
16:00	10.139	1.680	6	2.065	2.999	351	7.799	14.900	4.761	–		
17:00	9.980	1.680	6	2.065	2.999	351	5.788	12.888	2.908	–		
18:00	9.782	1.680	6	2.065	2.999	351	3.315	10.415	633	–		
19:00	9.556	1.680	6	2.065	2.999	351	1.411	8.511	–	-1.032	10.94%	800
20:00	9.085	1.680	6	2.065	2.999	351	–	7.100	–	-1.985	21.85%	1.534
21:00	8.855	1.680	6	2.065	2.999	351	–	7.100	–	-1.702	19.82%	1.341
22:00	8.616	1.680	6	2.065	2.999	351	–	7.100	–	-1.515	17.59%	1.152
23:00	7.896	1.680	6	2.065	2.999	351	–	7.100	–	-170	10.08%	595
								MIN	174	298		
								MAX	7.883	1.985		
												5.648 MWh ele demand from storage

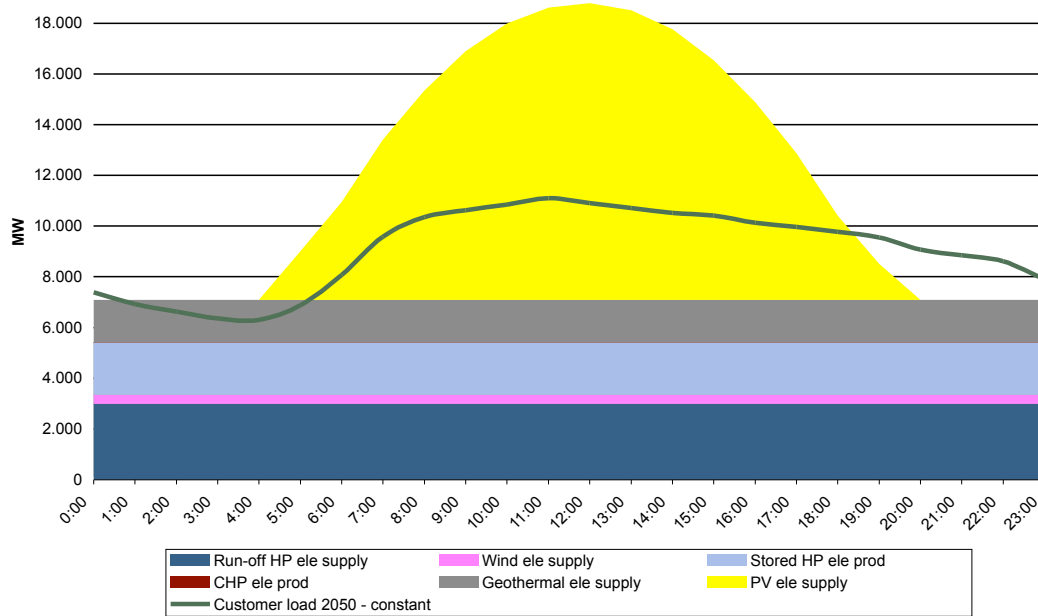
June	MWh
daily electricity production	230.668
daily electricity consumption	175.474
into/from daily storage	5.648
into annual storage	55.194

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply june – constant szenario



Comparison daily electricity demand vs. supply june – growth szenario



Comparison demand + supply one day July

Constant szenario (MW) – July

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.369	258	1	1.863	2.842	333	–	5.296	–	-72	1,35%	72
1:00	4.919	258	1	1.863	2.842	333	–	5.296	377	–		
2:00	4.733	258	1	1.863	2.842	333	–	5.296	564	–		
3:00	4.570	258	1	1.863	2.842	333	–	5.296	727	–		
4:00	4.558	258	1	1.863	2.842	333	–	5.296	738	–		
5:00	4.846	258	1	1.863	2.842	333	1.356	6.652	1.806	–		
6:00	5.538	258	1	1.863	2.842	333	3.026	8.322	2.785	–		
7:00	6.414	258	1	1.863	2.842	333	5.230	10.527	4.113	–		
8:00	6.993	258	1	1.863	2.842	333	7.002	12.298	5.305	–		
9:00	7.221	258	1	1.863	2.842	333	8.446	13.742	6.521	–		
10:00	7.496	258	1	1.863	2.842	333	9.480	14.776	7.280	–		
11:00	7.728	258	1	1.863	2.842	333	10.076	15.373	7.645	–		
12:00	7.673	258	1	1.863	2.842	333	10.244	15.540	7.867	–		
13:00	7.530	258	1	1.863	2.842	333	9.970	15.266	7.736	–		
14:00	7.425	258	1	1.863	2.842	333	9.259	14.555	7.131	–		
15:00	7.345	258	1	1.863	2.842	333	8.119	13.416	6.070	–		
16:00	7.200	258	1	1.863	2.842	333	6.586	11.883	4.683	–		
17:00	7.060	258	1	1.863	2.842	333	4.749	10.045	2.985	–		
18:00	6.913	258	1	1.863	2.842	333	2.580	7.876	963	–		
19:00	6.675	258	1	1.863	2.842	333	950	6.246	–	-429	6,42%	436
20:00	6.345	258	1	1.863	2.842	333	–	5.296	–	-1.049	16,53%	1.079
21:00	6.328	258	1	1.863	2.842	333	–	5.296	–	-1.031	16,30%	1.062
22:00	6.307	258	1	1.863	2.842	333	–	5.296	–	-1.011	16,02%	1.020
23:00	5.800	258	1	1.863	2.842	333	–	5.296	–	-504	8,69%	503

MIN
MAX

377
7.867

72
1.049

4.173 MWh ele demand from storage

July	MWh
daily electricity production	224.428
daily electricity consumption	156.182
into/from daily storage	4.173
into annual storage	68.246

Growth szenario (MW) – July

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.665	1.680	1	1.863	3.174	339	–	7.058	–	-608	7,93%	557
1:00	7.023	1.680	1	1.863	3.174	339	–	7.058	35	–		
2:00	6.757	1.680	1	1.863	3.174	339	–	7.058	300	–		
3:00	6.524	1.680	1	1.863	3.174	339	–	7.058	533	–		
4:00	6.508	1.680	1	1.863	3.174	339	–	7.058	550	–		
5:00	6.919	1.680	1	1.863	3.174	339	1.647	8.704	1.785	–		
6:00	7.906	1.680	1	1.863	3.174	339	3.674	10.732	2.826	–		
7:00	9.157	1.680	1	1.863	3.174	339	6.351	13.409	4.251	–		
8:00	9.984	1.680	1	1.863	3.174	339	8.502	15.560	5.576	–		
9:00	10.310	1.680	1	1.863	3.174	339	10.256	17.314	7.003	–		
10:00	10.703	1.680	1	1.863	3.174	339	11.511	18.569	7.866	–		
11:00	11.033	1.680	1	1.863	3.174	339	12.235	19.293	8.260	–		
12:00	10.955	1.680	1	1.863	3.174	339	12.439	19.497	8.541	–		
13:00	10.752	1.680	1	1.863	3.174	339	12.107	19.164	8.413	–		
14:00	10.600	1.680	1	1.863	3.174	339	11.243	18.301	7.700	–		
15:00	10.487	1.680	1	1.863	3.174	339	9.859	16.917	6.429	–		
16:00	10.280	1.680	1	1.863	3.174	339	7.998	15.055	4.775	–		
17:00	10.080	1.680	1	1.863	3.174	339	5.766	12.824	2.744	–		
18:00	9.870	1.680	1	1.863	3.174	339	3.133	10.190	320	–		
19:00	9.530	1.680	1	1.863	3.174	339	1.153	8.211	–	-1.319	0,14	1.229
20:00	9.059	1.680	1	1.863	3.174	339	–	7.058	–	-2.001	0,22	1.884
21:00	9.034	1.680	1	1.863	3.174	339	–	7.058	–	-1.872	0,22	1.863
22:00	9.005	1.680	1	1.863	3.174	339	–	7.058	–	-1.947	0,22	1.798
23:00	8.281	1.680	1	1.863	3.174	339	–	7.058	–	-1.223	0,15	1.118

MIN
MAX

35
8.541

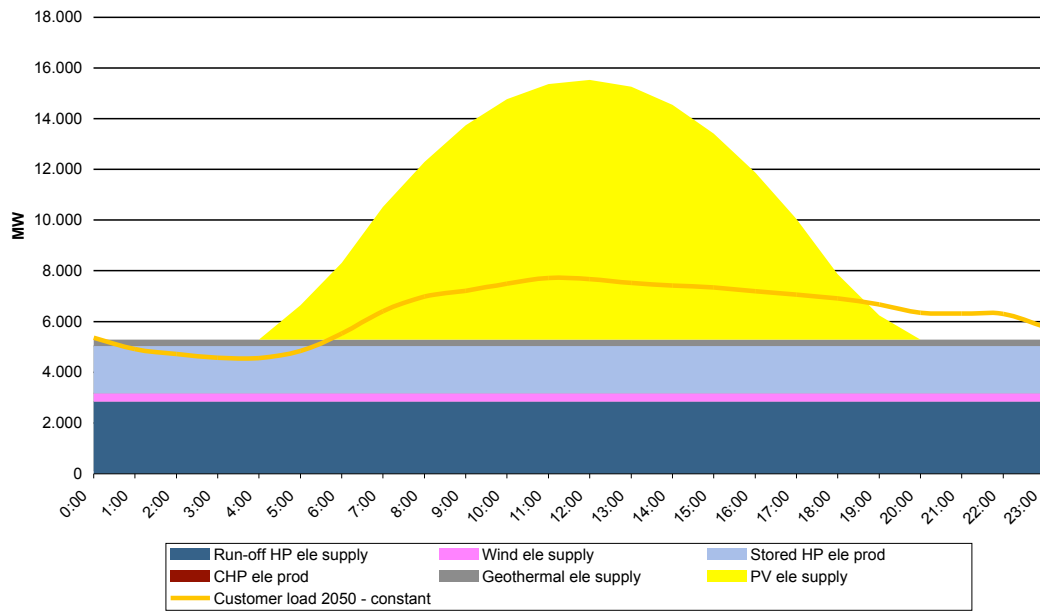
608
2.001

8.448 MWh ele demand from storage

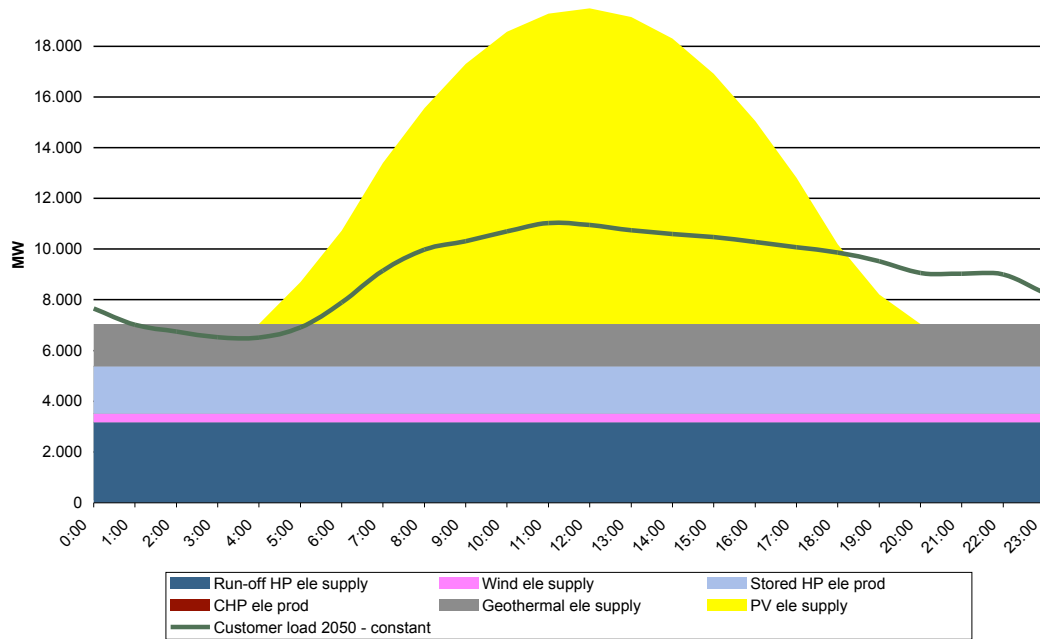
July	MWh
daily electricity production	232.560
daily electricity consumption	204.060
into/from daily storage	8.448
into annual storage	28.500

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply july – constant szenario



Comparison daily electricity demand vs. supply july – growth szenario



Comparison demand + supply one day August

Constant szenario (MW) – August

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.113	258	1	1.976	2.364	333	–	4.931	–	-182	3,55%	183
1:00	4.740	258	1	1.976	2.364	333	–	4.931	192	–		
2:00	4.601	258	1	1.976	2.364	333	–	4.931	331	–		
3:00	4.387	258	1	1.976	2.364	333	–	4.931	544	–		
4:00	4.389	258	1	1.976	2.364	333	–	4.931	542	–		
5:00	4.668	258	1	1.976	2.364	333	–	4.931	263	–		
6:00	5.424	258	1	1.976	2.364	333	2.045	6.977	1.553	–		
7:00	6.273	258	1	1.976	2.364	333	4.174	9.106	2.833	–		
8:00	6.827	258	1	1.976	2.364	333	6.030	10.961	4.135	–		
9:00	7.049	258	1	1.976	2.364	333	7.549	12.481	5.432	–		
10:00	7.282	258	1	1.976	2.364	333	8.649	13.581	6.298	–		
11:00	7.553	258	1	1.976	2.364	333	9.285	14.217	6.664	–		
12:00	7.416	258	1	1.976	2.364	333	9.462	14.394	6.978	–		
13:00	7.292	258	1	1.976	2.364	333	9.175	14.106	6.814	–		
14:00	7.150	258	1	1.976	2.364	333	8.420	13.351	6.201	–		
15:00	7.099	258	1	1.976	2.364	333	7.209	12.141	5.042	–		
16:00	6.844	258	1	1.976	2.364	333	5.592	10.524	3.680	–		
17:00	6.775	258	1	1.976	2.364	333	3.680	8.611	1.836	–		
18:00	6.719	258	1	1.976	2.364	333	1.617	6.548	–	-171	2,55%	177
19:00	6.620	258	1	1.976	2.364	333	–	4.931	–	-1.689	25,51%	1.740
20:00	6.641	258	1	1.976	2.364	333	–	4.931	–	-1.710	25,74%	1.757
21:00	6.344	258	1	1.976	2.364	333	–	4.931	–	-1.412	22,26%	1.422
22:00	6.056	258	1	1.976	2.364	333	–	4.931	–	-1.125	18,57%	1.138
23:00	5.549	258	1	1.976	2.364	333	–	4.931	–	-617	11,12%	616

MIN
MAX

192
6.978

171
1.710

7.033 MWh ele demand from storage

August	MWh
daily electricity production	201.755
daily electricity consumption	150.499
into/from daily storage	7.033
into annual storage	51.256

Growth szenario (MW) – August

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.300	1.680	1	1.976	2.640	339	–	6.637	–	-663	9,09%	612
1:00	6.767	1.680	1	1.976	2.640	339	–	6.637	–	-136	1,92%	121
2:00	6.569	1.680	1	1.976	2.640	339	–	6.637	68	–		
3:00	6.264	1.680	1	1.976	2.640	339	–	6.637	373	–		
4:00	6.267	1.680	1	1.976	2.640	339	–	6.637	370	–		
5:00	6.665	1.680	1	1.976	2.640	339	–	6.637	–	-36	0,42%	28
6:00	7.744	1.680	1	1.976	2.640	339	2.484	9.120	1.377	–		
7:00	8.956	1.680	1	1.976	2.640	339	5.069	11.706	2.750	–		
8:00	9.747	1.680	1	1.976	2.640	339	7.322	13.959	4.212	–		
9:00	10.064	1.680	1	1.976	2.640	339	9.167	15.804	5.740	–		
10:00	10.397	1.680	1	1.976	2.640	339	10.503	17.140	6.742	–		
11:00	10.784	1.680	1	1.976	2.640	339	11.275	17.912	7.128	–		
12:00	10.588	1.680	1	1.976	2.640	339	11.490	18.127	7.539	–		
13:00	10.411	1.680	1	1.976	2.640	339	11.141	17.778	7.367	–		
14:00	10.208	1.680	1	1.976	2.640	339	10.224	16.861	6.652	–		
15:00	10.135	1.680	1	1.976	2.640	339	8.754	15.391	5.256	–		
16:00	9.771	1.680	1	1.976	2.640	339	6.791	13.428	3.656	–		
17:00	9.673	1.680	1	1.976	2.640	339	4.468	11.105	1.432	–		
18:00	9.594	1.680	1	1.976	2.640	339	1.963	8.600	–	-994	10,36%	941
19:00	9.452	1.680	1	1.976	2.640	339	–	6.637	–	-2.812	29,78%	2.654
20:00	9.482	1.680	1	1.976	2.640	339	–	6.637	–	-2.845	30,00%	2.676
21:00	9.057	1.680	1	1.976	2.640	339	–	6.637	–	-2.421	26,73%	2.230
22:00	8.647	1.680	1	1.976	2.640	339	–	6.637	–	-2.010	23,25%	1.861
23:00	7.922	1.680	1	1.976	2.640	339	–	6.637	–	-1.285	16,22%	1.174

MIN
MAX

68
7.539

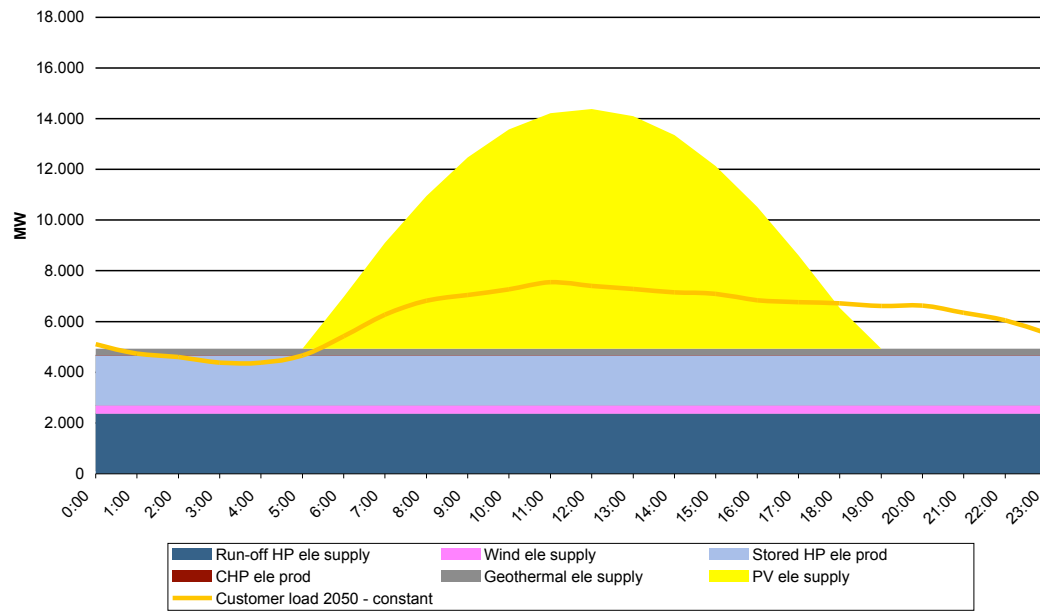
28
2.845

12.296 MWh ele demand from storage

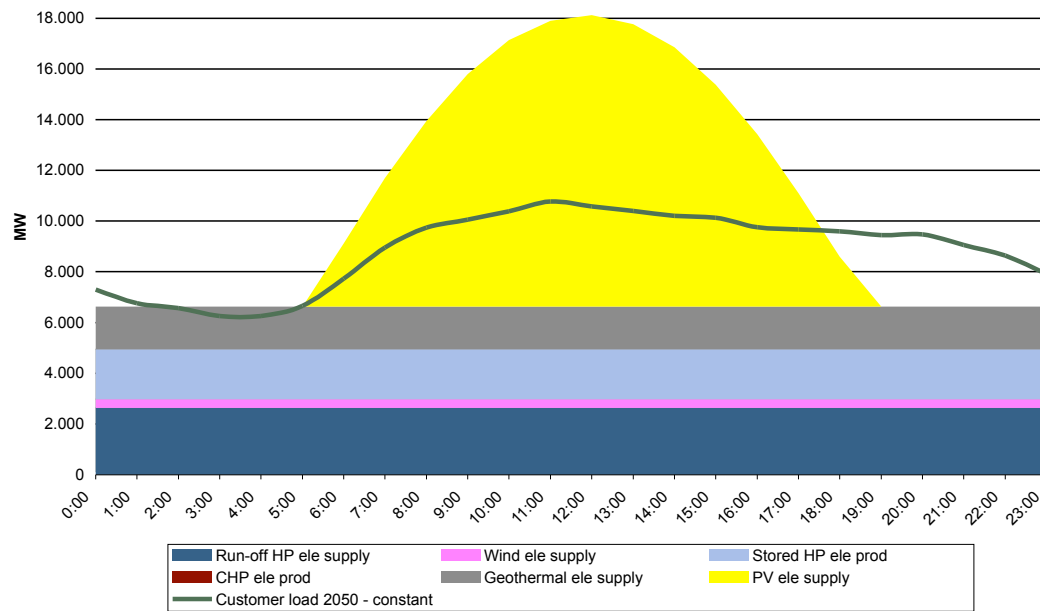
August	MWh
daily electricity production	208.546
daily electricity consumption	196.635
into/from daily storage	12.296
into annual storage	11.911

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply august – constant szenario



Comparison daily electricity demand vs. supply august – growth szenario



Comparison demand + supply one day September

Constant szenario (MW) – September

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.356	258	45	1.590	2.071	1.464	–	5.428	71	–		
1:00	4.973	258	45	1.590	2.071	1.464	–	5.428	455	–		
2:00	4.856	258	45	1.590	2.071	1.464	–	5.428	572	–		
3:00	4.709	258	45	1.590	2.071	1.464	–	5.428	719	–		
4:00	4.660	258	45	1.590	2.071	1.464	–	5.428	767	–		
5:00	5.044	258	45	1.590	2.071	1.464	–	5.428	384	–		
6:00	6.057	258	45	1.590	2.071	1.464	605	6.033	–	-24	0,39%	26
7:00	6.823	258	45	1.590	2.071	1.464	2.253	7.680	858	–		
8:00	7.185	258	45	1.590	2.071	1.464	4.594	10.022	2.837	–		
9:00	7.335	258	45	1.590	2.071	1.464	6.392	11.820	4.484	–		
10:00	7.518	258	45	1.590	2.071	1.464	7.726	13.154	5.635	–		
11:00	7.734	258	45	1.590	2.071	1.464	8.517	13.944	6.210	–		
12:00	7.562	258	45	1.590	2.071	1.464	8.738	14.165	6.603	–		
13:00	7.443	258	45	1.590	2.071	1.464	8.375	13.803	6.360	–		
14:00	7.326	258	45	1.590	2.071	1.464	7.439	12.866	5.540	–		
15:00	7.287	258	45	1.590	2.071	1.464	5.986	11.413	4.126	–		
16:00	7.145	258	45	1.590	2.071	1.464	4.095	9.522	2.377	–		
17:00	7.082	258	45	1.590	2.071	1.464	1.771	7.199	117	–		
18:00	7.039	258	45	1.590	2.071	1.464	318	5.746	–	-1.293	18,37%	1.315
19:00	7.263	258	45	1.590	2.071	1.464	–	5.428	–	-1.836	25,28%	1.903
20:00	7.128	258	45	1.590	2.071	1.464	–	5.428	–	-1.700	23,86%	1.708
21:00	6.572	258	45	1.590	2.071	1.464	–	5.428	–	-1.144	17,41%	1.131
22:00	6.256	258	45	1.590	2.071	1.464	–	5.428	–	-829	13,25%	827
23:00	5.802	258	45	1.590	2.071	1.464	–	5.428	–	-375	6,46%	367

MIN
MAX

71
6.603

24
1.836

7.277 MWh ele demand from storage

September	MWh
daily electricity production	190.779
daily electricity consumption	161.008
into/from daily storage	7.277
into annual storage	29.772

Growth szenario (MW) – September

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	7.647	1.680	28	1.590	2.313	1.493	–	7.104	–	-543	7,10%	501
1:00	7.100	1.680	28	1.590	2.313	1.493	–	7.104	4	–		
2:00	6.933	1.680	28	1.590	2.313	1.493	–	7.104	172	–		
3:00	6.723	1.680	28	1.590	2.313	1.493	–	7.104	382	–		
4:00	6.654	1.680	28	1.590	2.313	1.493	–	7.104	451	–		
5:00	7.201	1.680	28	1.590	2.313	1.493	–	7.104	–	-97	1,34%	97
6:00	8.647	1.680	28	1.590	2.313	1.493	735	7.839	–	-808	9,34%	808
7:00	9.741	1.680	28	1.590	2.313	1.493	2.736	9.840	99	–		
8:00	10.258	1.680	28	1.590	2.313	1.493	5.579	12.683	2.425	–		
9:00	10.473	1.680	28	1.590	2.313	1.493	7.762	14.866	4.393	–		
10:00	10.734	1.680	28	1.590	2.313	1.493	9.382	16.486	5.752	–		
11:00	11.043	1.680	28	1.590	2.313	1.493	10.342	17.446	6.404	–		
12:00	10.797	1.680	28	1.590	2.313	1.493	10.610	17.715	6.918	–		
13:00	10.626	1.680	28	1.590	2.313	1.493	10.170	17.275	6.649	–		
14:00	10.460	1.680	28	1.590	2.313	1.493	9.033	16.137	5.677	–		
15:00	10.404	1.680	28	1.590	2.313	1.493	7.268	14.373	3.969	–		
16:00	10.202	1.680	28	1.590	2.313	1.493	4.972	12.077	1.875	–		
17:00	10.112	1.680	28	1.590	2.313	1.493	2.151	9.255	–	-859	8,47%	785
18:00	10.050	1.680	28	1.590	2.313	1.493	386	7.491	–	-2.559	25,46%	2.380
19:00	10.370	1.680	28	1.590	2.313	1.493	–	7.104	–	-3.236	31,49%	3.098
20:00	10.177	1.680	28	1.590	2.313	1.493	–	7.104	–	-3.073	30,19%	2.825
21:00	9.383	1.680	28	1.590	2.313	1.493	–	7.104	–	-2.279	24,28%	2.061
22:00	8.933	1.680	28	1.590	2.313	1.493	–	7.104	–	-1.828	20,47%	1.670
23:00	8.284	1.680	28	1.590	2.313	1.493	–	7.104	–	-1.180	14,24%	1.057

MIN
MAX

4
6.918

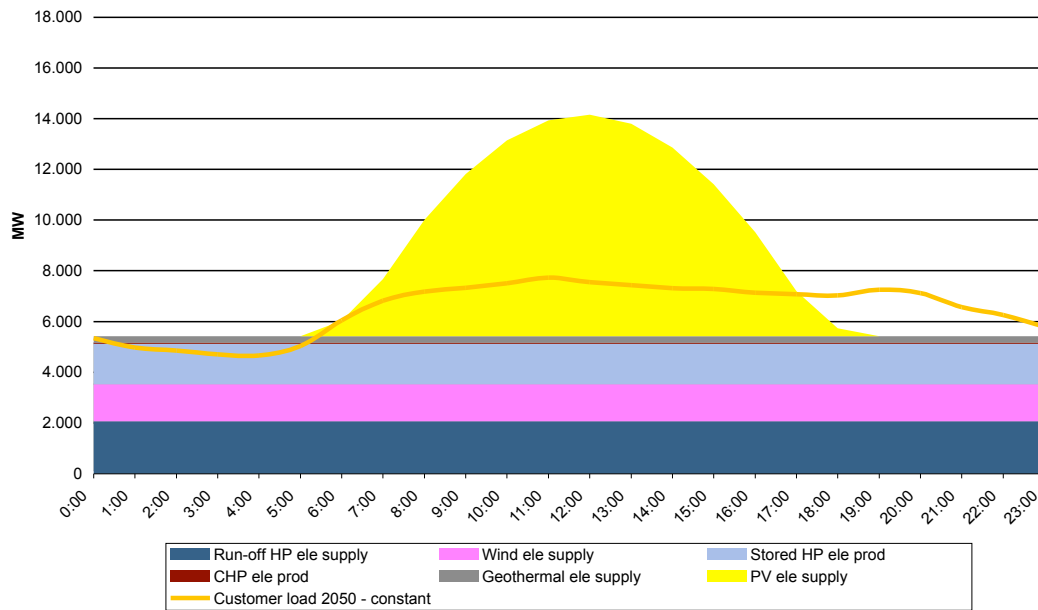
97
3.266

15.281 MWh ele demand from storage

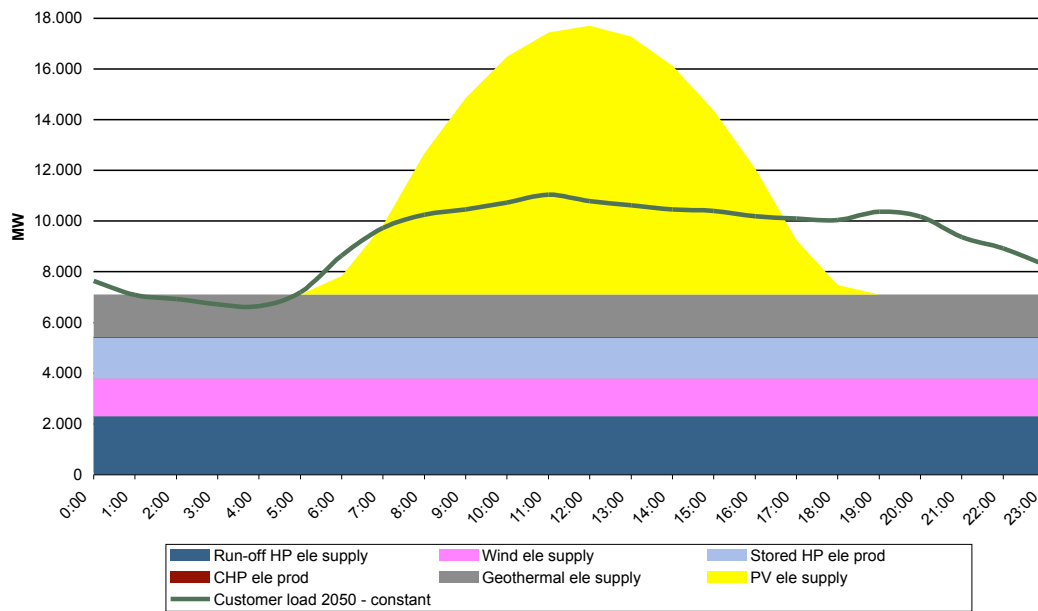
September	MWh
daily electricity production	196.886
daily electricity consumption	210.365
into/from daily storage	15.281
from annual storage	13.478

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply september – constant szenario



Comparison daily electricity demand vs. supply september – growth szenario



Comparison demand + supply one day October

Constant szenario (MW) – October

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	5.785	258	268	1.442	1.753	1.530	–	5.251	–	-535	9,24%	535
1:00	5.409	258	268	1.442	1.753	1.530	–	5.251	–	-158	2,92%	159
2:00	5.185	258	268	1.442	1.753	1.530	–	5.251	65	–		
3:00	5.007	258	268	1.442	1.753	1.530	–	5.251	244	–		
4:00	5.086	258	268	1.442	1.753	1.530	–	5.251	165	–		
5:00	5.513	258	268	1.442	1.753	1.530	–	5.251	–	-262	4,75%	285
6:00	6.494	258	268	1.442	1.753	1.530	–	5.251	–	-1.244	19,15%	1.371
7:00	7.479	258	268	1.442	1.753	1.530	945	6.196	–	-1.283	17,15%	1.353
8:00	7.782	258	268	1.442	1.753	1.530	2.306	7.557	–	-225	2,89%	223
9:00	7.737	258	268	1.442	1.753	1.530	3.936	9.187	1.450	–		
10:00	7.865	258	268	1.442	1.753	1.530	4.974	10.225	2.360	–		
11:00	8.079	258	268	1.442	1.753	1.530	5.588	10.839	2.760	–		
12:00	7.970	258	268	1.442	1.753	1.530	5.760	11.011	3.041	–		
13:00	7.829	258	268	1.442	1.753	1.530	5.478	10.728	2.900	–		
14:00	7.749	258	268	1.442	1.753	1.530	4.749	10.000	2.250	–		
15:00	7.704	258	268	1.442	1.753	1.530	3.618	8.869	1.165	–		
16:00	7.485	258	268	1.442	1.753	1.530	2.151	7.402	–	-83	1,11%	86
17:00	7.610	258	268	1.442	1.753	1.530	583	5.834	–	-1.776	23,34%	1.858
18:00	7.962	258	268	1.442	1.753	1.530	–	5.251	–	-2.711	34,05%	2.860
19:00	8.075	258	268	1.442	1.753	1.530	–	5.251	–	-2.824	34,97%	2.854
20:00	7.798	258	268	1.442	1.753	1.530	–	5.251	–	-2.547	32,67%	2.559
21:00	7.188	258	268	1.442	1.753	1.530	–	5.251	–	-1.937	26,95%	1.947
22:00	7.038	258	268	1.442	1.753	1.530	–	5.251	–	-1.787	25,39%	1.801
23:00	6.508	258	268	1.442	1.753	1.530	–	5.251	–	-1.257	19,32%	1.258
								MIN	65	83		
								MAX	3.041	2.824		

MWh ele demand from storage

October	MWh
daily electricity production	165.952
daily electricity consumption	173.273
into/from daily storage	19.147
from annual storage	7.320

Growth szenario (MW) – October

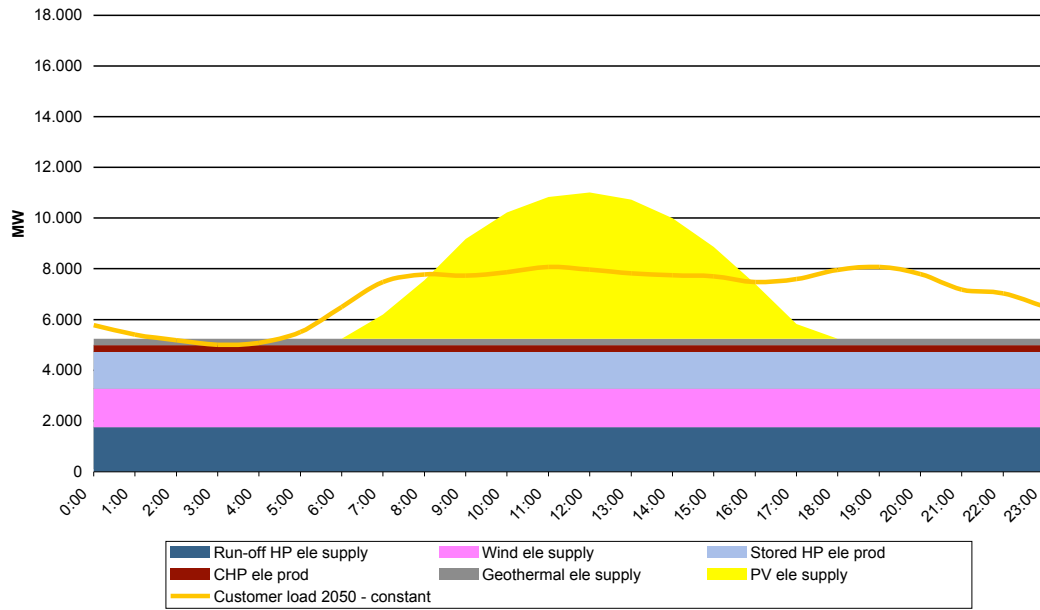
Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage	Percentage from demand	electricity from storage (MWh)
0:00	8.260	1.680	165	1.442	1.958	1.561	–	6.806	–	-1.454	17,60%	1.331
1:00	7.722	1.680	165	1.442	1.958	1.561	–	6.806	–	-815	11,86%	842
2:00	7.404	1.680	165	1.442	1.958	1.561	–	6.806	–	-597	8,07%	559
3:00	7.149	1.680	165	1.442	1.958	1.561	–	6.806	–	-343	4,79%	323
4:00	7.262	1.680	165	1.442	1.958	1.561	–	6.806	–	-455	6,27%	437
5:00	7.871	1.680	165	1.442	1.958	1.561	–	6.806	–	-1.064	13,52%	1.059
6:00	9.272	1.680	165	1.442	1.958	1.561	–	6.806	–	-2.466	26,60%	2.487
7:00	10.678	1.680	165	1.442	1.958	1.561	1.148	7.954	–	-3.724	25,51%	2.629
8:00	11.110	1.680	165	1.442	1.958	1.561	2.800	9.606	–	-1.504	13,54%	1.431
9:00	11.046	1.680	165	1.442	1.958	1.561	4.779	11.586	540	–		
10:00	11.229	1.680	165	1.442	1.958	1.561	6.040	12.846	1.617	–		
11:00	11.535	1.680	165	1.442	1.958	1.561	6.785	13.592	2.057	–		
12:00	11.380	1.680	165	1.442	1.958	1.561	6.995	13.801	2.421	–		
13:00	11.177	1.680	165	1.442	1.958	1.561	6.651	13.458	2.280	–		
14:00	11.064	1.680	165	1.442	1.958	1.561	5.766	12.573	1.508	–		
15:00	10.999	1.680	165	1.442	1.958	1.561	4.393	11.199	200	–		
16:00	10.687	1.680	165	1.442	1.958	1.561	2.612	9.419	–	-1.269	11,87%	1.196
17:00	10.865	1.680	165	1.442	1.958	1.561	708	7.514	–	-3.351	30,84%	3.207
18:00	11.368	1.680	165	1.442	1.958	1.561	–	6.806	–	-4.562	40,13%	4.403
19:00	11.529	1.680	165	1.442	1.958	1.561	–	6.806	–	-4.722	40,96%	4.368
20:00	11.134	1.680	165	1.442	1.958	1.561	–	6.806	–	-4.328	38,87%	3.978
21:00	10.262	1.680	165	1.442	1.958	1.561	–	6.806	–	-3.456	33,67%	3.179
22:00	10.048	1.680	165	1.442	1.958	1.561	–	6.806	–	-3.242	32,26%	2.990
23:00	9.292	1.680	165	1.442	1.958	1.561	–	6.806	–	-2.486	26,75%	2.276
								MIN	200	342		
								MAX	2.421	4.722		

MWh ele demand from storage

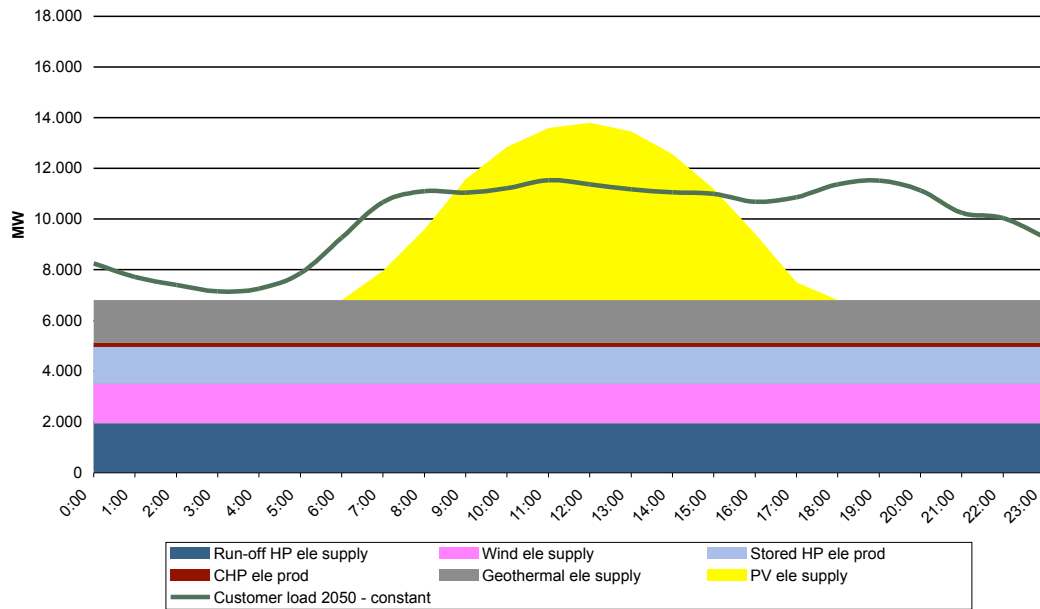
October	MWh
daily electricity production	169.144
daily electricity consumption	226.390
into/from daily storage	36.696
from annual storage	57.246

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply october – constant szenario



Comparison daily electricity demand vs. supply october – growth szenario



Comparison demand + supply one day November

Constant szenario (MW) – November

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	6.021	258	471	836	1.526	1.464	–	4.555	–	-1.466
1:00	5.599	258	471	836	1.526	1.464	–	4.555	–	-1.044
2:00	5.440	258	471	836	1.526	1.464	–	4.555	–	-885
3:00	5.279	258	471	836	1.526	1.464	–	4.555	–	-724
4:00	5.327	258	471	836	1.526	1.464	–	4.555	–	-771
5:00	5.598	258	471	836	1.526	1.464	–	4.555	–	-1.043
6:00	6.583	258	471	836	1.526	1.464	–	4.555	–	-2.028
7:00	7.448	258	471	836	1.526	1.464	–	4.555	–	-2.893
8:00	7.887	258	471	836	1.526	1.464	959	5.514	–	-2.373
9:00	7.906	258	471	836	1.526	1.464	2.032	6.587	–	-1.319
10:00	8.020	258	471	836	1.526	1.464	2.796	7.351	–	-668
11:00	8.089	258	471	836	1.526	1.464	3.256	7.811	–	-278
12:00	8.133	258	471	836	1.526	1.464	3.379	7.934	–	-199
13:00	8.038	258	471	836	1.526	1.464	3.167	7.722	–	-315
14:00	8.001	258	471	836	1.526	1.464	2.633	7.188	–	-813
15:00	7.947	258	471	836	1.526	1.464	1.793	6.349	–	-1.599
16:00	8.060	258	471	836	1.526	1.464	680	5.235	–	-2.825
17:00	8.163	258	471	836	1.526	1.464	–	4.555	–	-3.608
18:00	7.967	258	471	836	1.526	1.464	–	4.555	–	-3.412
19:00	7.655	258	471	836	1.526	1.464	–	4.555	–	-3.100
20:00	7.452	258	471	836	1.526	1.464	–	4.555	–	-2.897
21:00	6.906	258	471	836	1.526	1.464	–	4.555	–	-2.351
22:00	6.841	258	471	836	1.526	1.464	–	4.555	–	-2.286
23:00	6.348	258	471	836	1.526	1.464	–	4.555	–	-1.793
MIN										199
MAX										3.608

November	MWh
daily electricity production	129.928
daily electricity consumption	178.412
from annual storage	48.484

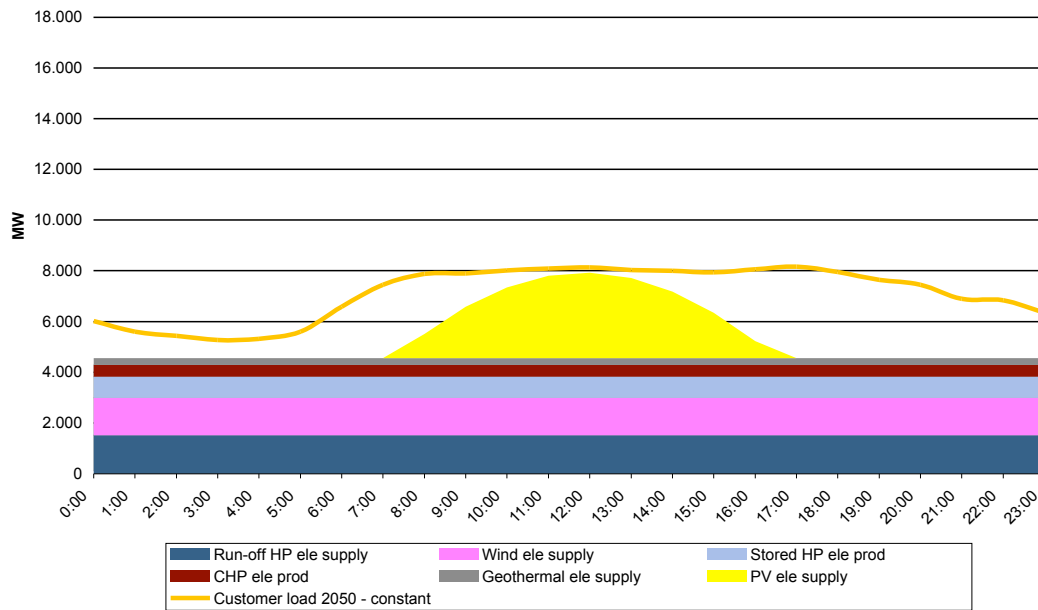
Growth szenario (MW) – November

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	8.596	1.680	290	836	1.705	1.493	–	6.004	–	-2.592
1:00	7.994	1.680	290	836	1.705	1.493	–	6.004	–	-1.999
2:00	7.767	1.680	290	836	1.705	1.493	–	6.004	–	-1.763
3:00	7.538	1.680	290	836	1.705	1.493	–	6.004	–	-1.534
4:00	7.605	1.680	290	836	1.705	1.493	–	6.004	–	-1.600
5:00	7.993	1.680	290	836	1.705	1.493	–	6.004	–	-1.989
6:00	9.398	1.680	290	836	1.705	1.493	–	6.004	–	-3.394
7:00	10.634	1.680	290	836	1.705	1.493	–	6.004	–	-4.630
8:00	11.260	1.680	290	836	1.705	1.493	1.164	7.168	–	-4.092
9:00	11.288	1.680	290	836	1.705	1.493	2.467	8.472	–	-2.816
10:00	11.450	1.680	290	836	1.705	1.493	3.395	9.400	–	-2.050
11:00	11.549	1.680	290	836	1.705	1.493	3.953	9.958	–	-1.591
12:00	11.612	1.680	290	836	1.705	1.493	4.103	10.108	–	-1.504
13:00	11.476	1.680	290	836	1.705	1.493	3.846	9.850	–	-1.628
14:00	11.423	1.680	290	836	1.705	1.493	3.197	9.201	–	-2.222
15:00	11.346	1.680	290	836	1.705	1.493	2.178	8.182	–	-3.164
16:00	11.508	1.680	290	836	1.705	1.493	826	6.831	–	-4.678
17:00	11.655	1.680	290	836	1.705	1.493	–	6.004	–	-5.651
18:00	11.375	1.680	290	836	1.705	1.493	–	6.004	–	-5.370
19:00	10.929	1.680	290	836	1.705	1.493	–	6.004	–	-4.925
20:00	10.640	1.680	290	836	1.705	1.493	–	6.004	–	-4.635
21:00	9.860	1.680	290	836	1.705	1.493	–	6.004	–	-3.896
22:00	9.767	1.680	290	836	1.705	1.493	–	6.004	–	-3.762
23:00	9.063	1.680	290	836	1.705	1.493	–	6.004	–	-3.269
MIN										1.504
MAX										5.651

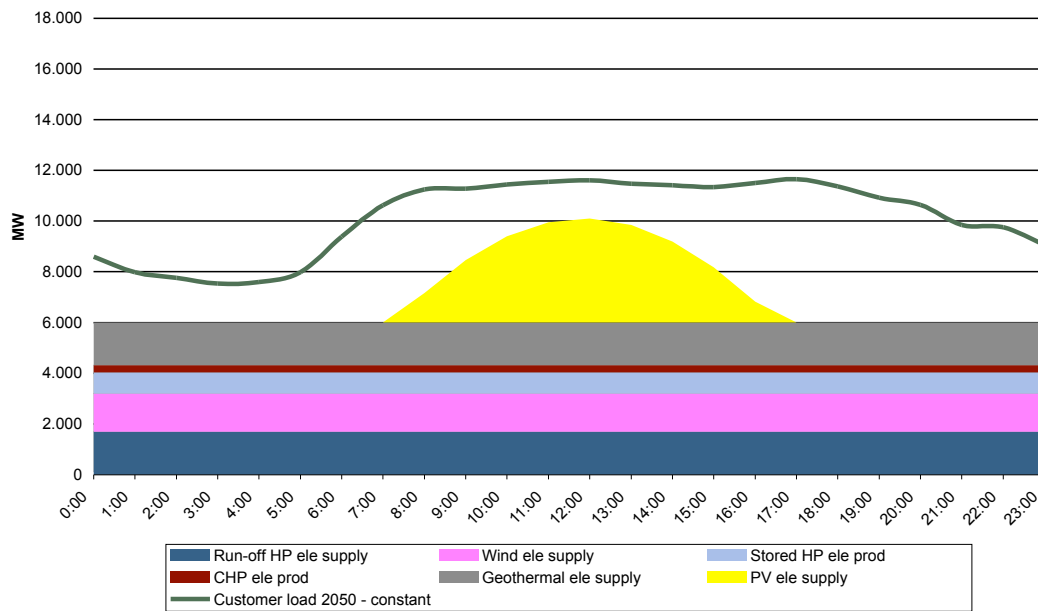
November	MWh
daily electricity production	130.574
daily electricity consumption	233.104
from annual storage	102.530

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply november – constant szenario



Comparison daily electricity demand vs. supply november – growth szenario



Comparison demand + supply one day December

Constant szenario (MW) – December

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	7.290	258	633	1.132	1.627	1.464	–	5.114	–	-2.176
1:00	7.014	258	633	1.132	1.627	1.464	–	5.114	–	-1.900
2:00	6.782	258	633	1.132	1.627	1.464	–	5.114	–	-1.668
3:00	6.641	258	633	1.132	1.627	1.464	–	5.114	–	-1.527
4:00	6.631	258	633	1.132	1.627	1.464	–	5.114	–	-1.517
5:00	6.985	258	633	1.132	1.627	1.464	–	5.114	–	-1.871
6:00	7.678	258	633	1.132	1.627	1.464	–	5.114	–	-2.564
7:00	8.633	258	633	1.132	1.627	1.464	–	5.114	–	-3.519
8:00	8.769	258	633	1.132	1.627	1.464	512	5.626	–	-3.143
9:00	8.889	258	633	1.132	1.627	1.464	1.246	6.360	–	-2.529
10:00	8.835	258	633	1.132	1.627	1.464	2.006	7.119	–	-1.716
11:00	8.889	258	633	1.132	1.627	1.464	2.377	7.491	–	-1.398
12:00	8.800	258	633	1.132	1.627	1.464	2.474	7.588	–	-1.212
13:00	8.773	258	633	1.132	1.627	1.464	2.275	7.389	–	-1.384
14:00	8.720	258	633	1.132	1.627	1.464	1.807	6.921	–	-1.799
15:00	8.700	258	633	1.132	1.627	1.464	998	6.112	–	-2.588
16:00	8.865	258	633	1.132	1.627	1.464	336	5.450	–	-3.415
17:00	9.187	258	633	1.132	1.627	1.464	–	5.114	–	-4.073
18:00	9.134	258	633	1.132	1.627	1.464	–	5.114	–	-4.020
19:00	8.853	258	633	1.132	1.627	1.464	–	5.114	–	-3.739
20:00	8.398	258	633	1.132	1.627	1.464	–	5.114	–	-3.284
21:00	7.883	258	633	1.132	1.627	1.464	–	5.114	–	-2.769
22:00	7.983	258	633	1.132	1.627	1.464	–	5.114	–	-2.869
23:00	7.566	258	633	1.132	1.627	1.464	–	5.114	–	-2.452
MIN										1.212
MAX										4.073

December	MWh
daily electricity production	136.571
daily electricity consumption	184.825
from annual storage	48.254

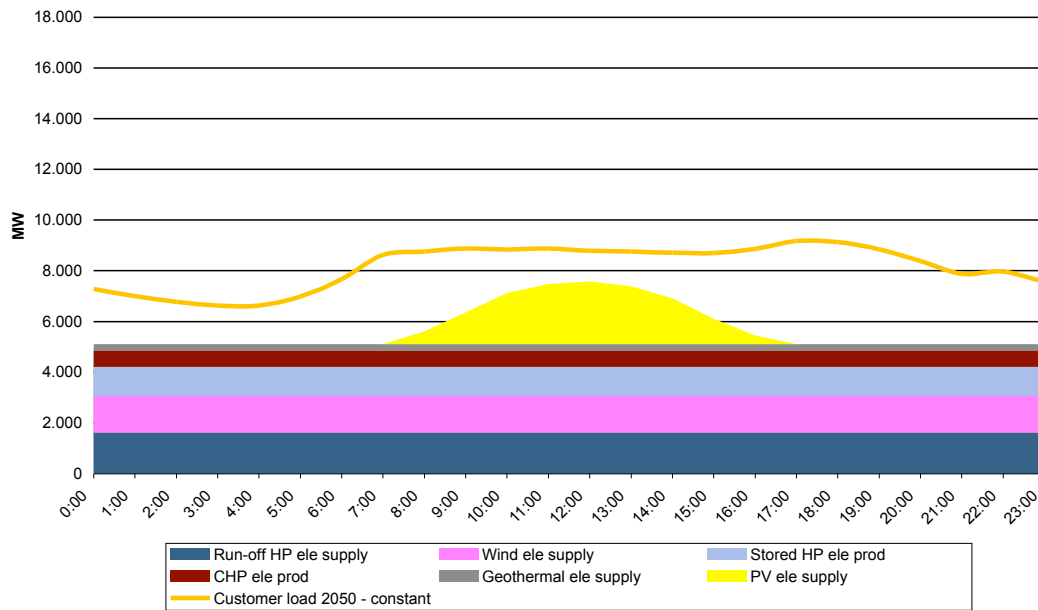
Growth szenario (MW) – December

Hour	Nat. ele consumption MW (thrid wednesday)	Geothermal	CHP	Stored HP	Run-off HP	Wind	PV	Sum ele. supply	oversupply	shortage
0:00	10.408	1.680	390	1.132	1.818	1.493	–	6.513	–	-3.895
1:00	10.015	1.680	390	1.132	1.818	1.493	–	6.513	–	-3.502
2:00	9.682	1.680	390	1.132	1.818	1.493	–	6.513	–	-3.170
3:00	9.481	1.680	390	1.132	1.818	1.493	–	6.513	–	-2.998
4:00	9.467	1.680	390	1.132	1.818	1.493	–	6.513	–	-2.954
5:00	9.972	1.680	390	1.132	1.818	1.493	–	6.513	–	-3.465
6:00	10.962	1.680	390	1.132	1.818	1.493	–	6.513	–	-4.449
7:00	12.326	1.680	390	1.132	1.818	1.493	–	6.513	–	-5.813
8:00	12.521	1.680	390	1.132	1.818	1.493	622	7.135	–	-5.386
9:00	12.691	1.680	390	1.132	1.818	1.493	1.513	8.025	–	-4.695
10:00	12.615	1.680	390	1.132	1.818	1.493	2.435	8.948	–	-3.667
11:00	12.691	1.680	390	1.132	1.818	1.493	2.886	9.399	–	-3.292
12:00	12.564	1.680	390	1.132	1.818	1.493	3.004	9.517	–	-3.047
13:00	12.525	1.680	390	1.132	1.818	1.493	2.762	9.275	–	-3.290
14:00	12.450	1.680	390	1.132	1.818	1.493	2.194	8.707	–	-3.743
15:00	12.421	1.680	390	1.132	1.818	1.493	1.212	7.725	–	-4.695
16:00	12.657	1.680	390	1.132	1.818	1.493	408	6.920	–	-5.736
17:00	13.117	1.680	390	1.132	1.818	1.493	–	6.513	–	-6.604
18:00	13.041	1.680	390	1.132	1.818	1.493	–	6.513	–	-6.528
19:00	12.640	1.680	390	1.132	1.818	1.493	–	6.513	–	-6.129
20:00	11.991	1.680	390	1.132	1.818	1.493	–	6.513	–	-5.478
21:00	11.255	1.680	390	1.132	1.818	1.493	–	6.513	–	-4.732
22:00	11.398	1.680	390	1.132	1.818	1.493	–	6.513	–	-4.885
23:00	10.802	1.680	390	1.132	1.818	1.493	–	6.513	–	-4.299
MIN										2.954
MAX										6.604

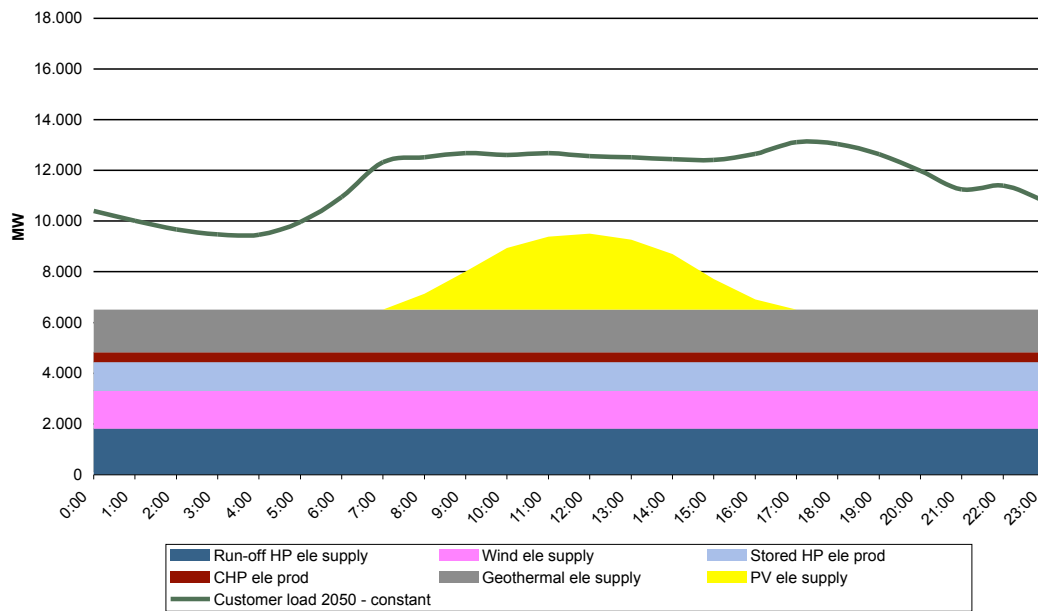
December	MWh
daily electricity production	136.004
daily electricity consumption	241.483
from annual storage	105.480

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Comparison daily electricity demand vs. supply december – constant szenario



Comparison daily electricity demand vs. supply december – growth szenario



Comparison demand + supply one day average

Constant szenario (MW) – December

Hour	Nat. ele consumption MW (thrid wednesday)	Sum ele. supply
0:00	5.724	5.360
1:00	5.361	5.360
2:00	5.180	5.360
3:00	5.003	5.360
4:00	4.983	5.360
5:00	5.339	5.809
6:00	6.119	6.825
7:00	7.065	8.361
8:00	7.530	10.039
9:00	7.683	11.437
10:00	7.828	12.436
11:00	7.999	13.021
12:00	7.861	13.179
13:00	7.728	12.914
14:00	7.617	12.225
15:00	7.545	11.106
16:00	7.406	9.658
17:00	7.386	8.002
18:00	7.462	6.552
19:00	7.415	5.673
20:00	7.143	5.360
21:00	6.779	5.360
22:00	6.614	5.360
23:00	6.126	5.360

Growth szenario (MW) – December

Hour	Nat. ele consumption MW (thrid wednesday)	Sum ele. supply
0:00	8.172	6.945
1:00	7.654	6.945
2:00	7.396	6.945
3:00	7.143	6.945
4:00	7.115	6.945
5:00	7.623	7.489
6:00	8.736	8.724
7:00	10.088	10.589
8:00	10.751	12.626
9:00	10.969	14.323
10:00	11.176	15.537
11:00	11.421	16.247
12:00	11.224	16.439
13:00	11.033	16.117
14:00	10.876	15.281
15:00	10.773	13.922
16:00	10.574	12.163
17:00	10.545	10.153
18:00	10.653	8.392
19:00	10.586	7.325
20:00	10.199	6.945
21:00	9.679	6.945
22:00	9.444	6.945
23:00	8.747	6.945

legend: calculated from given data (constant szenario)
 calculated from given data (growth szenari)

Data from Energie Autarkie 2050

Growth Scenario

		110	Wp_Ele/m2	13	GWp_PV	PV	13000	MW		km²	Verluste	0,04					
		110	MWp_Ele/km2			Wind	5050	MW									
Monate:		1	2	3	4	5	6	7	8	9	10	11	12				
HGT	Kd	645	526	449	225	65	9	1	1	42	248	436	586	3233			
Wind	h/Monat	220	200	200	200	100	50	50	50	220	230	220	220	1960			
Solar	kWh/m²_Hor	22,3	41,9	79,5	111,2	142,1	147,8	152	130,7	94,1	53,7	25	17				
R-Wert Solar		1,49	1,32	1,19	1,07	0,98	0,95	0,96	1,03	1,18	1,34	1,52	1,56				
Eta PV		0,14	0,135	0,13	0,12	0,11	0,11	0,1	0,1	0,12	0,13	0,14	0,15				
PV	GWh_Ele/km²	4,65	7,47	12,30	14,28	15,32	15,45	14,59	13,46	13,32	9,35	5,32	3,98				
Wasser 2009:														Leistung			
Laufw	TWh	1,26	1,17	2,21	2,92	3,19	2,66	2,91	2,42	2,12	1,80	1,57	1,67	25,91	5,40 GW	Max. Spitzenleistung Volatil:	19,14 GW
Speicherw	TWh	0,89	0,75	0,88	1,02	1,31	1,46	1,36	1,44	1,16	1,05	0,61	0,83	12,76	6,80 GW	Nachfrage: Spitzenlast zu dieser Zeit:	10 GW
Verbrauch 2009														Benötigte Pumpspeicherleistung:			
f. PSP	TWh	0,36	0,31	0,27	0,31	0,33	0,27	0,32	0,33	0,31	0,36	0,40	0,39	3,96			
Sonst	TWh	6,25	5,63	5,87	5,01	5,03	4,97	5,19	5,00	5,22	5,66	5,72	6,12	65,67	9,14 GW		
2050:																	
Erzeugung:		January	Febuary	March	April	May	June	July	August	Septemb	October	Novembe	Decembe	Gesamt	Soll		
Biomasse KWK	TWh	0,32	0,26	0,22	0,11	0,03	0,00	0,00	0,00	0,02	0,12	0,22	0,29	1,60	1,60		
PV	TWh	0,55	0,88	1,45	1,69	1,81	1,83	1,72	1,59	1,57	1,11	0,63	0,47	15,30	15,30		
Wind	TWh	1,11	1,01	1,01	1,01	0,51	0,25	0,25	0,25	1,11	1,16	1,11	1,11	9,90	9,90		
Speicherw.	TWh	0,91	0,76	0,89	1,04	1,33	1,49	1,39	1,47	1,18	1,07	0,62	0,84	13,00	13,00		
Laufwasser	TWh	1,02	0,95	1,79	2,37	2,58	2,16	2,36	1,96	1,72	1,46	1,27	1,35	21,00	21,00		
Sonstiges	TWh	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	1,25	15,00	15,00		
Summe:	TWh	5,16	5,11	6,62	7,47	7,52	6,98	6,98	6,53	6,86	6,17	5,10	5,32	75,80			
Verbrauch:		1	2	3	4	5	6	7	8	9	10	11	12	Gesamt			
Endverbrauch	TWh	6,46	5,82	6,07	5,19	5,21	5,15	5,37	5,17	5,41	5,85	5,92	6,33	67,96			
Pumpspeicher Tagesp.	TWh	0,20	0,23	0,30	0,32	0,28	0,25	0,24	0,22	0,32	0,27	0,21	0,19	3,02			
Pumpspeicher Jahressp.	TWh	0,00	0,00	0,05	0,39	0,41	0,32	0,27	0,23	0,23	0,01	0,00	0,00	1,90			
Verluste	TWh	0,27	0,24	0,26	0,24	0,24	0,23	0,24	0,22	0,24	0,25	0,25	0,26	2,92			
Gesamt m. PSP Tag:	TWh	6,66	6,05	6,37	5,51	5,49	5,40	5,60	5,39	5,73	6,13	6,13	6,52	70,98			
Gesamt m. PSP Jahr:	TWh	6,66	6,05	6,42	5,90	5,89	5,71	5,88	5,62	5,95	6,14	6,13	6,52	72,88			
Gesamt mit Verluste:	TWh	6,93	6,29	6,68	6,14	6,13	5,94	6,11	5,85	6,19	6,38	6,37	6,79	75,80			
Vom Jahresspeicher:	TWh	1,77	1,18	0,05	0,00	0,00	0,00	0,00	0,00	0,00	0,21	1,28	1,47				
Zum Jahresspeicher:	TWh	0,00	0,00	0,00	1,06	1,11	0,83	0,69	0,55	0,53	0,00	0,00	0,00				
Im Speicher	TWh	0,05	-1,14	0,00	1,06	2,17	3,00	3,69	4,24	4,77	4,56	3,28	1,81				
Für Jahrespumpen	TWh	0,00	0,00	0,05	0,39	0,41	0,32	0,27	0,23	0,23	0,01	0,00	0,00	1,90			
Für Tagespumpen	TWh	0,20	0,23	0,30	0,32	0,28	0,25	0,24	0,22	0,32	0,27	0,21	0,19	3,02			

21,5 GW

Constant Scenario

110 Wp_Ele/m2 110 MWp_Ele/km2		9,85 GWp_PV			PV Wind	9850 MW 4950 MW		89,55 km²		Verluste	0,04						
Monate:		1	2	3	4	5	6	7	8	9	10	11	12				
HGT	Kd	645	526	449	225	65	9	1	1	42	248	436	586	3233			
Wind	h/Monat	220	200	200	200	100	50	50	50	220	230	220	220	1960			
Solar	kWh/m²_Hor	22,3	41,9	79,5	111,2	142,1	147,8	152	130,7	94,1	53,7	25	17				
R-Wert Solar		1,49	1,32	1,19	1,07	0,98	0,95	0,96	1,03	1,18	1,34	1,52	1,56				
Eta PV		0,14	0,135	0,13	0,12	0,11	0,11	0,1	0,1	0,12	0,13	0,14	0,15				
PV	GWh_Ele/km²	4,65	7,47	12,30	14,28	15,32	15,45	14,59	13,46	13,32	9,35	5,32	3,98				
Wasser 2009:															Leistung		
Laufw	TWh	1,26	1,17	2,21	2,92	3,19	2,66	2,91	2,42	2,12	1,80	1,57	1,67	25,91	5,40 GW	Max. Spitzenleistung Volati:	15,97 GW
Speicherw	TWh	0,89	0,75	0,88	1,02	1,31	1,46	1,36	1,44	1,16	1,05	0,61	0,83	12,76	6,80 GW	Nachfrage: Spitzenlast zu dieser Zeit:	9 GW
Verbrauch 2009															Benötigte Pumpspeicherleistung:		
f. PSP	TWh	0,36	0,31	0,27	0,31	0,33	0,27	0,32	0,33	0,31	0,36	0,40	0,39	3,96	6,97 GW		
Sonst	TWh	6,25	5,63	5,87	5,01	5,03	4,97	5,19	5,00	5,22	5,66	5,72	6,12	65,67			
2050:																	
Erzeugung:		January	Febuary	March	April	May	June	July	August	September	October	November	December	Gesamt	Soll		
Biomasse KWK	TWh	0,52	0,42	0,36	0,18	0,05	0,01	0,00	0,00	0,03	0,20	0,35	0,47	2,60	2,60		
PV	TWh	0,42	0,67	1,10	1,28	1,37	1,38	1,31	1,21	1,19	0,84	0,48	0,36	11,60	11,6		
Wind	TWh	1,09	0,99	0,99	0,99	0,50	0,25	0,25	0,25	1,09	1,14	1,09	1,09	9,70	9,7		
Speicherw.	TWh	0,91	0,76	0,89	1,04	1,33	1,49	1,39	1,47	1,18	1,07	0,62	0,84	13,00	13,00		
Laufwasser	TWh	0,92	0,85	1,61	2,12	2,31	1,93	2,11	1,76	1,54	1,30	1,14	1,21	18,80	18,80		
Sonstiges	TWh	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	0,19	2,30	2,30		
Summe:	TWh	4,04	3,88	5,14	5,80	5,76	5,25	5,25	4,87	5,23	4,74	3,87	4,16	58,00			
Verbrauch:																	
		1	2	3	4	5	6	7	8	9	10	11	12	Gesamt			
Endverbrauch	TWh	4,93	4,44	4,63	3,96	3,97	3,92	4,09	3,94	4,12	4,46	4,51	4,83	51,80			
Pumpspeicher Tagesp.	TWh	0,18	0,20	0,25	0,27	0,22	0,20	0,19	0,17	0,27	0,24	0,19	0,17	2,56			
Pumpspeicher Jahressp.	TWh	0,00	0,00	0,05	0,31	0,31	0,23	0,19	0,15	0,17	0,01	0,00	0,00	1,43			
Verluste	TWh	0,20	0,19	0,20	0,18	0,18	0,17	0,18	0,17	0,18	0,19	0,19	0,20	2,23			
Gesamt m. PSP Tag:	TWh	5,11	4,64	4,88	4,23	4,19	4,12	4,28	4,12	4,39	4,70	4,70	5,00	54,36			
Gesamt m. PSP Jahr:	TWh	5,11	4,64	4,93	4,54	4,51	4,34	4,47	4,27	4,56	4,71	4,70	5,00	55,78			
Gesamt mit Verluste:	TWh	5,31	4,82	5,13	4,72	4,69	4,52	4,65	4,44	4,74	4,90	4,89	5,20	58,01			
Vom Jahresspeicher:	TWh	1,27	0,94	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,15	1,02	1,04				
Zum Jahresspeicher:	TWh	0,00	0,00	0,01	0,86	0,86	0,58	0,48	0,35	0,39	0,00	0,00	0,00				
Im Speicher	TWh	0,04	-0,90	0,01	0,87	1,73	2,31	2,79	3,14	3,53	3,38	2,35	1,31				
Für Jahrespumpen	TWh	0,00	0,00	0,05	0,31	0,31	0,23	0,19	0,15	0,17	0,01	0,00	0,00	1,43			
Für Tagespumpen	TWh	0,18	0,20	0,25	0,27	0,22	0,20	0,19	0,17	0,27	0,24	0,19	0,17	2,56			

Electricity Demand

Public Grid - Year 2010 (data from August 2011)							Public Grid - Year 2050 National ele consumption (1) monthly values (constant scenario)		Public Grid - Year 2050 National ele consumption (1) monthly values (growth scenario)	
National electricity consumption (1) - monthly values							2050 (constant scenario)		2050 (growth scenario)	
month	2009		2010		Veränderung		2050 (constant scenario)		2050 (growth scenario)	
	measured values in GWh	shares in %	measured values in GWh	shares in %	in GWh	in %	derived values in GWh	average value (09/10) shares in %	derived values in GWh	average value (09/10) shares in %
January	5.640	9,7	5.613	9,4	-27	-0,5	5.451	9,4	7.122	9,4
February	5.085	8,8	5.121	8,6	36	0,7	4.973	8,6	6.498	8,6
March	5.267	9,1	5.329	8,9	62	1,2	5.175	8,9	6.761	8,9
April	4.407	7,6	4.657	7,8	250	5,7	4.522	7,8	5.909	7,8
May	4.364	7,5	4.576	7,7	212	4,9	4.444	7,7	5.807	7,7
June	4.290	7,4	4.506	7,5	216	5,0	4.376	7,5	5.717	7,5
July	4.507	7,8	4.696	7,9	188	4,2	4.560	7,9	5.958	7,9
August	4.368	7,5	4.569	7,6	201	4,6	4.437	7,6	5.797	7,6
September	4.551	7,9	4.693	7,9	142	3,1	4.557	7,9	5.954	7,9
October	4.952	8,6	5.051	8,5	99	2,0	4.905	8,5	6.409	8,5
November	5.052	8,7	5.178	8,7	127	2,5	5.029	8,7	6.571	8,7
December	5.423	9,4	5.750	9,6	328	6,0	5.584	9,6	7.296	9,6
Stat. Kor. (a)										
Jahreszusatz (b)										
Jahr	57.905	100,0	59.739	100,0	1.834	3,2	58.015	100,0	75.799	100,0

Supply vs. Demand	demand vs. Supply
-1.409,3	-1.959,0
-1.091,7	-1.387,5
-31,4	-138,3
1.278,5	1.557,9
1.313,5	1.708,7
873,0	1.260,6
686,8	1.017,0
437,2	731,4
674,0	906,2
-161,1	-239,7
-1.163,6	-1.474,5
-1.423,4	-1.980,6

Anmerkung:

Das öffentliche Netz wird auf die österreichischen Versorgungsgebiete in den Regelzonen APG, TIRAG (bis 2010) und VKW (zuzüglich VIW) abgegrenzt.

Darüber hinaus werden hier auch jene österreichischen Versorgungsgebiete berücksichtigt, die in ausländischen Regelzonen liegen.

- (1) Umfasst die Netzaufgabe sowie auch jenen Teil des Eigenverbrauchs der Kraftwerke, der von diesen erzeugt wird
(2) Entspricht der insgesamt zur Verfügung gestellten elektrischen Energie einschließlich der physikalischen Stromexporte
(bilanztechnisch entspricht sie der Aufbringung)
(a) Da unterjährig die gesamte Abgabe im öffentlichen Netz erfasst wird, ist eine Korrektur aufgrund der Jahreserhebung hier nicht relevant
(b) Da unterjährig die gesamte Einspeisung in das öffentliche Netz erfasst wird, hier nicht relevant

legend:

	data from e-control
	data from feasibility study energy autarky 2050
	calculated from given data (constant scenario)
	calculated from given data (growth scenario)

Quelle: Energie-Control Austria

-5.280,4
5.263,0

-7.179,5
7.181,8

Public electricity supply on thrid wednesdays in 2010 – annual avera

[hourly load in MW]

Hour	Supply to end-users including grid losses and own use of grid – 2010 (annual average)	Share	Electricity supply 2050 – constant szenario	Electricity supply 2050 – growth szenario
0:00	6.123	3,53%	5.884	8.401
1:00	5.746	3,31%	5.523	7.885
2:00	5.552	3,20%	5.336	7.618
3:00	5.372	3,10%	5.163	7.371
4:00	5.367	3,09%	5.158	7.364
5:00	5.736	3,31%	5.512	7.870
6:00	6.575	3,79%	6.319	9.021
7:00	7.557	4,36%	7.262	10.369
8:00	7.995	4,61%	7.684	10.971
9:00	8.123	4,68%	7.806	11.146
10:00	8.252	4,76%	7.931	11.323
11:00	8.415	4,85%	8.087	11.547
12:00	8.294	4,78%	7.971	11.381
13:00	8.167	4,71%	7.849	11.207
14:00	8.066	4,65%	7.752	11.068
15:00	8.000	4,61%	7.688	10.977
16:00	7.896	4,55%	7.589	10.835
17:00	7.928	4,57%	7.619	10.879
18:00	7.996	4,61%	7.685	10.972
19:00	7.918	4,56%	7.610	10.864
20:00	7.625	4,39%	7.328	10.463
21:00	7.196	4,15%	6.916	9.874
22:00	7.057	4,07%	6.783	9.684
23:00	6.551	3,78%	6.296	8.990
	173.507	100%	166.752	238.079
	percent from 2010 demand		96,11%	137,22%

Public electricity supply Austria

loads

Supply to end-users including grid losses and own use of grid

(average values)

GWh

Yearly average				Constant szenario		Constant szenario	
Day	GWh	GW	Shares	GWh	Shares	GWh	Shares
Monday	169,9	7,1	15%	163,2	15%	233,4	15%
Tuesday	174,5	7,3	15%	167,4	15%	239,2	15%
Wednesday	173,7	7,2	15%	166,8	15%	238,1	15%
Thursday	173,6	7,2	15%	166,9	15%	238,7	15%
Friday	172,5	7,2	15%	165,3	15%	235,1	15%
Saturday	155,1	6,5	13%	148,2	13%	211,3	13%
Sunday	142,9	6,0	12%	136,3	12%	194,8	12%
	1.162,3		100%	1.114,1	100%	1.590,6	100%

legend:

	calculated from given data (e-control)
	calculated (constant szenario)
	calculated (growth szenario)

ÖFFENTLICHE STROMVERSORGUNG ÖSTERREICHS

Belastungsablauf

Abgabe an Endverbraucher inkl. Netzverluste und Eigenbedarf aus dem Netz

(1/4 h - Leistungsmittelwerte)

Jänner 2010

Datum	Zeit	MWh	MW
<i>Monatssumme</i>			
Jänner 2010		5.503.173,8	
<i>Maximum (aus viertelstündlichen Leistungsmittelwerten)</i>			
27.01.10	17:45-18:00h		9.749,0
<i>Minimum (aus viertelstündlichen Leistungsmittelwerten)</i>			
01.01.10	06:00-06:15h		4.655,4

Datum	Zeit	MWh	MW
01.01.10	00:00-00:15h	1.465,9	5.863,6
01.01.10	00:15-00:30h	1.446,3	5.785,3
01.01.10	00:30-00:45h	1.426,7	5.706,7
01.01.10	00:45-01:00h	1.410,2	5.640,9
01.01.10	01:00-01:15h	1.410,4	5.641,4
01.01.10	01:15-01:30h	1.387,0	5.548,1
01.01.10	01:30-01:45h	1.358,2	5.432,8
01.01.10	01:45-02:00h	1.337,9	5.351,7
01.01.10	02:00-02:15h	1.353,8	5.415,3
01.01.10	02:15-02:30h	1.324,6	5.298,3
01.01.10	02:30-02:45h	1.296,8	5.187,3
01.01.10	02:45-03:00h	1.269,8	5.079,1
01.01.10	03:00-03:15h	1.257,5	5.030,1
01.01.10	03:15-03:30h	1.231,0	4.923,9
01.01.10	03:30-03:45h	1.217,0	4.868,1
01.01.10	03:45-04:00h	1.204,4	4.817,5
01.01.10	04:00-04:15h	1.201,6	4.806,3
01.01.10	04:15-04:30h	1.196,3	4.785,0
01.01.10	04:30-04:45h	1.196,9	4.787,7
01.01.10	04:45-05:00h	1.194,8	4.779,2
01.01.10	05:00-05:15h	1.206,3	4.825,3
01.01.10	05:15-05:30h	1.208,6	4.834,2
01.01.10	05:30-05:45h	1.212,2	4.848,8
01.01.10	05:45-06:00h	1.207,7	4.830,9
01.01.10	06:00-06:15h	1.163,8	4.655,4
01.01.10	06:15-06:30h	1.177,9	4.711,6
01.01.10	06:30-06:45h	1.186,9	4.747,5
01.01.10	06:45-07:00h	1.199,7	4.799,0
01.01.10	07:00-07:15h	1.220,4	4.881,5
01.01.10	07:15-07:30h	1.235,7	4.942,7
01.01.10	07:30-07:45h	1.241,4	4.965,5
01.01.10	07:45-08:00h	1.247,9	4.991,6
01.01.10	08:00-08:15h	1.270,3	5.081,3
01.01.10	08:15-08:30h	1.290,8	5.163,4
01.01.10	08:30-08:45h	1.307,0	5.227,9
01.01.10	08:45-09:00h	1.325,7	5.302,9
01.01.10	09:00-09:15h	1.359,6	5.436,3
01.01.10	09:15-09:30h	1.376,0	5.504,1
01.01.10	09:30-09:45h	1.404,8	5.619,3
01.01.10	09:45-10:00h	1.420,4	5.681,5
01.01.10	10:00-10:15h	1.448,5	5.794,2
01.01.10	10:15-10:30h	1.471,8	5.887,3
01.01.10	10:30-10:45h	1.490,3	5.961,0
01.01.10	10:45-11:00h	1.513,8	6.055,2
01.01.10	11:00-11:15h	1.538,9	6.155,7
01.01.10	11:15-11:30h	1.554,9	6.219,6
01.01.10	11:30-11:45h	1.563,4	6.253,4
01.01.10	11:45-12:00h	1.552,7	6.210,9
01.01.10	12:00-12:15h	1.552,1	6.208,4
01.01.10	12:15-12:30h	1.530,2	6.120,7
01.01.10	12:30-12:45h	1.521,0	6.083,9
01.01.10	12:45-13:00h	1.512,1	6.048,6

Belastungsablauf am	
3. Mittwoch	
<i>Zeit</i>	
<i>Maximum</i>	
17:45h	9.349,3
<i>Minimum</i>	
03:45h	5.998,3

Zeit	MW
00:00h	6.793,9
00:15h	6.670,8
00:30h	6.497,7
00:45h	6.475,1
01:00h	6.461,5
01:15h	6.372,1
01:30h	6.293,5
01:45h	6.203,4
02:00h	6.248,9
02:15h	6.220,1
02:30h	6.141,0
02:45h	6.087,5
03:00h	6.086,1
03:15h	6.044,8
03:30h	6.017,5
03:45h	5.998,3
04:00h	6.039,4
04:15h	6.071,2
04:30h	6.148,9
04:45h	6.206,1
05:00h	6.402,2
05:15h	6.520,4
05:30h	6.738,4
05:45h	6.990,5
06:00h	7.208,5
06:15h	7.526,5
06:30h	7.769,8
06:45h	8.083,2
07:00h	8.384,0
07:15h	8.598,7
07:30h	8.693,2
07:45h	8.698,1
08:00h	8.814,6
08:15h	8.897,6
08:30h	8.893,0
08:45h	8.956,8
09:00h	8.949,5
09:15h	9.009,4
09:30h	9.056,6
09:45h	9.078,4
10:00h	9.093,2
10:15h	9.149,0
10:30h	9.134,2
10:45h	9.147,6
11:00h	9.154,6
11:15h	9.182,7
11:30h	9.114,3
11:45h	9.080,1
12:00h	9.001,7
12:15h	8.907,7
12:30h	8.780,5
12:45h	8.803,2

Weekly average				
Month	Day	MWh	MW	Shares
January	Monday	186.924,5	7.788,5	15%
	Tuesday	189.771,4	7.907,1	15%
	Wednesday	187.651,7	7.818,8	15%
	Thursday	191.802,8	7.991,8	15%
	Friday	178.094,9	7.420,6	14%
	Saturday	164.346,2	6.847,8	13%
	Sunday	154.749,2	6.447,9	12%
sum week %	23%	1.253.340,7		100%
from monthly sum				
Date	Day	MWh	MW	
01.01.2010	Friday	138.357,8	5.764,9	
02.01.2010	Saturday	151.710,0	6.321,3	
03.01.2010	Sunday	149.570,4	6.232,1	
04.01.2010	Monday	175.083,3	7.295,1	
05.01.2010	Tuesday	177.923,4	7.413,5	
06.01.2010	Wednesday	163.461,9	6.810,9	
07.01.2010	Thursday	178.592,8	7.441,4	
08.01.2010	Friday	181.540,2	7.564,2	
09.01.2010	Saturday	164.485,1	6.853,5	
10.01.2010	Sunday	153.062,5	6.377,6	
11.01.2010	Monday	189.036,0	7.876,5	
12.01.2010	Tuesday	192.257,7	8.010,7	
13.01.2010	Wednesday	195.013,0	8.125,5	
14.01.2010	Thursday	193.910,8	8.079,6	
15.01.2010	Friday	189.697,3	7.904,1	
16.01.2010	Saturday	168.028,4	7.001,2	
17.01.2010	Sunday	155.817,9	6.492,4	
18.01.2010	Monday	189.625,1	7.901,0	
19.01.2010	Tuesday	190.788,4	7.949,5	
20.01.2010	Wednesday	191.950,0	7.997,9	
21.01.2010	Thursday	195.097,3	8.129,1	
22.01.2010	Friday	190.697,5	7.945,7	
23.01.2010	Saturday	170.144,9	7.089,4	
24.01.2010	Sunday	159.488,3	6.645,3	
25.01.2010	Monday	193.953,8	8.081,4	
26.01.2010	Tuesday	198.116,3	8.254,8	
27.01.2010	Wednesday	200.182,0	8.340,9	
28.01.2010	Thursday	199.610,4	8.317,1	
29.01.2010	Friday	190.181,8	7.924,2	
30.01.2010	Saturday	167.362,4	6.973,4	
31.01.2010	Sunday	155.806,5	6.491,9	
monthly sum		5.510.553,2		

Weekly average constant szenario				
Month	Day	MWh	MW	Shares
January	Monday	184.896,1	7.704,0	15%
	Tuesday	187.712,2	7.821,3	15%
	Wednesday	185.615,4	7.734,0	15%
	Thursday	189.721,5	7.905,1	15%
	Friday	176.162,3	7.340,1	14%
	Saturday	162.562,8	6.773,4	13%
	Sunday	153.069,9	6.377,9	12%
sum week %	23%	1.239.740,2		100%
from monthly sum				
monthly sum		5.450.756,0		

legend:		data from e-control
		calculated from given data (e-control)
		monthly values – calculated in document "ÖffNetz_Monatsbilanz_Verw_2050"
		calculated (constant szenario)
		calculated (growth szenario)

Weekly average growth szenario				
Month	Day	MWh	MW	Shares
January	Monday	241.576,2	10.065,7	15%
	Tuesday	245.255,5	10.219,0	15%
	Wednesday	242.516,0	10.104,8	15%
	Thursday	247.880,7	10.328,4	15%
	Friday	230.165,0	9.590,2	14%
	Saturday	212.396,5	8.849,9	13%
	Sunday	199.993,6	8.333,1	12%
sum week %	23%	1.619.783,5		100%
from monthly sum				
monthly sum		7.121.689,1		

ÖFFENTLICHE STROMVERSORGUNG ÖSTERREICHS

Belastungsablauf

Abgabe an Endverbraucher inkl. Netzverluste und Eigenbedarf aus dem Netz

(1/4 h - Leistungsmittelwerte)

Jänner 2010

Datum	Zeit	MWh	MW
<i>Monatssumme</i>			
Jänner 2010		5.503.173,8	
<i>Maximum (aus viertelstündlichen Leistungsmittelwerten)</i>			
27.01.10	17:45-18:00h		9.749,0
<i>Minimum (aus viertelstündlichen Leistungsmittelwerten)</i>			
01.01.10	06:00-06:15h		4.655,4
Datum	Zeit	MWh	MW
01.01.10	00:00-00:15h	1.465,9	5.863,6
01.01.10	00:15-00:30h	1.446,3	5.785,3
01.01.10	00:30-00:45h	1.426,7	5.706,7
01.01.10	00:45-01:00h	1.410,2	5.640,9
01.01.10	01:00-01:15h	1.410,4	5.641,4
01.01.10	01:15-01:30h	1.387,0	5.548,1
01.01.10	01:30-01:45h	1.358,2	5.432,8
01.01.10	01:45-02:00h	1.337,9	5.351,7
01.01.10	02:00-02:15h	1.353,8	5.415,3
01.01.10	02:15-02:30h	1.324,6	5.298,3
01.01.10	02:30-02:45h	1.296,8	5.187,3
01.01.10	02:45-03:00h	1.269,8	5.079,1
01.01.10	03:00-03:15h	1.257,5	5.030,1
01.01.10	03:15-03:30h	1.231,0	4.923,9
01.01.10	03:30-03:45h	1.217,0	4.868,1
01.01.10	03:45-04:00h	1.204,4	4.817,5
01.01.10	04:00-04:15h	1.201,6	4.806,3
01.01.10	04:15-04:30h	1.196,3	4.785,0
01.01.10	04:30-04:45h	1.196,9	4.787,7
01.01.10	04:45-05:00h	1.194,8	4.779,2
01.01.10	05:00-05:15h	1.206,3	4.825,3
01.01.10	05:15-05:30h	1.208,6	4.834,2
01.01.10	05:30-05:45h	1.212,2	4.848,8
01.01.10	05:45-06:00h	1.207,7	4.830,9
01.01.10	06:00-06:15h	1.163,8	4.655,4
01.01.10	06:15-06:30h	1.177,9	4.711,6
01.01.10	06:30-06:45h	1.186,9	4.747,5
01.01.10	06:45-07:00h	1.199,7	4.799,0

Zeit	MW
<i>Belastungsablauf am 3. Mittwoch</i>	
Zeit	MW
<i>Maximum</i>	
17:45h	9.349,3
<i>Minimum</i>	
03:45h	5.998,3

01.01.10	13:00-13:15h	1.512,1	6.048,3	13:00h	8.868,5
01.01.10	13:15-13:30h	1.504,8	6.019,2	13:15h	8.839,7
01.01.10	13:30-13:45h	1.502,4	6.009,7	13:30h	8.797,4
01.01.10	13:45-14:00h	1.504,5	6.018,1	13:45h	8.724,5
01.01.10	14:00-14:15h	1.503,8	6.015,4	14:00h	8.720,1
01.01.10	14:15-14:30h	1.483,8	5.935,3	14:15h	8.689,5
01.01.10	14:30-14:45h	1.479,9	5.919,7	14:30h	8.632,2
01.01.10	14:45-15:00h	1.472,1	5.888,4	14:45h	8.644,8
01.01.10	15:00-15:15h	1.486,0	5.944,0	15:00h	8.610,9
01.01.10	15:15-15:30h	1.493,6	5.974,3	15:15h	8.603,7
01.01.10	15:30-15:45h	1.489,1	5.956,3	15:30h	8.582,6
01.01.10	15:45-16:00h	1.499,3	5.997,3	15:45h	8.608,7
01.01.10	16:00-16:15h	1.525,3	6.101,0	16:00h	8.634,2
01.01.10	16:15-16:30h	1.569,3	6.277,3	16:15h	8.702,6
01.01.10	16:30-16:45h	1.610,8	6.443,1	16:30h	8.793,0
01.01.10	16:45-17:00h	1.641,7	6.567,0	16:45h	8.964,2
01.01.10	17:00-17:15h	1.676,4	6.705,4	17:00h	9.102,9
01.01.10	17:15-17:30h	1.693,9	6.775,7	17:15h	9.223,2
01.01.10	17:30-17:45h	1.701,6	6.806,3	17:30h	9.344,3
01.01.10	17:45-18:00h	1.692,5	6.769,8	17:45h	9.349,3
01.01.10	18:00-18:15h	1.708,0	6.831,8	18:00h	9.237,2
01.01.10	18:15-18:30h	1.705,8	6.823,2	18:15h	9.229,3
01.01.10	18:30-18:45h	1.696,4	6.785,5	18:30h	9.171,2
01.01.10	18:45-19:00h	1.694,3	6.777,3	18:45h	9.136,0
01.01.10	19:00-19:15h	1.680,6	6.722,3	19:00h	8.996,9
01.01.10	19:15-19:30h	1.672,5	6.689,9	19:15h	8.864,3
01.01.10	19:30-19:45h	1.659,9	6.639,5	19:30h	8.734,5
01.01.10	19:45-20:00h	1.645,1	6.580,6	19:45h	8.580,7
01.01.10	20:00-20:15h	1.630,4	6.521,7	20:00h	8.447,1
01.01.10	20:15-20:30h	1.598,9	6.395,7	20:15h	8.252,9
01.01.10	20:30-20:45h	1.582,1	6.328,5	20:30h	8.133,9
01.01.10	20:45-21:00h	1.554,6	6.218,3	20:45h	8.029,6
01.01.10	21:00-21:15h	1.523,8	6.095,0	21:00h	7.823,9
01.01.10	21:15-21:30h	1.490,9	5.963,8	21:15h	7.731,3
01.01.10	21:30-21:45h	1.477,1	5.908,3	21:30h	7.489,4
01.01.10	21:45-22:00h	1.463,8	5.855,1	21:45h	7.429,3
01.01.10	22:00-22:15h	1.553,0	6.212,1	22:00h	7.752,8
01.01.10	22:15-22:30h	1.562,1	6.248,5	22:15h	7.723,1
01.01.10	22:30-22:45h	1.530,1	6.120,5	22:30h	7.534,9
01.01.10	22:45-23:00h	1.498,4	5.993,7	22:45h	7.445,2
01.01.10	23:00-23:15h	1.474,2	5.896,9	23:00h	7.331,9
01.01.10	23:15-23:30h	1.436,4	5.745,5	23:15h	7.129,9
01.01.10	23:30-23:45h	1.396,8	5.587,4	23:30h	7.002,6
01.01.10	23:45-00:00h	1.379,6	5.518,6	23:45h	6.859,3
02.01.10	00:00-00:15h	1.387,9	5.551,5		
02.01.10	00:15-00:30h	1.355,8	5.423,4		
02.01.10	00:30-00:45h	1.329,4	5.317,7		
02.01.10	00:45-01:00h	1.302,1	5.208,4		
02.01.10	01:00-01:15h	1.302,0	5.208,0		
02.01.10	01:15-01:30h	1.279,6	5.118,5		
02.01.10	01:30-01:45h	1.254,0	5.016,1		
02.01.10	01:45-02:00h	1.233,0	4.932,0		
02.01.10	02:00-02:15h	1.244,8	4.979,2		

01.01.10	07:00-07:15h	1.220,4	4.881,5	07:00h	8.384,0
01.01.10	07:15-07:30h	1.235,7	4.942,7	07:15h	8.598,7
01.01.10	07:30-07:45h	1.241,4	4.965,5	07:30h	8.693,2
01.01.10	07:45-08:00h	1.247,9	4.991,6	07:45h	8.688,1
01.01.10	08:00-08:15h	1.270,3	5.081,3	08:00h	8.814,6
01.01.10	08:15-08:30h	1.290,8	5.163,4	08:15h	8.897,6
01.01.10	08:30-08:45h	1.307,0	5.227,9	08:30h	8.893,0
01.01.10	08:45-09:00h	1.325,7	5.302,9	08:45h	8.956,8
01.01.10	09:00-09:15h	1.359,6	5.438,3	09:00h	8.949,5
01.01.10	09:15-09:30h	1.376,0	5.504,1	09:15h	9.009,4
01.01.10	09:30-09:45h	1.404,8	5.619,3	09:30h	9.056,6
01.01.10	09:45-10:00h	1.420,4	5.681,5	09:45h	9.078,4
01.01.10	10:00-10:15h	1.448,5	5.794,2	10:00h	9.093,2
01.01.10	10:15-10:30h	1.471,8	5.887,3	10:15h	9.149,0
01.01.10	10:30-10:45h	1.490,3	5.961,0	10:30h	9.134,2
01.01.10	10:45-11:00h	1.513,8	6.055,2	10:45h	9.147,6
01.01.10	11:00-11:15h	1.538,9	6.155,7	11:00h	9.154,6
01.01.10	11:15-11:30h	1.554,9	6.219,6	11:15h	9.182,7
01.01.10	11:30-11:45h	1.563,4	6.253,4	11:30h	9.114,3
01.01.10	11:45-12:00h	1.552,7	6.210,9	11:45h	9.080,1
01.01.10	12:00-12:15h	1.552,1	6.208,4	12:00h	9.001,7
01.01.10	12:15-12:30h	1.530,2	6.120,7	12:15h	8.907,7
01.01.10	12:30-12:45h	1.521,0	6.083,9	12:30h	8.780,5
01.01.10	12:45-13:00h	1.512,1	6.048,6	12:45h	8.803,2

02.01.10	02:15-02:30h	1.233,5	4.934,1
02.01.10	02:30-02:45h	1.209,4	4.837,6
02.01.10	02:45-03:00h	1.196,2	4.784,8
02.01.10	03:00-03:15h	1.184,1	4.736,2
02.01.10	03:15-03:30h	1.181,8	4.727,0
02.01.10	03:30-03:45h	1.183,2	4.732,9
02.01.10	03:45-04:00h	1.180,0	4.719,9
02.01.10	04:00-04:15h	1.187,9	4.751,5
02.01.10	04:15-04:30h	1.203,3	4.813,1
02.01.10	04:30-04:45h	1.209,2	4.836,7
02.01.10	04:45-05:00h	1.214,5	4.858,0
02.01.10	05:00-05:15h	1.246,5	4.985,9
02.01.10	05:15-05:30h	1.269,2	5.076,6
02.01.10	05:30-05:45h	1.290,4	5.161,5
02.01.10	05:45-06:00h	1.302,0	5.207,9
02.01.10	06:00-06:15h	1.289,2	5.156,9
02.01.10	06:15-06:30h	1.317,7	5.270,7
02.01.10	06:30-06:45h	1.350,9	5.403,5
02.01.10	06:45-07:00h	1.379,6	5.518,4
02.01.10	07:00-07:15h	1.428,3	5.713,2
02.01.10	07:15-07:30h	1.468,9	5.875,6
02.01.10	07:30-07:45h	1.494,3	5.977,2
02.01.10	07:45-08:00h	1.519,7	6.078,9
02.01.10	08:00-08:15h	1.534,5	6.138,0
02.01.10	08:15-08:30h	1.565,1	6.260,4
02.01.10	08:30-08:45h	1.598,3	6.393,3
02.01.10	08:45-09:00h	1.635,9	6.543,8
02.01.10	09:00-09:15h	1.661,5	6.645,9
02.01.10	09:15-09:30h	1.676,4	6.705,7
02.01.10	09:30-09:45h	1.692,7	6.770,9
02.01.10	09:45-10:00h	1.708,0	6.831,9
02.01.10	10:00-10:15h	1.719,1	6.876,4
02.01.10	10:15-10:30h	1.736,0	6.944,1
02.01.10	10:30-10:45h	1.736,3	6.945,3
02.01.10	10:45-11:00h	1.751,8	7.007,1
02.01.10	11:00-11:15h	1.766,2	7.064,9
02.01.10	11:15-11:30h	1.783,0	7.132,1
02.01.10	11:30-11:45h	1.789,4	7.157,5
02.01.10	11:45-12:00h	1.785,7	7.142,9
02.01.10	12:00-12:15h	1.779,7	7.118,7
02.01.10	12:15-12:30h	1.757,7	7.030,7
02.01.10	12:30-12:45h	1.740,4	6.961,5
02.01.10	12:45-13:00h	1.729,4	6.917,4
02.01.10	13:00-13:15h	1.747,1	6.988,3
02.01.10	13:15-13:30h	1.744,1	6.976,4
02.01.10	13:30-13:45h	1.739,0	6.956,1
02.01.10	13:45-14:00h	1.730,5	6.922,2
02.01.10	14:00-14:15h	1.733,8	6.935,4
02.01.10	14:15-14:30h	1.724,0	6.895,8
02.01.10	14:30-14:45h	1.729,2	6.916,8
02.01.10	14:45-15:00h	1.722,8	6.891,2
02.01.10	15:00-15:15h	1.731,2	6.924,7
02.01.10	15:15-15:30h	1.734,6	6.938,3
02.01.10	15:30-15:45h	1.742,5	6.970,0
02.01.10	15:45-16:00h	1.758,7	7.034,8
02.01.10	16:00-16:15h	1.780,1	7.120,4
02.01.10	16:15-16:30h	1.808,4	7.233,6
02.01.10	16:30-16:45h	1.839,5	7.343,7

02.01.10	16:45-17:00h	1.863,5	7.454,1
02.01.10	17:00-17:15h	1.890,2	7.560,7
02.01.10	17:15-17:30h	1.908,6	7.634,4
02.01.10	17:30-17:45h	1.903,1	7.612,5
02.01.10	17:45-18:00h	1.910,5	7.641,9
02.01.10	18:00-18:15h	1.899,5	7.597,9
02.01.10	18:15-18:30h	1.873,6	7.494,6
02.01.10	18:30-18:45h	1.849,7	7.398,9
02.01.10	18:45-19:00h	1.844,0	7.376,1
02.01.10	19:00-19:15h	1.822,4	7.289,6
02.01.10	19:15-19:30h	1.802,3	7.209,2
02.01.10	19:30-19:45h	1.791,4	7.165,5
02.01.10	19:45-20:00h	1.769,7	7.078,7
02.01.10	20:00-20:15h	1.739,2	6.957,0
02.01.10	20:15-20:30h	1.706,8	6.827,3
02.01.10	20:30-20:45h	1.686,1	6.744,3
02.01.10	20:45-21:00h	1.668,4	6.673,7
02.01.10	21:00-21:15h	1.625,6	6.502,2
02.01.10	21:15-21:30h	1.597,3	6.399,3
02.01.10	21:30-21:45h	1.572,7	6.290,9
02.01.10	21:45-22:00h	1.576,7	6.306,9
02.01.10	22:00-22:15h	1.674,1	6.696,4
02.01.10	22:15-22:30h	1.667,5	6.669,9
02.01.10	22:30-22:45h	1.641,9	6.567,7
02.01.10	22:45-23:00h	1.613,6	6.454,6
02.01.10	23:00-23:15h	1.592,9	6.371,5
02.01.10	23:15-23:30h	1.558,3	6.233,3
02.01.10	23:30-23:45h	1.521,6	6.086,6
02.01.10	23:45-00:00h	1.501,3	6.005,1
03.01.10	00:00-00:15h	1.517,2	6.068,9
03.01.10	00:15-00:30h	1.481,4	5.925,5
03.01.10	00:30-00:45h	1.453,4	5.813,7
03.01.10	00:45-01:00h	1.430,3	5.721,2
03.01.10	01:00-01:15h	1.420,8	5.683,0
03.01.10	01:15-01:30h	1.397,0	5.587,9
03.01.10	01:30-01:45h	1.376,2	5.504,8
03.01.10	01:45-02:00h	1.354,9	5.419,4
03.01.10	02:00-02:15h	1.367,5	5.470,1
03.01.10	02:15-02:30h	1.351,8	5.407,3
03.01.10	02:30-02:45h	1.330,5	5.322,0
03.01.10	02:45-03:00h	1.320,2	5.280,8
03.01.10	03:00-03:15h	1.299,3	5.197,0
03.01.10	03:15-03:30h	1.286,6	5.146,5
03.01.10	03:30-03:45h	1.271,6	5.086,4
03.01.10	03:45-04:00h	1.266,0	5.064,1
03.01.10	04:00-04:15h	1.269,4	5.077,6
03.01.10	04:15-04:30h	1.282,8	5.131,0
03.01.10	04:30-04:45h	1.275,1	5.100,4
03.01.10	04:45-05:00h	1.282,2	5.128,7
03.01.10	05:00-05:15h	1.282,1	5.128,4
03.01.10	05:15-05:30h	1.295,2	5.180,7
03.01.10	05:30-05:45h	1.312,9	5.251,6
03.01.10	05:45-06:00h	1.309,0	5.236,1
03.01.10	06:00-06:15h	1.265,9	5.063,4
03.01.10	06:15-06:30h	1.284,4	5.137,7
03.01.10	06:30-06:45h	1.306,9	5.227,6
03.01.10	06:45-07:00h	1.324,8	5.299,2
03.01.10	07:00-07:15h	1.368,5	5.474,0

03.01.10	21:45-22:00h	1.603,3	6.413,3
03.01.10	22:00-22:15h	1.708,6	6.834,4
03.01.10	22:15-22:30h	1.717,2	6.868,9
03.01.10	22:30-22:45h	1.693,3	6.773,3
03.01.10	22:45-23:00h	1.669,8	6.679,0
03.01.10	23:00-23:15h	1.636,1	6.544,5
03.01.10	23:15-23:30h	1.604,9	6.419,5
03.01.10	23:30-23:45h	1.582,1	6.328,5
03.01.10	23:45-00:00h	1.566,9	6.267,4
04.01.10	00:00-00:15h	1.574,3	6.297,2
04.01.10	00:15-00:30h	1.557,3	6.229,1
04.01.10	00:30-00:45h	1.531,7	6.126,7
04.01.10	00:45-01:00h	1.504,7	6.018,6
04.01.10	01:00-01:15h	1.506,7	6.026,7
04.01.10	01:15-01:30h	1.477,9	5.911,5
04.01.10	01:30-01:45h	1.448,4	5.793,7
04.01.10	01:45-02:00h	1.445,2	5.780,7
04.01.10	02:00-02:15h	1.450,4	5.801,5
04.01.10	02:15-02:30h	1.431,9	5.727,4
04.01.10	02:30-02:45h	1.412,7	5.660,8
04.01.10	02:45-03:00h	1.394,1	5.576,3
04.01.10	03:00-03:15h	1.395,2	5.580,7
04.01.10	03:15-03:30h	1.370,2	5.480,8
04.01.10	03:30-03:45h	1.369,8	5.479,2
04.01.10	03:45-04:00h	1.374,4	5.497,6
04.01.10	04:00-04:15h	1.388,8	5.555,3
04.01.10	04:15-04:30h	1.392,5	5.570,1
04.01.10	04:30-04:45h	1.398,4	5.593,5
04.01.10	04:45-05:00h	1.411,8	5.647,3
04.01.10	05:00-05:15h	1.460,1	5.940,5
04.01.10	05:15-05:30h	1.497,4	5.989,7
04.01.10	05:30-05:45h	1.519,3	6.077,3
04.01.10	05:45-06:00h	1.552,7	6.211,0
04.01.10	06:00-06:15h	1.552,1	6.208,5
04.01.10	06:15-06:30h	1.600,6	6.402,3
04.01.10	06:30-06:45h	1.649,8	6.599,4
04.01.10	06:45-07:00h	1.689,7	6.758,8
04.01.10	07:00-07:15h	1.778,6	7.114,5
04.01.10	07:15-07:30h	1.830,6	7.322,5
04.01.10	07:30-07:45h	1.859,5	7.437,9
04.01.10	07:45-08:00h	1.877,4	7.509,6
04.01.10	08:00-08:15h	1.912,1	7.648,3
04.01.10	08:15-08:30h	1.924,7	7.698,8
04.01.10	08:30-08:45h	1.953,8	7.815,2
04.01.10	08:45-09:00h	1.971,0	7.883,8
04.01.10	09:00-09:15h	1.988,7	7.955,0
04.01.10	09:15-09:30h	2.003,6	8.014,2
04.01.10	09:30-09:45h	2.008,6	8.034,4
04.01.10	09:45-10:00h	2.014,3	8.057,2
04.01.10	10:00-10:15h	2.020,5	8.081,8
04.01.10	10:15-10:30h	2.024,1	8.096,3
04.01.10	10:30-10:45h	2.009,8	8.039,1
04.01.10	10:45-11:00h	2.017,5	8.070,9
04.01.10	11:00-11:15h	2.021,9	8.087,6
04.01.10	11:15-11:30h	2.060,4	8.241,5
04.01.10	11:30-11:45h	2.054,6	8.218,2
04.01.10	11:45-12:00h	2.049,7	8.198,8
04.01.10	12:00-12:15h	2.042,6	8.170,5

03.01.10	07:15-07:30h	1.390,0	5.559,8
03.01.10	07:30-07:45h	1.402,5	5.610,1
03.01.10	07:45-08:00h	1.421,6	5.686,4
03.01.10	08:00-08:15h	1.447,0	5.787,9
03.01.10	08:15-08:30h	1.468,2	5.872,8
03.01.10	08:30-08:45h	1.493,2	5.972,8
03.01.10	08:45-09:00h	1.511,2	6.044,9
03.01.10	09:00-09:15h	1.545,0	6.180,0
03.01.10	09:15-09:30h	1.568,8	6.275,1
03.01.10	09:30-09:45h	1.596,6	6.386,2
03.01.10	09:45-10:00h	1.625,6	6.502,4
03.01.10	10:00-10:15h	1.643,5	6.573,8
03.01.10	10:15-10:30h	1.667,6	6.670,6
03.01.10	10:30-10:45h	1.694,1	6.776,3
03.01.10	10:45-11:00h	1.698,9	6.795,5
03.01.10	11:00-11:15h	1.722,1	6.888,5
03.01.10	11:15-11:30h	1.741,1	6.964,6
03.01.10	11:30-11:45h	1.727,2	6.908,7
03.01.10	11:45-12:00h	1.706,8	6.827,1
03.01.10	12:00-12:15h	1.693,6	6.774,3
03.01.10	12:15-12:30h	1.666,8	6.667,2
03.01.10	12:30-12:45h	1.652,0	6.608,0
03.01.10	12:45-13:00h	1.635,3	6.541,0
03.01.10	13:00-13:15h	1.637,6	6.550,6
03.01.10	13:15-13:30h	1.625,4	6.501,5
03.01.10	13:30-13:45h	1.625,4	6.501,4
03.01.10	13:45-14:00h	1.613,3	6.453,4
03.01.10	14:00-14:15h	1.601,8	6.407,3
03.01.10	14:15-14:30h	1.573,8	6.295,1
03.01.10	14:30-14:45h	1.573,5	6.294,0
03.01.10	14:45-15:00h	1.566,1	6.264,3
03.01.10	15:00-15:15h	1.576,1	6.304,3
03.01.10	15:15-15:30h	1.563,7	6.254,9
03.01.10	15:30-15:45h	1.559,7	6.238,7
03.01.10	15:45-16:00h	1.572,3	6.289,1
03.01.10	16:00-16:15h	1.614,4	6.457,6
03.01.10	16:15-16:30h	1.643,4	6.573,5
03.01.10	16:30-16:45h	1.697,4	6.789,6
03.01.10	16:45-17:00h	1.748,4	6.993,6
03.01.10	17:00-17:15h	1.778,1	7.112,2
03.01.10	17:15-17:30h	1.802,2	7.209,0
03.01.10	17:30-17:45h	1.812,1	7.248,3
03.01.10	17:45-18:00h	1.825,4	7.301,7
03.01.10	18:00-18:15h	1.833,4	7.333,5
03.01.10	18:15-18:30h	1.828,2	7.312,7
03.01.10	18:30-18:45h	1.824,9	7.299,5
03.01.10	18:45-19:00h	1.816,1	7.264,4
03.01.10	19:00-19:15h	1.819,7	7.278,7
03.01.10	19:15-19:30h	1.803,0	7.212,1
03.01.10	19:30-19:45h	1.796,9	7.187,8
03.01.10	19:45-20:00h	1.764,2	7.056,8
03.01.10	20:00-20:15h	1.751,5	7.005,9
03.01.10	20:15-20:30h	1.732,2	6.928,6
03.01.10	20:30-20:45h	1.711,1	6.844,4
03.01.10	20:45-21:00h	1.697,4	6.789,6
03.01.10	21:00-21:15h	1.665,9	6.663,7
03.01.10	21:15-21:30h	1.630,7	6.522,7
03.01.10	21:30-21:45h	1.600,8	6.403,2

04.01.10	12:15-12:30h	2.021,4	8.085,4
04.01.10	12:30-12:45h	2.009,6	8.038,3
04.01.10	12:45-13:00h	1.994,3	7.977,2
04.01.10	13:00-13:15h	2.023,9	8.095,4
04.01.10	13:15-13:30h	2.002,5	8.010,1
04.01.10	13:30-13:45h	1.992,5	7.969,9
04.01.10	13:45-14:00h	1.984,3	7.937,1
04.01.10	14:00-14:15h	1.971,6	7.886,4
04.01.10	14:15-14:30h	1.968,7	7.875,0
04.01.10	14:30-14:45h	1.963,6	7.854,4
04.01.10	14:45-15:00h	1.958,8	7.835,2
04.01.10	15:00-15:15h	1.972,8	7.891,3
04.01.10	15:15-15:30h	1.976,5	7.906,1
04.01.10	15:30-15:45h	1.966,0	7.864,0
04.01.10	15:45-16:00h	1.985,6	7.942,4
04.01.10	16:00-16:15h	1.988,5	7.954,0
04.01.10	16:15-16:30h	2.017,6	8.070,2
04.01.10	16:30-16:45h	2.058,2	8.232,7
04.01.10	16:45-17:00h	2.103,6	8.414,2
04.01.10	17:00-17:15h	2.149,5	8.597,9
04.01.10	17:15-17:30h	2.161,3	8.645,1
04.01.10	17:30-17:45h	2.182,6	8.730,5
04.01.10	17:45-18:00h	2.180,5	8.722,0
04.01.10	18:00-18:15h	2.185,9	8.743,5
04.01.10	18:15-18:30h	2.160,5	8.642,1
04.01.10	18:30-18:45h	2.151,4	8.605,7
04.01.10	18:45-19:00h	2.130,4	8.521,8
04.01.10	19:00-19:15h	2.101,2	8.404,8
04.01.10	19:15-19:30h	2.076,0	8.304,1
04.01.10	19:30-19:45h	2.036,5	8.146,2
04.01.10	19:45-20:00h	1.997,6	7.990,2
04.01.10	20:00-20:15h	1.953,7	7.814,6
04.01.10	20:15-20:30h	1.912,2	7.648,9
04.01.10	20:30-20:45h	1.901,8	7.632,1
04.01.10	20:45-21:00h	1.881,0	7.523,9
04.01.10	21:00-21:15h	1.853,3	7.413,4
04.01.10	21:15-21:30h	1.798,7	7.194,8
04.01.10	21:30-21:45h	1.754,4	7.021,7
04.01.10	21:45-22:00h	1.745,0	6.980,0
04.01.10	22:00-22:15h	1.836,9	7.347,7
04.01.10	22:15-22:30h	1.826,5	7.306,0
04.01.10	22:30-22:45h	1.791,0	7.163,9
04.01.10	22:45-23:00h	1.768,4	7.073,4
04.01.10	23:00-23:15h	1.761,2	7.044,7
04.01.10	23:15-23:30h	1.751,4	6.845,7
04.01.10	23:30-23:45h	1.670,2	6.702,2
04.01.10	23:45-00:00h	1.648,5	6.593,9
05.01.10	00:00-00:15h	1.656,9	6.627,5
05.01.10	00:15-00:30h	1.625,1	6.500,5
05.01.10	00:30-00:45h	1.594,6	6.378,5
05.01.10	00:45-01:00h	1.567,5	6.270,1
05.01.10	01:00-01:15h	1.562,4	6.249,7
05.01.10	01:15-01:30h	1.535,4	6.141,4
05.01.10	01:30-01:45h	1.498,5	6.005,3
05.01.10	01:45-02:00h	1.459,6	5.978,4
05.01.10	02:00-02:15h	1.509,8	6.039,1
05.01.10	02:15-02:30h	1.491,7	5.966,7
05.01.10	02:30-02:45h	1.476,1	5.904,5

05.01.10	02:45-03:00h	1.452,9	5.811,4
05.01.10	03:00-03:15h	1.439,3	5.757,1
05.01.10	03:15-03:30h	1.423,3	5.693,1
05.01.10	03:30-03:45h	1.411,6	5.646,3
05.01.10	03:45-04:00h	1.402,5	5.609,8
05.01.10	04:00-04:15h	1.418,4	5.673,5
05.01.10	04:15-04:30h	1.426,2	5.704,8
05.01.10	04:30-04:45h	1.433,4	5.733,7
05.01.10	04:45-05:00h	1.439,9	5.759,6
05.01.10	05:00-05:15h	1.475,3	5.901,3
05.01.10	05:15-05:30h	1.499,0	5.996,0
05.01.10	05:30-05:45h	1.530,4	6.121,7
05.01.10	05:45-06:00h	1.567,2	6.268,7
05.01.10	06:00-06:15h	1.585,3	6.341,3
05.01.10	06:15-06:30h	1.631,5	6.526,1
05.01.10	06:30-06:45h	1.669,1	6.676,4
05.01.10	06:45-07:00h	1.712,9	6.851,8
05.01.10	07:00-07:15h	1.790,2	7.160,8
05.01.10	07:15-07:30h	1.827,3	7.309,2
05.01.10	07:30-07:45h	1.875,4	7.501,5
05.01.10	07:45-08:00h	1.897,8	7.591,1
05.01.10	08:00-08:15h	1.928,1	7.712,6
05.01.10	08:15-08:30h	1.950,0	7.799,9
05.01.10	08:30-08:45h	1.982,9	7.931,4
05.01.10	08:45-09:00h	2.008,8	8.035,2
05.01.10	09:00-09:15h	2.041,6	8.166,4
05.01.10	09:15-09:30h	2.049,7	8.198,8
05.01.10	09:30-09:45h	2.056,5	8.225,9
05.01.10	09:45-10:00h	2.072,9	8.291,8
05.01.10	10:00-10:15h	2.071,8	8.287,0
05.01.10	10:15-10:30h	2.080,9	8.323,6
05.01.10	10:30-10:45h	2.081,1	8.324,3
05.01.10	10:45-11:00h	2.101,1	8.404,4
05.01.10	11:00-11:15h	2.100,2	8.400,8
05.01.10	11:15-11:30h	2.110,1	8.440,5
05.01.10	11:30-11:45h	2.112,3	8.449,3
05.01.10	11:45-12:00h	2.108,3	8.433,2
05.01.10	12:00-12:15h	2.096,1	8.384,4
05.01.10	12:15-12:30h	2.068,9	8.275,7
05.01.10	12:30-12:45h	2.045,5	8.182,0
05.01.10	12:45-13:00h	2.043,1	8.172,3
05.01.10	13:00-13:15h	2.057,5	8.229,9
05.01.10	13:15-13:30h	2.041,7	8.166,6
05.01.10	13:30-13:45h	2.051,4	8.205,7
05.01.10	13:45-14:00h	2.036,1	8.144,4
05.01.10	14:00-14:15h	2.047,4	8.189,4
05.01.10	14:15-14:30h	2.038,7	8.154,9
05.01.10	14:30-14:45h	2.031,9	8.127,4
05.01.10	14:45-15:00h	2.020,6	8.082,5
05.01.10	15:00-15:15h	2.023,1	8.092,5
05.01.10	15:15-15:30h	2.032,3	8.129,1
05.01.10	15:30-15:45h	2.033,4	8.133,6
05.01.10	15:45-16:00h	2.047,6	8.190,5
05.01.10	16:00-16:15h	2.051,2	8.204,8
05.01.10	16:15-16:30h	2.084,3	8.337,3
05.01.10	16:30-16:45h	2.107,4	8.429,7
05.01.10	16:45-17:00h	2.125,7	8.502,8
05.01.10	17:00-17:15h	2.159,0	8.635,8

05.01.10	17:15-17:30h	2.166,7	8.666,9
05.01.10	17:30-17:45h	2.174,7	8.698,6
05.01.10	17:45-18:00h	2.187,2	8.748,7
05.01.10	18:00-18:15h	2.177,5	8.710,1
05.01.10	18:15-18:30h	2.157,5	8.630,0
05.01.10	18:30-18:45h	2.141,5	8.566,1
05.01.10	18:45-19:00h	2.125,9	8.503,4
05.01.10	19:00-19:15h	2.096,8	8.387,1
05.01.10	19:15-19:30h	2.064,2	8.256,7
05.01.10	19:30-19:45h	2.041,7	8.166,6
05.01.10	19:45-20:00h	2.011,4	8.045,6
05.01.10	20:00-20:15h	1.988,5	7.874,1
05.01.10	20:15-20:30h	1.912,8	7.651,0
05.01.10	20:30-20:45h	1.866,9	7.547,0
05.01.10	20:45-21:00h	1.847,2	7.398,7
05.01.10	21:00-21:15h	1.821,3	7.285,1
05.01.10	21:15-21:30h	1.781,1	7.124,3
05.01.10	21:30-21:45h	1.743,4	6.973,6
05.01.10	21:45-22:00h	1.725,7	6.902,7
05.01.10	22:00-22:15h	1.826,0	7.304,1
05.01.10	22:15-22:30h	1.818,5	7.274,1
05.01.10	22:30-22:45h	1.779,7	7.118,9
05.01.10	22:45-23:00h	1.753,5	7.014,0
05.01.10	23:00-23:15h	1.722,0	6.888,1
05.01.10	23:15-23:30h	1.679,0	6.716,0
05.01.10	23:30-23:45h	1.645,1	6.580,6
05.01.10	23:45-00:00h	1.625,8	6.503,3
06.01.10	00:00-00:15h	1.624,9	6.499,8
06.01.10	00:15-00:30h	1.592,0	6.368,2
06.01.10	00:30-00:45h	1.561,6	6.246,5
06.01.10	00:45-01:00h	1.532,2	6.129,0
06.01.10	01:00-01:15h	1.527,9	6.111,5
06.01.10	01:15-01:30h	1.497,2	5.988,9
06.01.10	01:30-01:45h	1.483,2	5.932,6
06.01.10	01:45-02:00h	1.463,1	5.852,3
06.01.10	02:00-02:15h	1.477,8	5.911,0
06.01.10	02:15-02:30h	1.456,8	5.827,2
06.01.10	02:30-02:45h	1.436,0	5.744,0
06.01.10	02:45-03:00h	1.419,7	5.678,8
06.01.10	03:00-03:15h	1.402,2	5.608,9
06.01.10	03:15-03:30h	1.395,0	5.579,9
06.01.10	03:30-03:45h	1.376,1	5.504,5
06.01.10	03:45-04:00h	1.370,2	5.481,0
06.01.10	04:00-04:15h	1.371,8	5.487,0
06.01.10	04:15-04:30h	1.365,3	5.461,1
06.01.10	04:30-04:45h	1.357,6	5.430,6
06.01.10	04:45-05:00h	1.367,4	5.469,4
06.01.10	05:00-05:15h	1.372,4	5.489,6
06.01.10	05:15-05:30h	1.376,3	5.505,3
06.01.10	05:30-05:45h	1.396,4	5.585,6
06.01.10	05:45-06:00h	1.389,1	5.556,4
06.01.10	06:00-06:15h	1.342,8	5.371,1
06.01.10	06:15-06:30h	1.350,6	5.402,3
06.01.10	06:30-06:45h	1.371,4	5.485,8
06.01.10	06:45-07:00h	1.402,1	5.608,6
06.01.10	07:00-07:15h	1.438,5	5.753,9
06.01.10	07:15-07:30h	1.469,7	5.878,8
06.01.10	07:30-07:45h	1.488,6	5.954,4

06.01.10	07:45-08:00h	1.499,5	5.998,0
06.01.10	08:00-08:15h	1.520,9	6.083,8
06.01.10	08:15-08:30h	1.548,3	6.193,1
06.01.10	08:30-08:45h	1.579,2	6.317,0
06.01.10	08:45-09:00h	1.604,4	6.417,5
06.01.10	09:00-09:15h	1.630,0	6.519,9
06.01.10	09:15-09:30h	1.659,8	6.639,3
06.01.10	09:30-09:45h	1.674,7	6.699,0
06.01.10	09:45-10:00h	1.699,0	6.796,1
06.01.10	10:00-10:15h	1.715,4	6.861,7
06.01.10	10:15-10:30h	1.735,0	6.940,1
06.01.10	10:30-10:45h	1.754,5	7.017,9
06.01.10	10:45-11:00h	1.769,1	7.076,5
06.01.10	11:00-11:15h	1.786,4	7.145,6
06.01.10	11:15-11:30h	1.812,3	7.249,3
06.01.10	11:30-11:45h	1.811,2	7.244,9
06.01.10	11:45-12:00h	1.787,0	7.148,1
06.01.10	12:00-12:15h	1.785,1	7.140,6
06.01.10	12:15-12:30h	1.752,9	7.011,5
06.01.10	12:30-12:45h	1.729,2	6.916,8
06.01.10	12:45-13:00h	1.717,2	6.869,0
06.01.10	13:00-13:15h	1.713,7	6.854,9
06.01.10	13:15-13:30h	1.713,9	6.855,4
06.01.10	13:30-13:45h	1.698,3	6.793,1
06.01.10	13:45-14:00h	1.679,8	6.719,2
06.01.10	14:00-14:15h	1.696,3	6.785,0
06.01.10	14:15-14:30h	1.679,4	6.717,7
06.01.10	14:30-14:45h	1.677,5	6.709,9
06.01.10	14:45-15:00h	1.666,0	6.663,9
06.01.10	15:00-15:15h	1.671,7	6.687,0
06.01.10	15:15-15:30h	1.661,4	6.645,7
06.01.10	15:30-15:45h	1.660,6	6.642,4
06.01.10	15:45-16:00h	1.681,0	6.723,8
06.01.10	16:00-16:15h	1.697,0	6.788,1
06.01.10	16:15-16:30h	1.724,5	6.898,1
06.01.10	16:30-16:45h	1.772,3	7.089,2
06.01.10	16:45-17:00h	1.808,3	7.233,2
06.01.10	17:00-17:15h	1.837,2	7.348,9
06.01.10	17:15-17:30h	1.851,5	7.405,8
06.01.10	17:30-17:45h	1.889,7	7.558,9
06.01.10	17:45-18:00h	1.897,7	7.590,9
06.01.10	18:00-18:15h	1.904,8	7.619,3
06.01.10	18:15-18:30h	1.877,9	7.511,7
06.01.10	18:30-18:45h	1.875,5	7.502,2
06.01.10	18:45-19:00h	1.874,0	7.495,8
06.01.10	19:00-19:15h	1.869,2	7.476,9
06.01.10	19:15-19:30h	1.864,9	7.459,6
06.01.10	19:30-19:45h	1.844,8	7.379,4
06.01.10	19:45-20:00h	1.830,1	7.320,4
06.01.10	20:00-20:15h	1.787,9	7.151,6
06.01.10	20:15-20:30h	1.743,7	6.974,9
06.01.10	20:30-20:45h	1.711,1	6.844,4
06.01.10	20:45-21:00h	1.689,3	6.757,2
06.01.10	21:00-21:15h	1.674,5	6.698,2
06.01.10	21:15-21:30h	1.631,6	6.526,6
06.01.10	21:30-21:45h	1.615,2	6.460,8
06.01.10	21:45-22:00h	1.600,6	6.402,5
06.01.10	22:00-22:15h	1.698,4	6.793,7

06.01.10	22:15-22:30h	1.696,6	6.786,3
06.01.10	22:30-22:45h	1.665,8	6.663,2
06.01.10	22:45-23:00h	1.640,7	6.562,6
06.01.10	23:00-23:15h	1.613,7	6.454,6
06.01.10	23:15-23:30h	1.572,6	6.290,4
06.01.10	23:30-23:45h	1.546,3	6.185,1
06.01.10	23:45-00:00h	1.528,1	6.112,3
07.01.10	00:00-00:15h	1.540,2	6.160,7
07.01.10	00:15-00:30h	1.498,9	5.995,4
07.01.10	00:30-00:45h	1.477,3	5.909,4
07.01.10	00:45-01:00h	1.465,3	5.861,3
07.01.10	01:00-01:15h	1.462,2	5.848,9
07.01.10	01:15-01:30h	1.430,8	5.723,3
07.01.10	01:30-01:45h	1.410,7	5.642,7
07.01.10	01:45-02:00h	1.397,4	5.589,6
07.01.10	02:00-02:15h	1.417,3	5.669,1
07.01.10	02:15-02:30h	1.386,0	5.544,0
07.01.10	02:30-02:45h	1.376,6	5.506,5
07.01.10	02:45-03:00h	1.365,2	5.460,9
07.01.10	03:00-03:15h	1.354,6	5.418,5
07.01.10	03:15-03:30h	1.344,4	5.377,4
07.01.10	03:30-03:45h	1.342,8	5.371,4
07.01.10	03:45-04:00h	1.342,5	5.369,9
07.01.10	04:00-04:15h	1.352,1	5.408,3
07.01.10	04:15-04:30h	1.355,3	5.421,1
07.01.10	04:30-04:45h	1.378,6	5.514,4
07.01.10	04:45-05:00h	1.397,9	5.591,8
07.01.10	05:00-05:15h	1.467,4	5.869,5
07.01.10	05:15-05:30h	1.496,7	5.986,9
07.01.10	05:30-05:45h	1.540,9	6.163,8
07.01.10	05:45-06:00h	1.580,8	6.323,0
07.01.10	06:00-06:15h	1.631,1	6.524,6
07.01.10	06:15-06:30h	1.711,0	6.844,1
07.01.10	06:30-06:45h	1.779,3	7.117,4
07.01.10	06:45-07:00h	1.848,3	7.373,3
07.01.10	07:00-07:15h	1.909,0	7.636,2
07.01.10	07:15-07:30h	1.977,1	7.908,4
07.01.10	07:30-07:45h	1.983,9	7.935,5
07.01.10	07:45-08:00h	2.011,2	8.044,8
07.01.10	08:00-08:15h	2.034,8	8.139,3
07.01.10	08:15-08:30h	2.037,5	8.150,0
07.01.10	08:30-08:45h	2.063,0	8.252,0
07.01.10	08:45-09:00h	2.084,1	8.336,3
07.01.10	09:00-09:15h	2.094,0	8.375,8
07.01.10	09:15-09:30h	2.100,5	8.390,5
07.01.10	09:30-09:45h	2.097,2	8.389,0
07.01.10	09:45-10:00h	2.104,3	8.417,3
07.01.10	10:00-10:15h	2.110,0	8.439,8
07.01.10	10:15-10:30h	2.116,4	8.465,5
07.01.10	10:30-10:45h	2.118,5	8.474,1
07.01.10	10:45-11:00h	2.118,8	8.475,1
07.01.10	11:00-11:15h	2.129,2	8.516,7
07.01.10	11:15-11:30h	2.133,9	8.535,4
07.01.10	11:30-11:45h	2.135,1	8.551,1
07.01.10	11:45-12:00h	2.122,6	8.490,2
07.01.10	12:00-12:15h	2.113,3	8.453,2
07.01.10	12:15-12:30h	2.091,3	8.365,3
07.01.10	12:30-12:45h	2.079,4	8.317,7

07.01.10	12:45-13:00h	2.067,3	8.269,2
07.01.10	13:00-13:15h	2.076,6	8.306,6
07.01.10	13:15-13:30h	2.068,6	8.274,4
07.01.10	13:30-13:45h	2.067,5	8.269,9
07.01.10	13:45-14:00h	2.058,4	8.233,5
07.01.10	14:00-14:15h	2.055,5	8.222,0
07.01.10	14:15-14:30h	2.043,5	8.173,9
07.01.10	14:30-14:45h	2.031,3	8.125,4
07.01.10	14:45-15:00h	2.015,9	8.063,5
07.01.10	15:00-15:15h	2.009,0	8.035,9
07.01.10	15:15-15:30h	2.005,2	8.021,0
07.01.10	15:30-15:45h	2.010,1	8.040,4
07.01.10	15:45-16:00h	2.017,3	8.069,1
07.01.10	16:00-16:15h	2.041,2	8.164,6
07.01.10	16:15-16:30h	2.069,1	8.276,4
07.01.10	16:30-16:45h	2.121,1	8.484,5
07.01.10	16:45-17:00h	2.165,4	8.661,7
07.01.10	17:00-17:15h	2.199,3	8.797,4
07.01.10	17:15-17:30h	2.200,2	8.800,8
07.01.10	17:30-17:45h	2.223,5	8.892,8
07.01.10	17:45-18:00h	2.219,5	8.878,0
07.01.10	18:00-18:15h	2.195,3	8.781,1
07.01.10	18:15-18:30h	2.195,8	8.783,1
07.01.10	18:30-18:45h	2.184,7	8.738,8
07.01.10	18:45-19:00h	2.160,1	8.640,4
07.01.10	19:00-19:15h	2.129,9	8.519,4
07.01.10	19:15-19:30h	2.107,4	8.429,6
07.01.10	19:30-19:45h	2.081,4	8.325,8
07.01.10	19:45-20:00h	2.042,0	8.168,2
07.01.10	20:00-20:15h	1.996,6	7.986,5
07.01.10	20:15-20:30h	1.949,7	7.798,8
07.01.10	20:30-20:45h	1.931,8	7.727,0
07.01.10	20:45-21:00h	1.882,4	7.529,8
07.01.10	21:00-21:15h	1.851,9	7.407,8
07.01.10	21:15-21:30h	1.811,3	7.245,2
07.01.10	21:30-21:45h	1.770,0	7.080,0
07.01.10	21:45-22:00h	1.740,6	6.962,5
07.01.10	22:00-22:15h	1.829,8	7.319,1
07.01.10	22:15-22:30h	1.822,3	7.289,3
07.01.10	22:30-22:45h	1.781,6	7.126,4
07.01.10	22:45-23:00h	1.760,3	7.041,3
07.01.10	23:00-23:15h	1.724,0	6.895,8
07.01.10	23:15-23:30h	1.684,7	6.738,9
07.01.10	23:30-23:45h	1.648,4	6.593,6
07.01.10	23:45-00:00h	1.640,7	6.562,8
08.01.10	00:00-00:15h	1.636,1	6.544,2
08.01.10	00:15-00:30h	1.596,0	6.384,1
08.01.10	00:30-00:45h	1.570,1	6.280,3
08.01.10	00:45-01:00h	1.542,6	6.170,3
08.01.10	01:00-01:15h	1.541,9	6.167,4
08.01.10	01:15-01:30h	1.524,8	6.099,3
08.01.10	01:30-01:45h	1.501,8	6.007,2
08.01.10	01:45-02:00h	1.482,2	5.928,8
08.01.10	02:00-02:15h	1.499,5	5.997,8
08.01.10	02:15-02:30h	1.474,1	5.896,5
08.01.10	02:30-02:45h	1.456,4	5.825,7
08.01.10	02:45-03:00h	1.442,3	5.769,1
08.01.10	03:00-03:15h	1.430,1	5.720,5

08.01.10	03:15-03:30h	1.429,0	5.716,2
08.01.10	03:30-03:45h	1.419,0	5.676,0
08.01.10	03:45-04:00h	1.413,7	5.654,9
08.01.10	04:00-04:15h	1.429,9	5.719,8
08.01.10	04:15-04:30h	1.433,9	5.735,5
08.01.10	04:30-04:45h	1.453,4	5.813,6
08.01.10	04:45-05:00h	1.464,0	5.855,9
08.01.10	05:00-05:15h	1.513,7	6.054,8
08.01.10	05:15-05:30h	1.543,1	6.172,4
08.01.10	05:30-05:45h	1.579,8	6.319,2
08.01.10	05:45-06:00h	1.643,0	6.572,2
08.01.10	06:00-06:15h	1.683,5	6.734,1
08.01.10	06:15-06:30h	1.739,3	6.957,4
08.01.10	06:30-06:45h	1.812,0	7.247,8
08.01.10	06:45-07:00h	1.880,0	7.520,1
08.01.10	07:00-07:15h	1.936,0	7.744,0
08.01.10	07:15-07:30h	1.977,7	7.910,8
08.01.10	07:30-07:45h	2.028,9	8.115,5
08.01.10	07:45-08:00h	2.045,9	8.183,5
08.01.10	08:00-08:15h	2.058,9	8.235,6
08.01.10	08:15-08:30h	2.079,0	8.315,8
08.01.10	08:30-08:45h	2.093,0	8.371,8
08.01.10	08:45-09:00h	2.103,1	8.412,5
08.01.10	09:00-09:15h	2.118,9	8.475,4
08.01.10	09:15-09:30h	2.126,8	8.507,1
08.01.10	09:30-09:45h	2.135,6	8.542,6
08.01.10	09:45-10:00h	2.145,2	8.580,7
08.01.10	10:00-10:15h	2.152,0	8.608,0
08.01.10	10:15-10:30h	2.156,9	8.627,5
08.01.10	10:30-10:45h	2.172,5	8.690,0
08.01.10	10:45-11:00h	2.179,3	8.717,3
08.01.10	11:00-11:15h	2.186,7	8.746,9
08.01.10	11:15-11:30h	2.200,6	8.802,6
08.01.10	11:30-11:45h	2.194,6	8.778,4
08.01.10	11:45-12:00h	2.178,8	8.715,4
08.01.10	12:00-12:15h	2.170,3	8.681,2
08.01.10	12:15-12:30h	2.144,1	8.576,4
08.01.10	12:30-12:45h	2.131,6	8.526,3
08.01.10	12:45-13:00h	2.102,3	8.409,2
08.01.10	13:00-13:15h	2.110,2	8.441,0
08.01.10	13:15-13:30h	2.091,7	8.366,8
08.01.10	13:30-13:45h	2.089,2	8.356,8
08.01.10	13:45-14:00h	2.078,3	8.313,1
08.01.10	14:00-14:15h	2.085,5	8.342,1
08.01.10	14:15-14:30h	2.064,0	8.256,0
08.01.10	14:30-14:45h	2.047,1	8.188,4
08.01.10	14:45-15:00h	2.041,3	8.165,3
08.01.10	15:00-15:15h	2.041,6	8.166,5
08.01.10	15:15-15:30h	2.042,3	8.169,2
08.01.10	15:30-15:45h	2.039,4	8.157,4
08.01.10	15:45-16:00h	2.044,1	8.176,4
08.01.10	16:00-16:15h	2.055,2	8.221,0
08.01.10	16:15-16:30h	2.088,6	8.354,3
08.01.10	16:30-16:45h	2.125,2	8.501,0
08.01.10	16:45-17:00h	2.154,7	8.618,7
08.01.10	17:00-17:15h	2.178,3	8.713,1
08.01.10	17:15-17:30h	2.194,0	8.775,9
08.01.10	17:30-17:45h	2.198,5	8.794,0

08.01.10	17:45-18:00h	2.203,2	8.812,7
08.01.10	18:00-18:15h	2.171,3	8.685,3
08.01.10	18:15-18:30h	2.155,5	8.622,2
08.01.10	18:30-18:45h	2.146,1	8.584,2
08.01.10	18:45-19:00h	2.124,4	8.497,8
08.01.10	19:00-19:15h	2.096,5	8.386,0
08.01.10	19:15-19:30h	2.075,0	8.300,0
08.01.10	19:30-19:45h	2.040,6	8.162,4
08.01.10	19:45-20:00h	2.009,0	8.036,2
08.01.10	20:00-20:15h	1.969,4	7.877,5
08.01.10	20:15-20:30h	1.929,0	7.716,0
08.01.10	20:30-20:45h	1.907,2	7.628,8
08.01.10	20:45-21:00h	1.876,9	7.507,7
08.01.10	21:00-21:15h	1.823,2	7.293,0
08.01.10	21:15-21:30h	1.787,8	7.151,2
08.01.10	21:30-21:45h	1.763,0	7.051,8
08.01.10	21:45-22:00h	1.744,3	6.977,4
08.01.10	22:00-22:15h	1.836,1	7.344,4
08.01.10	22:15-22:30h	1.824,6	7.298,2
08.01.10	22:30-22:45h	1.794,6	7.178,2
08.01.10	22:45-23:00h	1.767,5	7.070,2
08.01.10	23:00-23:15h	1.742,5	6.970,2
08.01.10	23:15-23:30h	1.706,1	6.824,2
08.01.10	23:30-23:45h	1.674,2	6.697,0
08.01.10	23:45-00:00h	1.648,9	6.595,5
09.01.10	00:00-00:15h	1.644,5	6.578,0
09.01.10	00:15-00:30h	1.619,6	6.478,3
09.01.10	00:30-00:45h	1.582,1	6.328,6
09.01.10	00:45-01:00h	1.556,4	6.225,6
09.01.10	01:00-01:15h	1.553,8	6.215,2
09.01.10	01:15-01:30h	1.538,5	6.154,2
09.01.10	01:30-01:45h	1.515,2	6.080,7
09.01.10	01:45-02:00h	1.491,9	5.967,4
09.01.10	02:00-02:15h	1.500,3	6.001,2
09.01.10	02:15-02:30h	1.479,3	5.917,4
09.01.10	02:30-02:45h	1.456,3	5.825,4
09.01.10	02:45-03:00h	1.438,7	5.755,0
09.01.10	03:00-03:15h	1.425,8	5.703,0
09.01.10	03:15-03:30h	1.416,1	5.664,3
09.01.10	03:30-03:45h	1.405,8	5.623,3
09.01.10	03:45-04:00h	1.394,7	5.578,8
09.01.10	04:00-04:15h	1.383,1	5.532,2
09.01.10	04:15-04:30h	1.396,4	5.585,7
09.01.10	04:30-04:45h	1.401,3	5.605,1
09.01.10	04:45-05:00h	1.406,8	5.627,1
09.01.10	05:00-05:15h	1.426,1	5.704,2
09.01.10	05:15-05:30h	1.441,8	5.767,2
09.01.10	05:30-05:45h	1.458,2	5.832,8
09.01.10	05:45-06:00h	1.468,2	5.872,9
09.01.10	06:00-06:15h	1.445,8	5.783,3
09.01.10	06:15-06:30h	1.474,3	5.897,1
09.01.10	06:30-06:45h	1.501,6	6.006,4
09.01.10	06:45-07:00h	1.528,8	6.114,5
09.01.10	07:00-07:15h	1.563,2	6.332,8
09.01.10	07:15-07:30h	1.617,3	6.469,1
09.01.10	07:30-07:45h	1.638,4	6.553,7
09.01.10	07:45-08:00h	1.659,4	6.637,4
09.01.10	08:00-08:15h	1.702,2	6.809,0

09.01.10	08:15-08:30h	1.725,9	6.903,6
09.01.10	08:30-08:45h	1.749,6	6.998,2
09.01.10	08:45-09:00h	1.776,5	7.105,8
09.01.10	09:00-09:15h	1.806,2	7.224,7
09.01.10	09:15-09:30h	1.813,1	7.252,3
09.01.10	09:30-09:45h	1.840,7	7.363,0
09.01.10	09:45-10:00h	1.851,1	7.404,4
09.01.10	10:00-10:15h	1.866,6	7.466,3
09.01.10	10:15-10:30h	1.885,5	7.541,9
09.01.10	10:30-10:45h	1.904,3	7.617,3
09.01.10	10:45-11:00h	1.913,1	7.652,5
09.01.10	11:00-11:15h	1.928,5	7.714,0
09.01.10	11:15-11:30h	1.941,9	7.767,5
09.01.10	11:30-11:45h	1.947,4	7.789,5
09.01.10	11:45-12:00h	1.941,6	7.766,4
09.01.10	12:00-12:15h	1.928,8	7.715,3
09.01.10	12:15-12:30h	1.897,9	7.591,5
09.01.10	12:30-12:45h	1.885,6	7.542,3
09.01.10	12:45-13:00h	1.870,8	7.483,1
09.01.10	13:00-13:15h	1.875,5	7.502,0
09.01.10	13:15-13:30h	1.865,5	7.462,0
09.01.10	13:30-13:45h	1.853,9	7.415,7
09.01.10	13:45-14:00h	1.840,1	7.360,5
09.01.10	14:00-14:15h	1.850,6	7.402,4
09.01.10	14:15-14:30h	1.836,3	7.345,1
09.01.10	14:30-14:45h	1.843,7	7.374,9
09.01.10	14:45-15:00h	1.835,2	7.340,8
09.01.10	15:00-15:15h	1.841,5	7.366,0
09.01.10	15:15-15:30h	1.834,9	7.339,7
09.01.10	15:30-15:45h	1.840,9	7.363,7
09.01.10	15:45-16:00h	1.854,7	7.419,0
09.01.10	16:00-16:15h	1.854,5	7.418,1
09.01.10	16:15-16:30h	1.879,5	7.517,9
09.01.10	16:30-16:45h	1.913,7	7.654,8
09.01.10	16:45-17:00h	1.920,0	7.700,0
09.01.10	17:00-17:15h	1.975,6	7.902,4
09.01.10	17:15-17:30h	1.974,8	7.899,4
09.01.10	17:30-17:45h	1.963,5	7.865,1
09.01.10	17:45-18:00h	1.972,5	7.890,0
09.01.10	18:00-18:15h	1.971,5	7.886,0
09.01.10	18:15-18:30h	1.947,5	7.790,2
09.01.10	18:30-18:45h	1.924,8	7.699,3
09.01.10	18:45-19:00h	1.904,9	7.619,5
09.01.10	19:00-19:15h	1.883,4	7.533,6
09.01.10	19:15-19:30h	1.855,5	7.455,5
09.01.10	19:30-19:45h	1.842,2	7.368,7
09.01.10	19:45-20:00h	1.809,5	7.238,1
09.01.10	20:00-20:15h	1.785,0	7.140,0
09.01.10	20:15-20:30h	1.748,1	6.992,2
09.01.10	20:30-20:45h	1.729,1	6.916,2
09.01.10	20:45-21:00h	1.703,7	6.814,9
09.01.10	21:00-21:15h	1.668,5	6.673,9
09.01.10	21:15-21:30h	1.646,9	6.587,7
09.01.10	21:30-21:45h	1.640,5	6.498,0
09.01.10	21:45-22:00h	1.615,4	6.461,6
09.01.10	22:00-22:15h	1.707,2	6.828,7
09.01.10	22:15-22:30h	1.708,9	6.835,8
09.01.10	22:30-22:45h	1.678,3	6.713,1

09.01.10	22:45-23:00h	1.661,9	6.647,5
09.01.10	23:00-23:15h	1.649,5	6.598,1
09.01.10	23:15-23:30h	1.611,5	6.446,2
09.01.10	23:30-23:45h	1.580,1	6.320,2
09.01.10	23:45-00:00h	1.549,3	6.197,3
10.01.10	00:00-00:15h	1.544,5	6.178,1
10.01.10	00:15-00:30h	1.514,6	6.058,5
10.01.10	00:30-00:45h	1.484,9	5.938,3
10.01.10	00:45-01:00h	1.469,5	5.878,1
10.01.10	01:00-01:15h	1.469,4	5.877,5
10.01.10	01:15-01:30h	1.443,5	5.773,9
10.01.10	01:30-01:45h	1.422,1	5.688,4
10.01.10	01:45-02:00h	1.399,0	5.596,2
10.01.10	02:00-02:15h	1.408,7	5.634,8
10.01.10	02:15-02:30h	1.392,6	5.570,4
10.01.10	02:30-02:45h	1.377,1	5.508,5
10.01.10	02:45-03:00h	1.358,3	5.433,2
10.01.10	03:00-03:15h	1.347,9	5.391,6
10.01.10	03:15-03:30h	1.329,3	5.317,3
10.01.10	03:30-03:45h	1.321,2	5.284,7
10.01.10	03:45-04:00h	1.311,4	5.245,4
10.01.10	04:00-04:15h	1.313,8	5.255,3
10.01.10	04:15-04:30h	1.316,9	5.267,7
10.01.10	04:30-04:45h	1.315,3	5.261,1
10.01.10	04:45-05:00h	1.315,7	5.262,8
10.01.10	05:00-05:15h	1.329,4	5.317,5
10.01.10	05:15-05:30h	1.332,8	5.331,2
10.01.10	05:30-05:45h	1.337,2	5.348,9
10.01.10	05:45-06:00h	1.337,3	5.349,4
10.01.10	06:00-06:15h	1.297,8	5.191,4
10.01.10	06:15-06:30h	1.303,0	5.211,9
10.01.10	06:30-06:45h	1.330,3	5.321,3
10.01.10	06:45-07:00h	1.358,3	5.433,0
10.01.10	07:00-07:15h	1.390,4	5.561,5
10.01.10	07:15-07:30h	1.415,3	5.661,3
10.01.10	07:30-07:45h	1.439,9	5.759,8
10.01.10	07:45-08:00h	1.452,5	5.809,9
10.01.10	08:00-08:15h	1.472,8	5.891,2
10.01.10	08:15-08:30h	1.500,9	6.003,8
10.01.10	08:30-08:45h	1.527,8	6.111,1
10.01.10	08:45-09:00h	1.542,7	6.170,7
10.01.10	09:00-09:15h	1.588,3	6.353,4
10.01.10	09:15-09:30h	1.608,4	6.433,7
10.01.10	09:30-09:45h	1.630,5	6.522,2
10.01.10	09:45-10:00h	1.655,3	6.621,1
10.01.10	10:00-10:15h	1.675,1	6.700,4
10.01.10	10:15-10:30h	1.706,1	6.824,3
10.01.10	10:30-10:45h	1.721,9	6.887,7
10.01.10	10:45-11:00h	1.747,9	6.991,7
10.01.10	11:00-11:15h	1.766,1	7.064,5
10.01.10	11:15-11:30h	1.798,9	7.195,5
10.01.10	11:30-11:45h	1.796,1	7.184,4
10.01.10	11:45-12:00h	1.775,5	7.102,0
10.01.10	12:00-12:15h	1.758,8	7.035,3
10.01.10	12:15-12:30h	1.728,2	6.912,7
10.01.10	12:30-12:45h	1.715,5	6.862,2
10.01.10	12:45-13:00h	1.695,2	6.780,7
10.01.10	13:00-13:15h	1.706,4	6.825,5

10.01.10	13:15-13:30h	1.696,5	6.786,2
10.01.10	13:30-13:45h	1.683,3	6.733,0
10.01.10	13:45-14:00h	1.661,8	6.647,1
10.01.10	14:00-14:15h	1.657,0	6.628,0
10.01.10	14:15-14:30h	1.642,9	6.571,6
10.01.10	14:30-14:45h	1.644,4	6.577,6
10.01.10	14:45-15:00h	1.634,3	6.537,0
10.01.10	15:00-15:15h	1.636,9	6.547,4
10.01.10	15:15-15:30h	1.633,9	6.535,5
10.01.10	15:30-15:45h	1.634,6	6.538,5
10.01.10	15:45-16:00h	1.635,7	6.542,7
10.01.10	16:00-16:15h	1.636,0	6.544,0
10.01.10	16:15-16:30h	1.670,9	6.683,7
10.01.10	16:30-16:45h	1.715,9	6.863,6
10.01.10	16:45-17:00h	1.768,1	7.072,3
10.01.10	17:00-17:15h	1.801,7	7.206,9
10.01.10	17:15-17:30h	1.822,5	7.289,9
10.01.10	17:30-17:45h	1.839,7	7.358,9
10.01.10	17:45-18:00h	1.844,0	7.376,0
10.01.10	18:00-18:15h	1.859,0	7.435,8
10.01.10	18:15-18:30h	1.858,9	7.435,7
10.01.10	18:30-18:45h	1.849,4	7.397,6
10.01.10	18:45-19:00h	1.845,1	7.380,5
10.01.10	19:00-19:15h	1.841,4	7.365,7
10.01.10	19:15-19:30h	1.840,8	7.363,1
10.01.10	19:30-19:45h	1.828,0	7.312,1
10.01.10	19:45-20:00h	1.811,6	7.246,2
10.01.10	20:00-20:15h	1.793,9	7.175,5
10.01.10	20:15-20:30h	1.765,0	7.060,1
10.01.10	20:30-20:45h	1.745,9	6.983,4
10.01.10	20:45-21:00h	1.706,5	6.826,0
10.01.10	21:00-21:15h	1.686,0	6.743,9
10.01.10	21:15-21:30h	1.649,7	6.598,7
10.01.10	21:30-21:45h	1.619,2	6.477,0
10.01.10	21:45-22:00h	1.609,6	6.438,5
10.01.10	22:00-22:15h	1.718,6	6.874,6
10.01.10	22:15-22:30h	1.717,9	6.871,6
10.01.10	22:30-22:45h	1.680,3	6.721,2
10.01.10	22:45-23:00h	1.667,0	6.667,9
10.01.10	23:00-23:15h	1.653,1	6.612,5
10.01.10	23:15-23:30h	1.611,0	6.444,0
10.01.10	23:30-23:45h	1.579,8	6.319,3
10.01.10	23:45-00:00h	1.566,6	6.266,3
11.01.10	00:00-00:15h	1.577,0	6.307,9
11.01.10	00:15-00:30h	1.552,4	6.209,5
11.01.10	00:30-00:45h	1.528,7	6.114,7
11.01.10	00:45-01:00h	1.498,8	5.995,1
11.01.10	01:00-01:15h	1.497,9	5.991,5
11.01.10	01:15-01:30h	1.482,8	5.931,3
11.01.10	01:30-01:45h	1.466,2	5.865,0
11.01.10	01:45-02:00h	1.451,0	5.804,0
11.01.10	02:00-02:15h	1.460,5	5.842,0
11.01.10	02:15-02:30h	1.447,7	5.790,7
11.01.10	02:30-02:45h	1.437,4	5.749,6
11.01.10	02:45-03:00h	1.423,0	5.692,2
11.01.10	03:00-03:15h	1.416,4	5.665,4
11.01.10	03:15-03:30h	1.402,5	5.609,9
11.01.10	03:30-03:45h	1.398,8	5.595,2

11.01.10	03:45-04:00h	1.408,1	5.632,3
11.01.10	04:00-04:15h	1.415,3	5.660,0
11.01.10	04:15-04:30h	1.426,0	5.704,2
11.01.10	04:30-04:45h	1.453,0	5.811,8
11.01.10	04:45-05:00h	1.470,8	5.883,1
11.01.10	05:00-05:15h	1.529,8	6.119,0
11.01.10	05:15-05:30h	1.557,1	6.228,4
11.01.10	05:30-05:45h	1.615,7	6.462,9
11.01.10	05:45-06:00h	1.679,3	6.717,3
11.01.10	06:00-06:15h	1.735,2	6.940,7
11.01.10	06:15-06:30h	1.809,7	7.238,8
11.01.10	06:30-06:45h	1.899,8	7.599,3
11.01.10	06:45-07:00h	1.967,1	7.868,4
11.01.10	07:00-07:15h	2.060,3	8.241,1
11.01.10	07:15-07:30h	2.105,8	8.423,2
11.01.10	07:30-07:45h	2.127,6	8.510,5
11.01.10	07:45-08:00h	2.141,5	8.566,0
11.01.10	08:00-08:15h	2.162,0	8.647,9
11.01.10	08:15-08:30h	2.179,7	8.718,6
11.01.10	08:30-08:45h	2.162,9	8.731,7
11.01.10	08:45-09:00h	2.200,9	8.803,6
11.01.10	09:00-09:15h	2.202,4	8.809,7
11.01.10	09:15-09:30h	2.208,7	8.834,7
11.01.10	09:30-09:45h	2.223,6	8.894,3
11.01.10	09:45-10:00h	2.225,7	8.902,7
11.01.10	10:00-10:15h	2.225,7	8.902,6
11.01.10	10:15-10:30h	2.242,3	8.969,2
11.01.10	10:30-10:45h	2.259,3	9.037,3
11.01.10	10:45-11:00h	2.254,3	9.017,2
11.01.10	11:00-11:15h	2.274,4	9.097,8
11.01.10	11:15-11:30h	2.268,9	9.075,7
11.01.10	11:30-11:45h	2.271,7	9.086,6
11.01.10	11:45-12:00h	2.255,5	9.022,1
11.01.10	12:00-12:15h	2.245,4	8.981,6
11.01.10	12:15-12:30h	2.231,9	8.927,5
11.01.10	12:30-12:45h	2.222,5	8.890,2
11.01.10	12:45-13:00h	2.229,5	8.917,8
11.01.10	13:00-13:15h	2.219,6	8.878,5
11.01.10	13:15-13:30h	2.235,0	8.939,8
11.01.10	13:30-13:45h	2.210,1	8.840,5
11.01.10	13:45-14:00h	2.199,7	8.799,0
11.01.10	14:00-14:15h	2.220,3	8.881,1
11.01.10	14:15-14:30h	2.216,2	8.864,7
11.01.10	14:30-14:45h	2.200,4	8.801,7
11.01.10	14:45-15:00h	2.198,7	8.794,7
11.01.10	15:00-15:15h	2.198,4	8.793,7
11.01.10	15:15-15:30h	2.187,3	8.749,3
11.01.10	15:30-15:45h	2.193,2	8.772,8
11.01.10	15:45-16:00h	2.191,3	8.765,1
11.01.10	16:00-16:15h	2.196,0	8.784,2
11.01.10	16:15-16:30h	2.228,2	8.912,6
11.01.10	16:30-16:45h	2.252,3	9.009,2
11.01.10	16:45-17:00h	2.285,3	9.141,2
11.01.10	17:00-17:15h	2.317,2	9.288,6
11.01.10	17:15-17:30h	2.333,2	9.332,9
11.01.10	17:30-17:45h	2.336,8	9.347,3
11.01.10	17:45-18:00h	2.335,7	9.342,6
11.01.10	18:00-18:15h	2.325,7	9.302,7

11.01.10	18:15-18:30h	2.306,6	9.226,3
11.01.10	18:30-18:45h	2.301,3	9.205,4
11.01.10	18:45-19:00h	2.271,5	9.085,8
11.01.10	19:00-19:15h	2.253,4	9.013,6
11.01.10	19:15-19:30h	2.208,7	8.834,7
11.01.10	19:30-19:45h	2.188,2	8.752,9
11.01.10	19:45-20:00h	2.140,5	8.561,9
11.01.10	20:00-20:15h	2.102,7	8.410,6
11.01.10	20:15-20:30h	2.060,3	8.241,1
11.01.10	20:30-20:45h	2.024,2	8.096,8
11.01.10	20:45-21:00h	1.987,9	7.951,8
11.01.10	21:00-21:15h	1.956,3	7.825,2
11.01.10	21:15-21:30h	1.906,1	7.624,5
11.01.10	21:30-21:45h	1.871,4	7.485,8
11.01.10	21:45-22:00h	1.819,2	7.277,0
11.01.10	22:00-22:15h	1.918,2	7.672,8
11.01.10	22:15-22:30h	1.907,0	7.628,0
11.01.10	22:30-22:45h	1.874,2	7.496,9
11.01.10	22:45-23:00h	1.843,4	7.373,4
11.01.10	23:00-23:15h	1.805,3	7.221,1
11.01.10	23:15-23:30h	1.765,8	7.063,4
11.01.10	23:30-23:45h	1.724,6	6.898,5
11.01.10	23:45-00:00h	1.708,3	6.833,1
12.01.10	00:00-00:15h	1.697,3	6.789,0
12.01.10	00:15-00:30h	1.666,6	6.666,3
12.01.10	00:30-00:45h	1.645,2	6.561,0
12.01.10	00:45-01:00h	1.616,2	6.464,7
12.01.10	01:00-01:15h	1.624,0	6.495,9
12.01.10	01:15-01:30h	1.606,5	6.425,8
12.01.10	01:30-01:45h	1.572,6	6.290,5
12.01.10	01:45-02:00h	1.562,2	6.248,9
12.01.10	02:00-02:15h	1.577,2	6.308,7
12.01.10	02:15-02:30h	1.558,1	6.232,2
12.01.10	02:30-02:45h	1.538,4	6.153,6
12.01.10	02:45-03:00h	1.507,7	6.000,6
12.01.10	03:00-03:15h	1.501,1	6.004,6
12.01.10	03:15-03:30h	1.503,2	6.012,6
12.01.10	03:30-03:45h	1.494,0	5.976,2
12.01.10	03:45-04:00h	1.493,6	5.974,5
12.01.10	04:00-04:15h	1.511,4	6.045,8
12.01.10	04:15-04:30h	1.524,8	6.099,3
12.01.10	04:30-04:45h	1.529,0	6.115,8
12.01.10	04:45-05:00h	1.547,6	6.190,3
12.01.10	05:00-05:15h	1.596,0	6.363,9
12.01.10	05:15-05:30h	1.644,8	6.538,8
12.01.10	05:30-05:45h	1.689,6	6.758,3
12.01.10	05:45-06:00h	1.748,5	6.993,8
12.01.10	06:00-06:15h	1.802,2	7.208,7
12.01.10	06:15-06:30h	1.876,1	7.504,4
12.01.10	06:30-06:45h	1.958,2	7.832,6
12.01.10	06:45-07:00h	2.034,0	8.136,1
12.01.10	07:00-07:15h	2.112,3	8.449,1
12.01.10	07:15-07:30h	2.171,5	8.686,1
12.01.10	07:30-07:45h	2.228,2	8.941,2
12.01.10	07:45-08:00h	2.194,3	8.776,6
12.01.10	08:00-08:15h	2.223,3	8.889,2
12.01.10	08:15-08:30h	2.234,6	8.938,3
12.01.10	08:30-08:45h	2.235,2	8.940,9

12.01.10	08:45-09:00h	2.230,7	8.922,9
12.01.10	09:00-09:15h	2.241,3	8.965,2
12.01.10	09:15-09:30h	2.257,9	9.031,6
12.01.10	09:30-09:45h	2.252,2	9.008,8
12.01.10	09:45-10:00h	2.259,3	9.037,2
12.01.10	10:00-10:15h	2.270,6	9.082,5
12.01.10	10:15-10:30h	2.268,8	9.075,2
12.01.10	10:30-10:45h	2.273,5	9.094,2
12.01.10	10:45-11:00h	2.269,5	9.078,1
12.01.10	11:00-11:15h	2.267,4	9.069,4
12.01.10	11:15-11:30h	2.269,8	9.079,4
12.01.10	11:30-11:45h	2.264,6	9.058,6
12.01.10	11:45-12:00h	2.258,9	9.035,4
12.01.10	12:00-12:15h	2.235,9	8.943,7
12.01.10	12:15-12:30h	2.209,9	8.839,6
12.01.10	12:30-12:45h	2.198,0	8.792,1
12.01.10	12:45-13:00h	2.187,5	8.749,9
12.01.10	13:00-13:15h	2.199,7	8.798,8
12.01.10	13:15-13:30h	2.199,0	8.796,2
12.01.10	13:30-13:45h	2.187,6	8.750,4
12.01.10	13:45-14:00h	2.180,2	8.720,7
12.01.10	14:00-14:15h	2.176,8	8.707,1
12.01.10	14:15-14:30h	2.175,7	8.702,8
12.01.10	14:30-14:45h	2.163,2	8.653,0
12.01.10	14:45-15:00h	2.150,6	8.602,4
12.01.10	15:00-15:15h	2.153,6	8.614,3
12.01.10	15:15-15:30h	2.155,1	8.620,5
12.01.10	15:30-15:45h	2.157,2	8.628,9
12.01.10	15:45-16:00h	2.163,8	8.655,2
12.01.10	16:00-16:15h	2.187,1	8.748,2
12.01.10	16:15-16:30h	2.196,8	8.787,1
12.01.10	16:30-16:45h	2.243,3	8.973,3
12.01.10	16:45-17:00h	2.288,6	9.154,4
12.01.10	17:00-17:15h	2.326,8	9.307,2
12.01.10	17:15-17:30h	2.348,5	9.393,8
12.01.10	17:30-17:45h	2.350,4	9.401,7
12.01.10	17:45-18:00h	2.357,2	9.428,6
12.01.10	18:00-18:15h	2.341,3	9.365,3
12.01.10	18:15-18:30h	2.328,9	9.315,4
12.01.10	18:30-18:45h	2.314,8	9.259,1
12.01.10	18:45-19:00h	2.299,8	9.199,1
12.01.10	19:00-19:15h	2.267,1	9.068,4
12.01.10	19:15-19:30h	2.227,0	8.907,8
12.01.10	19:30-19:45h	2.182,6	8.730,3
12.01.10	19:45-20:00h	2.162,6	8.650,3
12.01.10	20:00-20:15h	2.108,3	8.433,1
12.01.10	20:15-20:30h	2.080,9	8.323,7
12.01.10	20:30-20:45h	2.047,1	8.188,3
12.01.10	20:45-21:00h	2.017,3	8.069,3
12.01.10	21:00-21:15h	1.970,5	7.882,2
12.01.10	21:15-21:30h	1.923,4	7.693,4
12.01.10	21:30-21:45h	1.880,6	7.522,6
12.01.10	21:45-22:00h	1.867,1	7.468,4
12.01.10	22:00-22:15h	1.935,4	7.741,7
12.01.10	22:15-22:30h	1.928,1	7.712,5
12.01.10	22:30-22:45h	1.891,4	7.565,7
12.01.10	22:45-23:00h	1.860,2	7.440,6
12.01.10	23:00-23:15h	1.827,2	7.308,6

12.01.10	23:15-23:30h	1.780,1	7.120,6
12.01.10	23:30-23:45h	1.734,9	6.939,5
12.01.10	23:45-00:00h	1.719,0	6.876,1
13.01.10	00:00-00:15h	1.729,0	6.916,2
13.01.10	00:15-00:30h	1.697,7	6.790,8
13.01.10	00:30-00:45h	1.670,6	6.682,6
13.01.10	00:45-01:00h	1.652,0	6.607,9
13.01.10	01:00-01:15h	1.659,2	6.636,7
13.01.10	01:15-01:30h	1.617,8	6.471,2
13.01.10	01:30-01:45h	1.612,2	6.449,0
13.01.10	01:45-02:00h	1.598,5	6.394,1
13.01.10	02:00-02:15h	1.605,1	6.420,2
13.01.10	02:15-02:30h	1.581,5	6.325,8
13.01.10	02:30-02:45h	1.571,3	6.285,0
13.01.10	02:45-03:00h	1.550,6	6.202,2
13.01.10	03:00-03:15h	1.540,6	6.162,5
13.01.10	03:15-03:30h	1.530,5	6.121,9
13.01.10	03:30-03:45h	1.525,2	6.100,7
13.01.10	03:45-04:00h	1.518,0	6.071,9
13.01.10	04:00-04:15h	1.520,4	6.081,6
13.01.10	04:15-04:30h	1.528,5	6.114,0
13.01.10	04:30-04:45h	1.542,7	6.171,0
13.01.10	04:45-05:00h	1.563,7	6.254,6
13.01.10	05:00-05:15h	1.611,7	6.446,6
13.01.10	05:15-05:30h	1.650,5	6.601,9
13.01.10	05:30-05:45h	1.702,7	6.810,8
13.01.10	05:45-06:00h	1.748,4	6.993,5
13.01.10	06:00-06:15h	1.815,6	7.262,3
13.01.10	06:15-06:30h	1.889,9	7.559,7
13.01.10	06:30-06:45h	1.968,5	7.874,1
13.01.10	06:45-07:00h	2.052,5	8.210,1
13.01.10	07:00-07:15h	2.140,7	8.563,0
13.01.10	07:15-07:30h	2.183,6	8.734,2
13.01.10	07:30-07:45h	2.222,7	8.890,7
13.01.10	07:45-08:00h	2.230,9	8.923,6
13.01.10	08:00-08:15h	2.248,7	8.994,6
13.01.10	08:15-08:30h	2.259,5	9.038,0
13.01.10	08:30-08:45h	2.269,2	9.076,9
13.01.10	08:45-09:00h	2.286,7	9.146,9
13.01.10	09:00-09:15h	2.285,8	9.143,4
13.01.10	09:15-09:30h	2.302,2	9.208,7
13.01.10	09:30-09:45h	2.301,2	9.205,0
13.01.10	09:45-10:00h	2.297,0	9.188,2
13.01.10	10:00-10:15h	2.308,2	9.232,7
13.01.10	10:15-10:30h	2.315,1	9.260,5
13.01.10	10:30-10:45h	2.322,3	9.289,3
13.01.10	10:45-11:00h	2.335,5	9.342,0
13.01.10	11:00-11:15h	2.326,3	9.305,4
13.01.10	11:15-11:30h	2.324,0	9.296,1
13.01.10	11:30-11:45h	2.323,2	9.292,7
13.01.10	11:45-12:00h	2.322,5	9.290,1
13.01.10	12:00-12:15h	2.292,6	9.170,3
13.01.10	12:15-12:30h	2.259,5	9.037,8
13.01.10	12:30-12:45h	2.251,9	9.007,7
13.01.10	12:45-13:00h	2.247,1	8.988,2
13.01.10	13:00-13:15h	2.262,7	9.050,7
13.01.10	13:15-13:30h	2.244,6	8.978,2
13.01.10	13:30-13:45h	2.246,2	8.984,9

13.01.10	13:45-14:00h	2.247,8	8.991,4
13.01.10	14:00-14:15h	2.240,9	8.963,7
13.01.10	14:15-14:30h	2.241,4	8.965,6
13.01.10	14:30-14:45h	2.234,6	8.938,4
13.01.10	14:45-15:00h	2.225,3	8.901,0
13.01.10	15:00-15:15h	2.243,8	8.975,1
13.01.10	15:15-15:30h	2.242,6	8.970,6
13.01.10	15:30-15:45h	2.231,0	8.923,9
13.01.10	15:45-16:00h	2.235,5	8.941,8
13.01.10	16:00-16:15h	2.235,9	8.943,7
13.01.10	16:15-16:30h	2.255,7	9.022,8
13.01.10	16:30-16:45h	2.281,8	9.127,1
13.01.10	16:45-17:00h	2.311,4	9.245,7
13.01.10	17:00-17:15h	2.335,2	9.340,8
13.01.10	17:15-17:30h	2.352,7	9.410,7
13.01.10	17:30-17:45h	2.351,6	9.406,6
13.01.10	17:45-18:00h	2.363,4	9.453,5
13.01.10	18:00-18:15h	2.344,5	9.378,2
13.01.10	18:15-18:30h	2.326,8	9.307,3
13.01.10	18:30-18:45h	2.311,4	9.245,7
13.01.10	18:45-19:00h	2.297,4	9.189,7
13.01.10	19:00-19:15h	2.270,5	9.081,8
13.01.10	19:15-19:30h	2.233,5	8.933,8
13.01.10	19:30-19:45h	2.203,9	8.815,5
13.01.10	19:45-20:00h	2.169,5	8.678,0
13.01.10	20:00-20:15h	2.124,3	8.497,3
13.01.10	20:15-20:30h	2.081,4	8.325,7
13.01.10	20:30-20:45h	2.043,8	8.175,2
13.01.10	20:45-21:00h	2.001,8	8.007,2
13.01.10	21:00-21:15h	1.959,6	7.838,4
13.01.10	21:15-21:30h	1.920,1	7.680,5
13.01.10	21:30-21:45h	1.871,0	7.483,9
13.01.10	21:45-22:00h	1.860,0	7.439,9
13.01.10	22:00-22:15h	1.933,9	7.735,7
13.01.10	22:15-22:30h	1.930,0	7.719,9
13.01.10	22:30-22:45h	1.888,8	7.555,2
13.01.10	22:45-23:00h	1.855,4	7.421,7
13.01.10	23:00-23:15h	1.828,3	7.313,3
13.01.10	23:15-23:30h	1.790,0	7.160,1
13.01.10	23:30-23:45h	1.753,6	7.014,3
13.01.10	23:45-00:00h	1.718,1	6.872,2
14.01.10	00:00-00:15h	1.726,3	6.905,2
14.01.10	00:15-00:30h	1.700,5	6.801,8
14.01.10	00:30-00:45h	1.671,3	6.685,3
14.01.10	00:45-01:00h	1.654,7	6.618,8
14.01.10	01:00-01:15h	1.640,7	6.562,9
14.01.10	01:15-01:30h	1.614,4	6.457,7
14.01.10	01:30-01:45h	1.603,2	6.412,7
14.01.10	01:45-02:00h	1.588,0	6.352,2
14.01.10	02:00-02:15h	1.599,7	6.398,6
14.01.10	02:15-02:30h	1.582,1	6.328,6
14.01.10	02:30-02:45h	1.564,6	6.258,4
14.01.10	02:45-03:00h	1.544,6	6.178,3
14.01.10	03:00-03:15h	1.529,0	6.116,0
14.01.10	03:15-03:30h	1.518,7	6.075,0
14.01.10	03:30-03:45h	1.506,9	6.027,7
14.01.10	03:45-04:00h	1.496,7	5.986,7
14.01.10	04:00-04:15h	1.501,9	6.007,7

14.01.10	04:15-04:30h	1.521,4	6.085,6
14.01.10	04:30-04:45h	1.534,4	6.137,5
14.01.10	04:45-05:00h	1.556,6	6.226,2
14.01.10	05:00-05:15h	1.608,5	6.434,0
14.01.10	05:15-05:30h	1.646,8	6.587,2
14.01.10	05:30-05:45h	1.692,8	6.771,1
14.01.10	05:45-06:00h	1.762,8	7.051,3
14.01.10	06:00-06:15h	1.815,0	7.260,0
14.01.10	06:15-06:30h	1.879,7	7.519,0
14.01.10	06:30-06:45h	1.961,8	7.847,0
14.01.10	06:45-07:00h	2.033,4	8.133,4
14.01.10	07:00-07:15h	2.113,4	8.453,7
14.01.10	07:15-07:30h	2.173,5	8.693,8
14.01.10	07:30-07:45h	2.185,6	8.742,3
14.01.10	07:45-08:00h	2.205,5	8.822,1
14.01.10	08:00-08:15h	2.238,9	8.955,6
14.01.10	08:15-08:30h	2.259,1	9.036,3
14.01.10	08:30-08:45h	2.274,4	9.097,7
14.01.10	08:45-09:00h	2.283,2	9.132,8
14.01.10	09:00-09:15h	2.292,8	9.171,0
14.01.10	09:15-09:30h	2.294,1	9.176,3
14.01.10	09:30-09:45h	2.297,5	9.189,9
14.01.10	09:45-10:00h	2.293,9	9.175,5
14.01.10	10:00-10:15h	2.296,9	9.187,8
14.01.10	10:15-10:30h	2.305,9	9.223,6
14.01.10	10:30-10:45h	2.319,2	9.278,7
14.01.10	10:45-11:00h	2.325,3	9.301,0
14.01.10	11:00-11:15h	2.319,7	9.278,9
14.01.10	11:15-11:30h	2.333,1	9.332,2
14.01.10	11:30-11:45h	2.324,1	9.296,6
14.01.10	11:45-12:00h	2.298,3	9.193,2
14.01.10	12:00-12:15h	2.279,0	9.116,1
14.01.10	12:15-12:30h	2.259,3	9.037,3
14.01.10	12:30-12:45h	2.234,3	8.937,0
14.01.10	12:45-13:00h	2.212,2	8.862,2
14.01.10	13:00-13:15h	2.266,0	9.064,1
14.01.10	13:15-13:30h	2.248,9	8.995,8
14.01.10	13:30-13:45h	2.247,2	8.988,8
14.01.10	13:45-14:00h	2.230,8	8.923,4
14.01.10	14:00-14:15h	2.223,3	8.893,7
14.01.10	14:15-14:30h	2.208,9	8.835,6
14.01.10	14:30-14:45h	2.207,3	8.829,2
14.01.10	14:45-15:00h	2.201,3	8.805,3
14.01.10	15:00-15:15h	2.195,2	8.780,9
14.01.10	15:15-15:30h	2.199,5	8.795,5
14.01.10	15:30-15:45h	2.188,8	8.755,2
14.01.10	15:45-16:00h	2.196,9	8.787,4
14.01.10	16:00-16:15h	2.208,5	8.833,9
14.01.10	16:15-16:30h	2.224,8	8.899,4
14.01.10	16:30-16:45h	2.236,2	8.944,9
14.01.10	16:45-17:00h	2.277,7	9.110,8
14.01.10	17:00-17:15h	2.308,0	9.232,1
14.01.10	17:15-17:30h	2.328,3	9.313,4
14.01.10	17:30-17:45h	2.377,1	9.397,1
14.01.10	17:45-18:00h	2.335,2	9.341,0
14.01.10	18:00-18:15h	2.325,3	9.301,3
14.01.10	18:15-18:30h	2.316,0	9.264,1
14.01.10	18:30-18:45h	2.296,7	9.186,4

14.01.10	18:45-19:00h	2.286,5	9.145,8
14.01.10	19:00-19:15h	2.262,7	9.050,9
14.01.10	19:15-19:30h	2.228,6	8.914,4
14.01.10	19:30-19:45h	2.193,8	8.775,1
14.01.10	19:45-20:00h	2.154,0	8.615,8
14.01.10	20:00-20:15h	2.107,6	8.430,3
14.01.10	20:15-20:30h	2.068,3	8.273,1
14.01.10	20:30-20:45h	2.038,5	8.153,9
14.01.10	20:45-21:00h	1.998,5	7.994,0
14.01.10	21:00-21:15h	1.962,5	7.850,0
14.01.10	21:15-21:30h	1.917,0	7.667,9
14.01.10	21:30-21:45h	1.880,6	7.522,6
14.01.10	21:45-22:00h	1.853,5	7.414,2
14.01.10	22:00-22:15h	1.927,9	7.711,7
14.01.10	22:15-22:30h	1.930,3	7.721,3
14.01.10	22:30-22:45h	1.889,3	7.557,4
14.01.10	22:45-23:00h	1.855,5	7.422,1
14.01.10	23:00-23:15h	1.824,0	7.296,0
14.01.10	23:15-23:30h	1.773,3	7.093,3
14.01.10	23:30-23:45h	1.740,7	6.962,9
14.01.10	23:45-00:00h	1.723,7	6.894,8
15.01.10	00:00-00:15h	1.720,8	6.883,2
15.01.10	00:15-00:30h	1.694,1	6.776,6
15.01.10	00:30-00:45h	1.660,7	6.642,8
15.01.10	00:45-01:00h	1.642,3	6.569,3
15.01.10	01:00-01:15h	1.639,8	6.559,1
15.01.10	01:15-01:30h	1.616,5	6.466,2
15.01.10	01:30-01:45h	1.595,4	6.381,5
15.01.10	01:45-02:00h	1.571,7	6.287,0
15.01.10	02:00-02:15h	1.585,1	6.340,4
15.01.10	02:15-02:30h	1.560,7	6.242,6
15.01.10	02:30-02:45h	1.542,6	6.170,3
15.01.10	02:45-03:00h	1.528,1	6.112,3
15.01.10	03:00-03:15h	1.523,5	6.094,1
15.01.10	03:15-03:30h	1.513,0	6.052,2
15.01.10	03:30-03:45h	1.502,7	6.010,7
15.01.10	03:45-04:00h	1.493,0	5.972,1
15.01.10	04:00-04:15h	1.511,0	6.043,9
15.01.10	04:15-04:30h	1.513,6	6.054,4
15.01.10	04:30-04:45h	1.528,2	6.112,9
15.01.10	04:45-05:00h	1.541,5	6.166,0
15.01.10	05:00-05:15h	1.583,6	6.334,6
15.01.10	05:15-05:30h	1.619,2	6.476,9
15.01.10	05:30-05:45h	1.668,7	6.674,9
15.01.10	05:45-06:00h	1.723,4	6.893,6
15.01.10	06:00-06:15h	1.780,4	7.121,7
15.01.10	06:15-06:30h	1.864,1	7.466,4
15.01.10	06:30-06:45h	1.944,1	7.776,3
15.01.10	06:45-07:00h	2.021,6	8.086,4
15.01.10	07:00-07:15h	2.095,4	8.381,6
15.01.10	07:15-07:30h	2.147,4	8.589,7
15.01.10	07:30-07:45h	2.187,2	8.749,0
15.01.10	07:45-08:00h	2.205,7	8.823,0
15.01.10	08:00-08:15h	2.225,3	8.901,3
15.01.10	08:15-08:30h	2.225,7	8.902,9
15.01.10	08:30-08:45h	2.244,9	8.979,6
15.01.10	08:45-09:00h	2.245,9	8.983,6
15.01.10	09:00-09:15h	2.254,1	9.016,5

15.01.10	09:15-09:30h	2.267,8	9.071,1
15.01.10	09:30-09:45h	2.277,0	9.108,0
15.01.10	09:45-10:00h	2.282,0	9.128,0
15.01.10	10:00-10:15h	2.275,7	9.102,7
15.01.10	10:15-10:30h	2.282,3	9.129,1
15.01.10	10:30-10:45h	2.293,6	9.174,5
15.01.10	10:45-11:00h	2.285,1	9.140,6
15.01.10	11:00-11:15h	2.277,4	9.109,7
15.01.10	11:15-11:30h	2.288,8	9.155,2
15.01.10	11:30-11:45h	2.279,6	9.118,6
15.01.10	11:45-12:00h	2.264,4	9.057,6
15.01.10	12:00-12:15h	2.251,6	9.006,5
15.01.10	12:15-12:30h	2.211,1	8.844,4
15.01.10	12:30-12:45h	2.190,9	8.763,7
15.01.10	12:45-13:00h	2.176,3	8.705,4
15.01.10	13:00-13:15h	2.171,7	8.686,9
15.01.10	13:15-13:30h	2.155,4	8.621,8
15.01.10	13:30-13:45h	2.161,6	8.646,5
15.01.10	13:45-14:00h	2.143,3	8.573,4
15.01.10	14:00-14:15h	2.136,7	8.547,0
15.01.10	14:15-14:30h	2.123,5	8.493,9
15.01.10	14:30-14:45h	2.111,0	8.444,1
15.01.10	14:45-15:00h	2.096,4	8.385,4
15.01.10	15:00-15:15h	2.104,3	8.417,2
15.01.10	15:15-15:30h	2.105,2	8.421,0
15.01.10	15:30-15:45h	2.097,7	8.390,6
15.01.10	15:45-16:00h	2.096,3	8.385,1
15.01.10	16:00-16:15h	2.111,3	8.445,2
15.01.10	16:15-16:30h	2.120,5	8.481,8
15.01.10	16:30-16:45h	2.153,6	8.614,5
15.01.10	16:45-17:00h	2.191,0	8.764,1
15.01.10	17:00-17:15h	2.245,0	8.980,1
15.01.10	17:15-17:30h	2.262,3	9.049,4
15.01.10	17:30-17:45h	2.270,8	9.083,2
15.01.10	17:45-18:00h	2.277,7	9.111,0
15.01.10	18:00-18:15h	2.258,1	9.032,3
15.01.10	18:15-18:30h	2.242,3	8.969,0
15.01.10	18:30-18:45h	2.232,6	8.930,3
15.01.10	18:45-19:00h	2.207,7	8.830,6
15.01.10	19:00-19:15h	2.184,6	8.738,5
15.01.10	19:15-19:30h	2.149,6	8.598,3
15.01.10	19:30-19:45h	2.123,4	8.493,5
15.01.10	19:45-20:00h	2.076,8	8.307,1
15.01.10	20:00-20:15h	2.037,6	8.150,3
15.01.10	20:15-20:30h	1.993,4	7.973,6
15.01.10	20:30-20:45h	1.966,1	7.864,2
15.01.10	20:45-21:00h	1.933,0	7.731,8
15.01.10	21:00-21:15h	1.877,0	7.507,9
15.01.10	21:15-21:30h	1.842,0	7.368,0
15.01.10	21:30-21:45h	1.816,9	7.267,5
15.01.10	21:45-22:00h	1.795,7	7.183,0
15.01.10	22:00-22:15h	1.880,5	7.521,9
15.01.10	22:15-22:30h	1.880,2	7.520,9
15.01.10	22:30-22:45h	1.853,6	7.414,6
15.01.10	22:45-23:00h	1.824,1	7.296,6
15.01.10	23:00-23:15h	1.792,7	7.170,7
15.01.10	23:15-23:30h	1.750,6	7.002,6
15.01.10	23:30-23:45h	1.717,4	6.869,7

15.01.10	23:45-00:00h	1.700,9	6.803,5
16.01.10	00:00-00:15h	1.692,1	6.768,2
16.01.10	00:15-00:30h	1.666,6	6.666,3
16.01.10	00:30-00:45h	1.638,1	6.552,4
16.01.10	00:45-01:00h	1.607,6	6.430,5
16.01.10	01:00-01:15h	1.611,1	6.444,4
16.01.10	01:15-01:30h	1.581,2	6.324,7
16.01.10	01:30-01:45h	1.569,1	6.276,3
16.01.10	01:45-02:00h	1.558,1	6.232,3
16.01.10	02:00-02:15h	1.553,8	6.215,4
16.01.10	02:15-02:30h	1.526,8	6.107,2
16.01.10	02:30-02:45h	1.504,6	6.018,2
16.01.10	02:45-03:00h	1.490,3	5.961,1
16.01.10	03:00-03:15h	1.463,4	5.853,7
16.01.10	03:15-03:30h	1.448,9	5.795,6
16.01.10	03:30-03:45h	1.433,4	5.733,8
16.01.10	03:45-04:00h	1.427,4	5.709,4
16.01.10	04:00-04:15h	1.431,1	5.724,4
16.01.10	04:15-04:30h	1.432,2	5.728,7
16.01.10	04:30-04:45h	1.433,7	5.734,9
16.01.10	04:45-05:00h	1.432,1	5.728,4
16.01.10	05:00-05:15h	1.460,3	5.841,1
16.01.10	05:15-05:30h	1.458,9	5.835,6
16.01.10	05:30-05:45h	1.484,2	5.937,0
16.01.10	05:45-06:00h	1.500,2	6.000,8
16.01.10	06:00-06:15h	1.488,8	5.955,2
16.01.10	06:15-06:30h	1.519,4	6.077,7
16.01.10	06:30-06:45h	1.550,7	6.203,0
16.01.10	06:45-07:00h	1.590,4	6.361,7
16.01.10	07:00-07:15h	1.639,2	6.556,7
16.01.10	07:15-07:30h	1.694,8	6.779,0
16.01.10	07:30-07:45h	1.702,4	6.809,6
16.01.10	07:45-08:00h	1.723,0	6.892,0
16.01.10	08:00-08:15h	1.763,4	7.053,6
16.01.10	08:15-08:30h	1.790,1	7.160,2
16.01.10	08:30-08:45h	1.814,1	7.256,4
16.01.10	08:45-09:00h	1.843,4	7.373,7
16.01.10	09:00-09:15h	1.871,6	7.486,3
16.01.10	09:15-09:30h	1.897,0	7.587,9
16.01.10	09:30-09:45h	1.907,1	7.628,3
16.01.10	09:45-10:00h	1.918,8	7.675,1
16.01.10	10:00-10:15h	1.936,8	7.747,3
16.01.10	10:15-10:30h	1.948,0	7.792,0
16.01.10	10:30-10:45h	1.962,3	7.849,2
16.01.10	10:45-11:00h	1.976,1	7.904,2
16.01.10	11:00-11:15h	1.982,3	7.929,0
16.01.10	11:15-11:30h	1.990,4	7.961,7
16.01.10	11:30-11:45h	1.984,3	7.937,1
16.01.10	11:45-12:00h	1.970,4	7.881,8
16.01.10	12:00-12:15h	1.958,5	7.834,0
16.01.10	12:15-12:30h	1.922,6	7.690,5
16.01.10	12:30-12:45h	1.901,8	7.607,2
16.01.10	12:45-13:00h	1.879,5	7.514,1
16.01.10	13:00-13:15h	1.872,4	7.489,5
16.01.10	13:15-13:30h	1.862,6	7.450,6
16.01.10	13:30-13:45h	1.868,9	7.475,6
16.01.10	13:45-14:00h	1.852,6	7.410,4
16.01.10	14:00-14:15h	1.845,0	7.379,8

16.01.10	14:15-14:30h	1.832,0	7.327,8
16.01.10	14:30-14:45h	1.835,9	7.343,5
16.01.10	14:45-15:00h	1.823,7	7.294,9
16.01.10	15:00-15:15h	1.830,1	7.320,5
16.01.10	15:15-15:30h	1.819,7	7.278,7
16.01.10	15:30-15:45h	1.820,0	7.279,8
16.01.10	15:45-16:00h	1.825,7	7.302,8
16.01.10	16:00-16:15h	1.819,6	7.278,5
16.01.10	16:15-16:30h	1.832,0	7.328,2
16.01.10	16:30-16:45h	1.881,2	7.524,7
16.01.10	16:45-17:00h	1.928,8	7.715,2
16.01.10	17:00-17:15h	1.970,8	7.883,1
16.01.10	17:15-17:30h	1.996,6	7.986,4
16.01.10	17:30-17:45h	2.005,1	8.020,3
16.01.10	17:45-18:00h	2.010,9	8.043,4
16.01.10	18:00-18:15h	2.005,0	8.020,1
16.01.10	18:15-18:30h	1.984,2	7.936,8
16.01.10	18:30-18:45h	1.976,0	7.904,1
16.01.10	18:45-19:00h	1.947,8	7.791,2
16.01.10	19:00-19:15h	1.930,2	7.720,7
16.01.10	19:15-19:30h	1.909,8	7.639,3
16.01.10	19:30-19:45h	1.887,0	7.547,8
16.01.10	19:45-20:00h	1.863,8	7.455,1
16.01.10	20:00-20:15h	1.839,6	7.358,6
16.01.10	20:15-20:30h	1.796,6	7.186,3
16.01.10	20:30-20:45h	1.775,7	7.102,8
16.01.10	20:45-21:00h	1.759,2	7.036,7
16.01.10	21:00-21:15h	1.729,8	6.919,0
16.01.10	21:15-21:30h	1.696,5	6.786,1
16.01.10	21:30-21:45h	1.678,5	6.714,1
16.01.10	21:45-22:00h	1.661,4	6.645,7
16.01.10	22:00-22:15h	1.756,2	7.024,6
16.01.10	22:15-22:30h	1.754,6	7.018,3
16.01.10	22:30-22:45h	1.735,0	6.940,1
16.01.10	22:45-23:00h	1.694,4	6.801,4
16.01.10	23:00-23:15h	1.694,2	6.776,1
16.01.10	23:15-23:30h	1.652,8	6.611,3
16.01.10	23:30-23:45h	1.618,6	6.467,1
16.01.10	23:45-00:00h	1.587,7	6.350,7
17.01.10	00:00-00:15h	1.603,8	6.415,2
17.01.10	00:15-00:30h	1.572,9	6.291,7
17.01.10	00:30-00:45h	1.542,2	6.168,6
17.01.10	00:45-01:00h	1.519,9	6.079,6
17.01.10	01:00-01:15h	1.510,9	6.043,7
17.01.10	01:15-01:30h	1.511,8	5.981,9
17.01.10	01:30-01:45h	1.463,4	5.863,7
17.01.10	01:45-02:00h	1.444,2	5.776,8
17.01.10	02:00-02:15h	1.463,4	5.853,5
17.01.10	02:15-02:30h	1.434,1	5.736,4
17.01.10	02:30-02:45h	1.419,5	5.678,1
17.01.10	02:45-03:00h	1.395,0	5.580,1
17.01.10	03:00-03:15h	1.381,6	5.526,2
17.01.10	03:15-03:30h	1.370,4	5.481,6
17.01.10	03:30-03:45h	1.357,7	5.449,9
17.01.10	03:45-04:00h	1.359,0	5.439,1
17.01.10	04:00-04:15h	1.348,2	5.392,8
17.01.10	04:15-04:30h	1.348,8	5.395,1
17.01.10	04:30-04:45h	1.350,0	5.400,1

17.01.10	04:45-05:00h	1.347,9	5.391,7
17.01.10	05:00-05:15h	1.364,2	5.456,8
17.01.10	05:15-05:30h	1.367,5	5.470,1
17.01.10	05:30-05:45h	1.372,2	5.488,7
17.01.10	05:45-06:00h	1.367,2	5.468,8
17.01.10	06:00-06:15h	1.340,4	5.361,6
17.01.10	06:15-06:30h	1.349,0	5.395,8
17.01.10	06:30-06:45h	1.362,0	5.448,1
17.01.10	06:45-07:00h	1.385,7	5.542,7
17.01.10	07:00-07:15h	1.445,7	5.782,7
17.01.10	07:15-07:30h	1.471,2	5.884,7
17.01.10	07:30-07:45h	1.484,0	5.936,2
17.01.10	07:45-08:00h	1.507,5	6.030,2
17.01.10	08:00-08:15h	1.531,1	6.124,5
17.01.10	08:15-08:30h	1.561,9	6.247,4
17.01.10	08:30-08:45h	1.580,1	6.320,4
17.01.10	08:45-09:00h	1.610,6	6.442,4
17.01.10	09:00-09:15h	1.653,3	6.613,3
17.01.10	09:15-09:30h	1.668,6	6.674,4
17.01.10	09:30-09:45h	1.702,9	6.811,4
17.01.10	09:45-10:00h	1.729,1	6.916,4
17.01.10	10:00-10:15h	1.742,5	6.970,1
17.01.10	10:15-10:30h	1.764,1	7.056,4
17.01.10	10:30-10:45h	1.785,4	7.141,5
17.01.10	10:45-11:00h	1.806,0	7.224,0
17.01.10	11:00-11:15h	1.824,4	7.297,4
17.01.10	11:15-11:30h	1.845,9	7.383,5
17.01.10	11:30-11:45h	1.832,8	7.331,0
17.01.10	11:45-12:00h	1.808,9	7.235,7
17.01.10	12:00-12:15h	1.796,8	7.187,2
17.01.10	12:15-12:30h	1.762,0	7.047,9
17.01.10	12:30-12:45h	1.738,3	6.953,2
17.01.10	12:45-13:00h	1.712,1	6.848,5
17.01.10	13:00-13:15h	1.713,4	6.853,5
17.01.10	13:15-13:30h	1.705,9	6.823,4
17.01.10	13:30-13:45h	1.690,4	6.761,6
17.01.10	13:45-14:00h	1.669,6	6.678,3
17.01.10	14:00-14:15h	1.680,3	6.721,1
17.01.10	14:15-14:30h	1.669,7	6.678,8
17.01.10	14:30-14:45h	1.652,3	6.609,3
17.01.10	14:45-15:00h	1.639,4	6.557,8
17.01.10	15:00-15:15h	1.644,1	6.576,4
17.01.10	15:15-15:30h	1.639,1	6.556,6
17.01.10	15:30-15:45h	1.640,4	6.561,6
17.01.10	15:45-16:00h	1.650,1	6.600,5
17.01.10	16:00-16:15h	1.668,2	6.673,0
17.01.10	16:15-16:30h	1.679,2	6.716,9
17.01.10	16:30-16:45h	1.706,5	6.826,1
17.01.10	16:45-17:00h	1.755,8	7.023,2
17.01.10	17:00-17:15h	1.813,7	7.254,8
17.01.10	17:15-17:30h	1.830,8	7.323,3
17.01.10	17:30-17:45h	1.849,0	7.396,0
17.01.10	17:45-18:00h	1.858,6	7.434,2
17.01.10	18:00-18:15h	1.864,9	7.459,6
17.01.10	18:15-18:30h	1.869,9	7.479,4
17.01.10	18:30-18:45h	1.875,9	7.503,5
17.01.10	18:45-19:00h	1.869,8	7.479,1
17.01.10	19:00-19:15h	1.849,7	7.398,9

17.01.10	19:15-19:30h	1.848,7	7.394,8
17.01.10	19:30-19:45h	1.839,2	7.356,9
17.01.10	19:45-20:00h	1.820,8	7.283,4
17.01.10	20:00-20:15h	1.801,8	7.207,2
17.01.10	20:15-20:30h	1.767,4	7.069,8
17.01.10	20:30-20:45h	1.735,1	6.940,2
17.01.10	20:45-21:00h	1.710,6	6.842,6
17.01.10	21:00-21:15h	1.681,9	6.727,6
17.01.10	21:15-21:30h	1.651,0	6.604,1
17.01.10	21:30-21:45h	1.633,3	6.533,3
17.01.10	21:45-22:00h	1.634,2	6.536,7
17.01.10	22:00-22:15h	1.736,7	6.947,0
17.01.10	22:15-22:30h	1.729,2	6.916,7
17.01.10	22:30-22:45h	1.697,0	6.788,2
17.01.10	22:45-23:00h	1.663,6	6.654,3
17.01.10	23:00-23:15h	1.654,6	6.618,6
17.01.10	23:15-23:30h	1.610,2	6.441,0
17.01.10	23:30-23:45h	1.579,2	6.316,9
17.01.10	23:45-00:00h	1.558,4	6.233,6
18.01.10	00:00-00:15h	1.575,6	6.302,4
18.01.10	00:15-00:30h	1.553,7	6.214,9
18.01.10	00:30-00:45h	1.519,9	6.079,5
18.01.10	00:45-01:00h	1.495,9	5.983,7
18.01.10	01:00-01:15h	1.497,8	5.991,4
18.01.10	01:15-01:30h	1.469,3	5.877,0
18.01.10	01:30-01:45h	1.451,4	5.805,7
18.01.10	01:45-02:00h	1.441,6	5.766,5
18.01.10	02:00-02:15h	1.459,5	5.838,0
18.01.10	02:15-02:30h	1.442,7	5.770,8
18.01.10	02:30-02:45h	1.428,7	5.714,9
18.01.10	02:45-03:00h	1.420,6	5.682,5
18.01.10	03:00-03:15h	1.413,3	5.653,2
18.01.10	03:15-03:30h	1.410,2	5.640,6
18.01.10	03:30-03:45h	1.398,8	5.595,1
18.01.10	03:45-04:00h	1.406,7	5.626,7
18.01.10	04:00-04:15h	1.422,4	5.689,6
18.01.10	04:15-04:30h	1.423,7	5.694,9
18.01.10	04:30-04:45h	1.443,1	5.772,2
18.01.10	04:45-05:00h	1.479,2	5.916,9
18.01.10	05:00-05:15h	1.540,1	6.160,6
18.01.10	05:15-05:30h	1.580,8	6.323,1
18.01.10	05:30-05:45h	1.629,9	6.519,6
18.01.10	05:45-06:00h	1.703,6	6.814,2
18.01.10	06:00-06:15h	1.763,9	7.055,7
18.01.10	06:15-06:30h	1.840,9	7.363,8
18.01.10	06:30-06:45h	1.921,5	7.686,2
18.01.10	06:45-07:00h	1.984,5	7.938,0
18.01.10	07:00-07:15h	2.091,1	8.364,4
18.01.10	07:15-07:30h	2.144,5	8.577,9
18.01.10	07:30-07:45h	2.154,5	8.618,0
18.01.10	07:45-08:00h	2.172,1	8.688,3
18.01.10	08:00-08:15h	2.208,7	8.834,8
18.01.10	08:15-08:30h	2.213,8	8.855,4
18.01.10	08:30-08:45h	2.228,7	8.915,0
18.01.10	08:45-09:00h	2.235,1	8.940,6
18.01.10	09:00-09:15h	2.242,9	8.971,5
18.01.10	09:15-09:30h	2.249,7	8.998,8
18.01.10	09:30-09:45h	2.268,6	9.074,4

18.01.10	09:45-10:00h	2.268,0	9.072,1
18.01.10	10:00-10:15h	2.295,9	9.183,4
18.01.10	10:15-10:30h	2.285,4	9.141,5
18.01.10	10:30-10:45h	2.294,7	9.179,0
18.01.10	10:45-11:00h	2.297,2	9.188,8
18.01.10	11:00-11:15h	2.296,5	9.186,1
18.01.10	11:15-11:30h	2.296,0	9.184,2
18.01.10	11:30-11:45h	2.294,9	9.179,7
18.01.10	11:45-12:00h	2.276,9	9.107,7
18.01.10	12:00-12:15h	2.259,0	9.036,0
18.01.10	12:15-12:30h	2.220,3	8.881,3
18.01.10	12:30-12:45h	2.214,8	8.859,3
18.01.10	12:45-13:00h	2.218,4	8.873,8
18.01.10	13:00-13:15h	2.232,5	8.929,8
18.01.10	13:15-13:30h	2.246,7	8.986,8
18.01.10	13:30-13:45h	2.233,6	8.934,3
18.01.10	13:45-14:00h	2.227,5	8.910,0
18.01.10	14:00-14:15h	2.231,4	8.925,5
18.01.10	14:15-14:30h	2.231,7	8.926,9
18.01.10	14:30-14:45h	2.210,3	8.841,2
18.01.10	14:45-15:00h	2.205,2	8.820,9
18.01.10	15:00-15:15h	2.201,4	8.805,8
18.01.10	15:15-15:30h	2.200,8	8.803,3
18.01.10	15:30-15:45h	2.189,7	8.758,8
18.01.10	15:45-16:00h	2.201,7	8.806,8
18.01.10	16:00-16:15h	2.192,8	8.771,3
18.01.10	16:15-16:30h	2.210,0	8.839,8
18.01.10	16:30-16:45h	2.229,8	8.919,3
18.01.10	16:45-17:00h	2.267,9	9.071,6
18.01.10	17:00-17:15h	2.282,7	9.170,6
18.01.10	17:15-17:30h	2.317,0	9.268,0
18.01.10	17:30-17:45h	2.322,0	9.288,2
18.01.10	17:45-18:00h	2.323,8	9.295,4
18.01.10	18:00-18:15h	2.309,7	9.238,9
18.01.10	18:15-18:30h	2.295,9	9.183,4
18.01.10	18:30-18:45h	2.277,8	9.111,1
18.01.10	18:45-19:00h	2.252,7	9.010,8
18.01.10	19:00-19:15h	2.236,6	8.946,6
18.01.10	19:15-19:30h	2.204,7	8.818,9
18.01.10	19:30-19:45h	2.167,9	8.671,6
18.01.10	19:45-20:00h	2.143,0	8.572,0
18.01.10	20:00-20:15h	2.112,1	8.448,5
18.01.10	20:15-20:30h	2.049,0	8.195,9
18.01.10	20:30-20:45h	2.035,6	8.142,3
18.01.10	20:45-21:00h	1.987,1	7.948,6
18.01.10	21:00-21:15h	1.953,9	7.815,6
18.01.10	21:15-21:30h	1.913,4	7.653,6
18.01.10	21:30-21:45h	1.864,4	7.457,4
18.01.10	21:45-22:00h	1.835,8	7.343,3
18.01.10	22:00-22:15h	1.892,1	7.568,4
18.01.10	22:15-22:30h	1.885,9	7.543,4
18.01.10	22:30-22:45h	1.850,1	7.400,5
18.01.10	22:45-23:00h	1.822,7	7.290,8
18.01.10	23:00-23:15h	1.784,5	7.138,2
18.01.10	23:15-23:30h	1.739,2	6.956,8
18.01.10	23:30-23:45h	1.711,3	6.845,0
18.01.10	23:45-00:00h	1.683,6	6.734,5
19.01.10	00:00-00:15h	1.689,9	6.759,5

19.01.10	00:15-00:30h	1.657,2	6.628,6
19.01.10	00:30-00:45h	1.630,8	6.523,3
19.01.10	00:45-01:00h	1.601,1	6.404,3
19.01.10	01:00-01:15h	1.595,2	6.380,9
19.01.10	01:15-01:30h	1.570,1	6.280,2
19.01.10	01:30-01:45h	1.556,0	6.224,0
19.01.10	01:45-02:00h	1.538,1	6.152,5
19.01.10	02:00-02:15h	1.549,1	6.196,3
19.01.10	02:15-02:30h	1.530,8	6.123,3
19.01.10	02:30-02:45h	1.513,7	6.054,6
19.01.10	02:45-03:00h	1.491,7	5.966,8
19.01.10	03:00-03:15h	1.492,7	5.971,0
19.01.10	03:15-03:30h	1.480,0	5.920,0
19.01.10	03:30-03:45h	1.475,6	5.902,4
19.01.10	03:45-04:00h	1.473,8	5.895,1
19.01.10	04:00-04:15h	1.483,2	5.932,9
19.01.10	04:15-04:30h	1.487,6	5.950,6
19.01.10	04:30-04:45h	1.509,9	6.039,7
19.01.10	04:45-05:00h	1.526,4	6.105,6
19.01.10	05:00-05:15h	1.586,4	6.345,6
19.01.10	05:15-05:30h	1.615,0	6.459,9
19.01.10	05:30-05:45h	1.674,9	6.699,5
19.01.10	05:45-06:00h	1.748,9	6.995,5
19.01.10	06:00-06:15h	1.793,4	7.173,5
19.01.10	06:15-06:30h	1.896,5	7.585,9
19.01.10	06:30-06:45h	1.960,2	7.840,9
19.01.10	06:45-07:00h	2.041,5	8.166,0
19.01.10	07:00-07:15h	2.126,9	8.507,8
19.01.10	07:15-07:30h	2.159,5	8.637,8
19.01.10	07:30-07:45h	2.192,7	8.770,7
19.01.10	07:45-08:00h	2.203,4	8.813,8
19.01.10	08:00-08:15h	2.231,4	8.925,6
19.01.10	08:15-08:30h	2.245,1	8.980,5
19.01.10	08:30-08:45h	2.236,5	8.945,9
19.01.10	08:45-09:00h	2.255,0	9.000,0
19.01.10	09:00-09:15h	2.253,9	9.015,5
19.01.10	09:15-09:30h	2.250,8	9.003,1
19.01.10	09:30-09:45h	2.262,0	9.048,2
19.01.10	09:45-10:00h	2.267,2	9.068,9
19.01.10	10:00-10:15h	2.258,1	9.032,8
19.01.10	10:15-10:30h	2.264,6	9.058,2
19.01.10	10:30-10:45h	2.282,8	9.131,3
19.01.10	10:45-11:00h	2.293,2	9.173,0
19.01.10	11:00-11:15h	2.287,4	9.149,5
19.01.10	11:15-11:30h	2.297,6	9.190,8
19.01.10	11:30-11:45h	2.290,8	9.163,3
19.01.10	11:45-12:00h	2.267,3	9.069,1
19.01.10	12:00-12:15h	2.247,4	8.989,7
19.01.10	12:15-12:30h	2.225,7	8.902,9
19.01.10	12:30-12:45h	2.205,6	8.822,1
19.01.10	12:45-13:00h	2.191,8	8.767,1
19.01.10	13:00-13:15h	2.194,4	8.777,6
19.01.10	13:15-13:30h	2.184,0	8.735,8
19.01.10	13:30-13:45h	2.185,5	8.695,5
19.01.10	13:45-14:00h	2.156,1	8.624,5
19.01.10	14:00-14:15h	2.157,8	8.631,2
19.01.10	14:15-14:30h	2.157,5	8.629,9
19.01.10	14:30-14:45h	2.139,9	8.559,9

19.01.10	14:45-15:00h	2.136,5	8.546,2
19.01.10	15:00-15:15h	2.137,1	8.548,5
19.01.10	15:15-15:30h	2.126,5	8.506,1
19.01.10	15:30-15:45h	2.127,2	8.508,7
19.01.10	15:45-16:00h	2.137,6	8.550,5
19.01.10	16:00-16:15h	2.141,4	8.565,6
19.01.10	16:15-16:30h	2.136,6	8.546,4
19.01.10	16:30-16:45h	2.162,2	8.728,9
19.01.10	16:45-17:00h	2.229,7	8.918,7
19.01.10	17:00-17:15h	2.267,7	9.070,7
19.01.10	17:15-17:30h	2.301,8	9.207,1
19.01.10	17:30-17:45h	2.319,2	9.276,7
19.01.10	17:45-18:00h	2.325,0	9.300,1
19.01.10	18:00-18:15h	2.311,1	9.244,5
19.01.10	18:15-18:30h	2.300,5	9.202,1
19.01.10	18:30-18:45h	2.282,3	9.129,3
19.01.10	18:45-19:00h	2.274,5	9.098,0
19.01.10	19:00-19:15h	2.244,4	8.977,7
19.01.10	19:15-19:30h	2.196,2	8.794,8
19.01.10	19:30-19:45h	2.181,7	8.726,6
19.01.10	19:45-20:00h	2.151,5	8.606,2
19.01.10	20:00-20:15h	2.097,8	8.391,2
19.01.10	20:15-20:30h	2.054,1	8.216,5
19.01.10	20:30-20:45h	2.023,1	8.092,3
19.01.10	20:45-21:00h	1.990,6	7.962,3
19.01.10	21:00-21:15h	1.954,5	7.817,8
19.01.10	21:15-21:30h	1.902,7	7.610,8
19.01.10	21:30-21:45h	1.851,1	7.404,4
19.01.10	21:45-22:00h	1.831,1	7.324,4
19.01.10	22:00-22:15h	1.907,0	7.627,9
19.01.10	22:15-22:30h	1.905,1	7.620,3
19.01.10	22:30-22:45h	1.858,1	7.432,3
19.01.10	22:45-23:00h	1.830,7	7.322,9
19.01.10	23:00-23:15h	1.788,9	7.155,7
19.01.10	23:15-23:30h	1.755,6	7.022,6
19.01.10	23:30-23:45h	1.714,4	6.857,7
19.01.10	23:45-00:00h	1.691,3	6.765,2
20.01.10	00:00-00:15h	1.699,6	6.798,2
20.01.10	00:15-00:30h	1.668,8	6.675,1
20.01.10	00:30-00:45h	1.625,5	6.502,0
20.01.10	00:45-01:00h	1.619,8	6.479,4
20.01.10	01:00-01:15h	1.616,5	6.465,8
20.01.10	01:15-01:30h	1.594,1	6.376,3
20.01.10	01:30-01:45h	1.574,4	6.297,8
20.01.10	01:45-02:00h	1.551,9	6.207,7
20.01.10	02:00-02:15h	1.563,3	6.253,2
20.01.10	02:15-02:30h	1.556,1	6.224,4
20.01.10	02:30-02:45h	1.536,3	6.145,3
20.01.10	02:45-03:00h	1.522,9	6.091,8
20.01.10	03:00-03:15h	1.522,6	6.090,4
20.01.10	03:15-03:30h	1.512,3	6.049,1
20.01.10	03:30-03:45h	1.505,4	6.021,8
20.01.10	03:45-04:00h	1.500,6	6.002,6
20.01.10	04:00-04:15h	1.510,9	6.043,7
20.01.10	04:15-04:30h	1.518,9	6.075,4
20.01.10	04:30-04:45h	1.538,3	6.153,2
20.01.10	04:45-05:00h	1.552,6	6.210,4
20.01.10	05:00-05:15h	1.601,6	6.406,4

20.01.10	05:15-05:30h	1.631,2	6.524,7
20.01.10	05:30-05:45h	1.685,7	6.742,7
20.01.10	05:45-06:00h	1.748,7	6.994,8
20.01.10	06:00-06:15h	1.803,2	7.212,7
20.01.10	06:15-06:30h	1.882,7	7.530,8
20.01.10	06:30-06:45h	1.943,5	7.774,1
20.01.10	06:45-07:00h	2.021,9	8.087,5
20.01.10	07:00-07:15h	2.097,1	8.388,3
20.01.10	07:15-07:30h	2.150,7	8.603,0
20.01.10	07:30-07:45h	2.174,4	8.697,5
20.01.10	07:45-08:00h	2.173,1	8.692,3
20.01.10	08:00-08:15h	2.204,7	8.818,9
20.01.10	08:15-08:30h	2.225,5	8.901,8
20.01.10	08:30-08:45h	2.224,3	8.897,3
20.01.10	08:45-09:00h	2.240,3	8.961,1
20.01.10	09:00-09:15h	2.238,4	8.953,8
20.01.10	09:15-09:30h	2.253,4	9.013,7
20.01.10	09:30-09:45h	2.265,2	9.060,8
20.01.10	09:45-10:00h	2.270,7	9.082,7
20.01.10	10:00-10:15h	2.274,4	9.097,5
20.01.10	10:15-10:30h	2.288,3	9.153,2
20.01.10	10:30-10:45h	2.284,6	9.138,4
20.01.10	10:45-11:00h	2.288,0	9.151,9
20.01.10	11:00-11:15h	2.289,7	9.158,9
20.01.10	11:15-11:30h	2.296,7	9.186,9
20.01.10	11:30-11:45h	2.279,6	9.118,5
20.01.10	11:45-12:00h	2.271,1	9.084,4
20.01.10	12:00-12:15h	2.251,5	9.006,0
20.01.10	12:15-12:30h	2.228,0	8.912,0
20.01.10	12:30-12:45h	2.196,2	8.784,7
20.01.10	12:45-13:00h	2.201,9	8.807,5
20.01.10	13:00-13:15h	2.218,2	8.872,8
20.01.10	13:15-13:30h	2.211,0	8.844,0
20.01.10	13:30-13:45h	2.200,4	8.801,6
20.01.10	13:45-14:00h	2.182,2	8.728,7
20.01.10	14:00-14:15h	2.181,1	8.724,4
20.01.10	14:15-14:30h	2.173,4	8.693,7
20.01.10	14:30-14:45h	2.159,1	8.636,5
20.01.10	14:45-15:00h	2.162,3	8.649,1
20.01.10	15:00-15:15h	2.153,8	8.615,2
20.01.10	15:15-15:30h	2.152,0	8.608,0
20.01.10	15:30-15:45h	2.146,7	8.586,9
20.01.10	15:45-16:00h	2.153,3	8.613,0
20.01.10	16:00-16:15h	2.159,6	8.638,5
20.01.10	16:15-16:30h	2.176,7	8.706,9
20.01.10	16:30-16:45h	2.199,3	8.797,3
20.01.10	16:45-17:00h	2.242,1	8.989,5
20.01.10	17:00-17:15h	2.276,8	9.107,2
20.01.10	17:15-17:30h	2.306,9	9.227,4
20.01.10	17:30-17:45h	2.337,1	9.348,5
20.01.10	17:45-18:00h	2.338,4	9.353,5
20.01.10	18:00-18:15h	2.310,4	9.241,5
20.01.10	18:15-18:30h	2.308,4	9.233,5
20.01.10	18:30-18:45h	2.293,9	9.175,5
20.01.10	18:45-19:00h	2.285,1	9.140,3
20.01.10	19:00-19:15h	2.250,3	9.001,1
20.01.10	19:15-19:30h	2.217,1	8.868,5
20.01.10	19:30-19:45h	2.184,7	8.738,7

20.01.10	19:45-20:00h	2.146,3	8.585,0
20.01.10	20:00-20:15h	2.112,9	8.451,4
20.01.10	20:15-20:30h	2.064,3	8.257,1
20.01.10	20:30-20:45h	2.034,5	8.138,2
20.01.10	20:45-21:00h	2.008,5	8.033,8
20.01.10	21:00-21:15h	1.957,0	7.828,2
20.01.10	21:15-21:30h	1.933,9	7.735,6
20.01.10	21:30-21:45h	1.873,4	7.493,7
20.01.10	21:45-22:00h	1.858,4	7.433,6
20.01.10	22:00-22:15h	1.939,3	7.757,1
20.01.10	22:15-22:30h	1.931,8	7.727,4
20.01.10	22:30-22:45h	1.884,8	7.539,2
20.01.10	22:45-23:00h	1.862,4	7.449,5
20.01.10	23:00-23:15h	1.834,0	7.336,2
20.01.10	23:15-23:30h	1.783,5	7.134,2
20.01.10	23:30-23:45h	1.751,7	7.006,9
20.01.10	23:45-00:00h	1.715,9	6.863,5
21.01.10	00:00-00:15h	1.727,9	6.911,6
21.01.10	00:15-00:30h	1.693,9	6.775,7
21.01.10	00:30-00:45h	1.662,4	6.649,7
21.01.10	00:45-01:00h	1.629,0	6.515,8
21.01.10	01:00-01:15h	1.634,8	6.539,2
21.01.10	01:15-01:30h	1.614,6	6.458,3
21.01.10	01:30-01:45h	1.598,7	6.394,9
21.01.10	01:45-02:00h	1.576,7	6.306,8
21.01.10	02:00-02:15h	1.591,4	6.365,4
21.01.10	02:15-02:30h	1.581,3	6.325,1
21.01.10	02:30-02:45h	1.563,4	6.253,5
21.01.10	02:45-03:00h	1.538,6	6.154,6
21.01.10	03:00-03:15h	1.523,6	6.094,3
21.01.10	03:15-03:30h	1.518,1	6.072,4
21.01.10	03:30-03:45h	1.514,6	6.058,5
21.01.10	03:45-04:00h	1.510,1	6.040,2
21.01.10	04:00-04:15h	1.521,8	6.087,1
21.01.10	04:15-04:30h	1.530,3	6.121,3
21.01.10	04:30-04:45h	1.539,3	6.157,0
21.01.10	04:45-05:00h	1.566,4	6.265,7
21.01.10	05:00-05:15h	1.611,7	6.446,7
21.01.10	05:15-05:30h	1.652,1	6.608,3
21.01.10	05:30-05:45h	1.688,7	6.754,7
21.01.10	05:45-06:00h	1.753,6	7.014,4
21.01.10	06:00-06:15h	1.816,1	7.284,2
21.01.10	06:15-06:30h	1.895,2	7.581,0
21.01.10	06:30-06:45h	1.973,5	7.893,9
21.01.10	06:45-07:00h	2.033,7	8.134,6
21.01.10	07:00-07:15h	2.111,9	8.447,6
21.01.10	07:15-07:30h	2.159,1	8.636,2
21.01.10	07:30-07:45h	2.193,7	8.774,9
21.01.10	07:45-08:00h	2.220,3	8.881,0
21.01.10	08:00-08:15h	2.252,4	9.009,7
21.01.10	08:15-08:30h	2.266,0	9.063,8
21.01.10	08:30-08:45h	2.274,5	9.098,0
21.01.10	08:45-09:00h	2.289,6	9.158,6
21.01.10	09:00-09:15h	2.276,3	9.105,2
21.01.10	09:15-09:30h	2.294,1	9.176,4
21.01.10	09:30-09:45h	2.311,1	9.244,3
21.01.10	09:45-10:00h	2.310,3	9.241,2
21.01.10	10:00-10:15h	2.321,1	9.284,5

21.01.10	10:15-10:30h	2.331,1	9.324,4
21.01.10	10:30-10:45h	2.330,6	9.322,6
21.01.10	10:45-11:00h	2.341,2	9.364,6
21.01.10	11:00-11:15h	2.333,2	9.332,6
21.01.10	11:15-11:30h	2.336,4	9.345,7
21.01.10	11:30-11:45h	2.329,8	9.319,2
21.01.10	11:45-12:00h	2.322,2	9.288,8
21.01.10	12:00-12:15h	2.299,3	9.197,3
21.01.10	12:15-12:30h	2.282,1	9.128,3
21.01.10	12:30-12:45h	2.259,2	9.036,9
21.01.10	12:45-13:00h	2.245,2	8.980,6
21.01.10	13:00-13:15h	2.260,6	9.042,2
21.01.10	13:15-13:30h	2.260,5	9.042,1
21.01.10	13:30-13:45h	2.261,4	9.046,6
21.01.10	13:45-14:00h	2.249,7	8.998,8
21.01.10	14:00-14:15h	2.243,4	8.973,8
21.01.10	14:15-14:30h	2.244,1	8.976,4
21.01.10	14:30-14:45h	2.231,5	8.925,9
21.01.10	14:45-15:00h	2.233,6	8.934,6
21.01.10	15:00-15:15h	2.232,5	8.930,1
21.01.10	15:15-15:30h	2.235,5	8.942,0
21.01.10	15:30-15:45h	2.227,7	8.910,9
21.01.10	15:45-16:00h	2.234,8	8.939,3
21.01.10	16:00-16:15h	2.240,2	8.961,0
21.01.10	16:15-16:30h	2.251,9	9.007,7
21.01.10	16:30-16:45h	2.262,5	9.050,1
21.01.10	16:45-17:00h	2.288,9	9.155,7
21.01.10	17:00-17:15h	2.334,8	9.339,2
21.01.10	17:15-17:30h	2.345,5	9.382,1
21.01.10	17:30-17:45h	2.363,0	9.452,0
21.01.10	17:45-18:00h	2.362,8	9.451,2
21.01.10	18:00-18:15h	2.341,1	9.364,5
21.01.10	18:15-18:30h	2.348,1	9.392,3
21.01.10	18:30-18:45h	2.331,5	9.326,2
21.01.10	18:45-19:00h	2.340,5	9.341,3
21.01.10	19:00-19:15h	2.290,2	9.160,6
21.01.10	19:15-19:30h	2.251,6	9.006,5
21.01.10	19:30-19:45h	2.212,7	8.850,7
21.01.10	19:45-20:00h	2.172,0	8.688,1
21.01.10	20:00-20:15h	2.139,6	8.558,5
21.01.10	20:15-20:30h	2.078,5	8.313,9
21.01.10	20:30-20:45h	2.059,8	8.238,0
21.01.10	20:45-21:00h	2.024,4	8.097,5
21.01.10	21:00-21:15h	1.974,1	7.896,3
21.01.10	21:15-21:30h	1.917,7	7.751,9
21.01.10	21:30-21:45h	1.885,4	7.541,6
21.01.10	21:45-22:00h	1.861,9	7.447,4
21.01.10	22:00-22:15h	1.944,1	7.776,3
21.01.10	22:15-22:30h	1.946,7	7.786,7
21.01.10	22:30-22:45h	1.890,9	7.563,5
21.01.10	22:45-23:00h	1.866,0	7.464,1
21.01.10	23:00-23:15h	1.836,9	7.347,6
21.01.10	23:15-23:30h	1.797,7	7.190,7
21.01.10	23:30-23:45h	1.755,9	7.023,7
21.01.10	23:45-00:00h	1.683,3	6.851,3
21.01.10	00:00-00:15h	1.728,3	6.993,6
22.01.10	00:15-00:30h	1.687,9	6.751,8
22.01.10	00:30-00:45h	1.665,4	6.661,7

22.01.10	00:45-01:00h	1.634,0	6.535,9
22.01.10	01:00-01:15h	1.639,4	6.557,4
22.01.10	01:15-01:30h	1.621,6	6.486,5
22.01.10	01:30-01:45h	1.600,5	6.401,9
22.01.10	01:45-02:00h	1.588,8	6.355,1
22.01.10	02:00-02:15h	1.598,3	6.393,1
22.01.10	02:15-02:30h	1.579,0	6.316,0
22.01.10	02:30-02:45h	1.552,4	6.209,5
22.01.10	02:45-03:00h	1.537,0	6.148,0
22.01.10	03:00-03:15h	1.540,9	6.163,7
22.01.10	03:15-03:30h	1.521,5	6.085,9
22.01.10	03:30-03:45h	1.524,9	6.099,4
22.01.10	03:45-04:00h	1.506,5	6.025,9
22.01.10	04:00-04:15h	1.525,1	6.100,6
22.01.10	04:15-04:30h	1.526,8	6.107,1
22.01.10	04:30-04:45h	1.539,7	6.158,8
22.01.10	04:45-05:00h	1.560,9	6.243,6
22.01.10	05:00-05:15h	1.610,4	6.441,6
22.01.10	05:15-05:30h	1.652,7	6.610,7
22.01.10	05:30-05:45h	1.697,7	6.790,8
22.01.10	05:45-06:00h	1.755,4	7.021,6
22.01.10	06:00-06:15h	1.807,5	7.230,1
22.01.10	06:15-06:30h	1.890,9	7.563,5
22.01.10	06:30-06:45h	1.963,8	7.855,3
22.01.10	06:45-07:00h	2.033,1	8.132,2
22.01.10	07:00-07:15h	2.106,7	8.426,6
22.01.10	07:15-07:30h	2.162,0	8.647,8
22.01.10	07:30-07:45h	2.182,7	8.730,7
22.01.10	07:45-08:00h	2.201,8	8.807,1
22.01.10	08:00-08:15h	2.223,0	8.892,2
22.01.10	08:15-08:30h	2.234,5	8.938,1
22.01.10	08:30-08:45h	2.248,5	8.994,0
22.01.10	08:45-09:00h	2.249,5	8.998,2
22.01.10	09:00-09:15h	2.258,0	9.032,0
22.01.10	09:15-09:30h	2.263,3	9.053,0
22.01.10	09:30-09:45h	2.285,3	9.141,1
22.01.10	09:45-10:00h	2.285,7	9.142,8
22.01.10	10:00-10:15h	2.284,4	9.137,5
22.01.10	10:15-10:30h	2.295,3	9.181,1
22.01.10	10:30-10:45h	2.296,9	9.187,5
22.01.10	10:45-11:00h	2.305,7	9.222,7
22.01.10	11:00-11:15h	2.311,4	9.245,5
22.01.10	11:15-11:30h	2.311,2	9.244,8
22.01.10	11:30-11:45h	2.289,7	9.158,9
22.01.10	11:45-12:00h	2.268,4	9.073,5
22.01.10	12:00-12:15h	2.243,3	8.973,1
22.01.10	12:15-12:30h	2.206,9	8.827,6
22.01.10	12:30-12:45h	2.202,9	8.811,5
22.01.10	12:45-13:00h	2.180,6	8.722,4
22.01.10	13:00-13:15h	2.184,6	8.738,4
22.01.10	13:15-13:30h	2.177,6	8.710,3
22.01.10	13:30-13:45h	2.159,6	8.638,2
22.01.10	13:45-14:00h	2.142,9	8.571,9
22.01.10	14:00-14:15h	2.134,7	8.538,7
22.01.10	14:15-14:30h	2.131,4	8.525,5
22.01.10	14:30-14:45h	2.120,3	8.481,0
22.01.10	14:45-15:00h	2.109,2	8.436,7
22.01.10	15:00-15:15h	2.109,0	8.436,2

22.01.10	15:15-15:30h	2.102,6	8.410,3
22.01.10	15:30-15:45h	2.100,5	8.402,1
22.01.10	15:45-16:00h	2.104,6	8.418,4
22.01.10	16:00-16:15h	2.108,4	8.433,6
22.01.10	16:15-16:30h	2.113,8	8.455,3
22.01.10	16:30-16:45h	2.141,6	8.566,4
22.01.10	16:45-17:00h	2.181,4	8.725,6
22.01.10	17:00-17:15h	2.222,1	8.888,6
22.01.10	17:15-17:30h	2.261,4	9.045,6
22.01.10	17:30-17:45h	2.280,4	9.121,5
22.01.10	17:45-18:00h	2.274,2	9.096,9
22.01.10	18:00-18:15h	2.273,8	9.095,1
22.01.10	18:15-18:30h	2.263,6	9.054,2
22.01.10	18:30-18:45h	2.247,5	8.990,9
22.01.10	18:45-19:00h	2.226,3	8.905,0
22.01.10	19:00-19:15h	2.197,1	8.788,6
22.01.10	19:15-19:30h	2.171,6	8.686,5
22.01.10	19:30-19:45h	2.140,8	8.563,3
22.01.10	19:45-20:00h	2.096,2	8.384,9
22.01.10	20:00-20:15h	2.052,7	8.211,0
22.01.10	20:15-20:30h	2.005,8	8.023,3
22.01.10	20:30-20:45h	1.980,1	7.920,4
22.01.10	20:45-21:00h	1.939,3	7.757,4
22.01.10	21:00-21:15h	1.907,2	7.629,0
22.01.10	21:15-21:30h	1.860,8	7.443,2
22.01.10	21:30-21:45h	1.828,2	7.312,8
22.01.10	21:45-22:00h	1.810,0	7.240,2
22.01.10	22:00-22:15h	1.898,4	7.593,7
22.01.10	22:15-22:30h	1.894,4	7.577,7
22.01.10	22:30-22:45h	1.861,7	7.446,7
22.01.10	22:45-23:00h	1.846,6	7.386,3
22.01.10	23:00-23:15h	1.814,7	7.258,9
22.01.10	23:15-23:30h	1.774,7	7.098,7
22.01.10	23:30-23:45h	1.742,1	6.968,4
22.01.10	23:45-00:00h	1.715,7	6.862,9
23.01.10	00:00-00:15h	1.716,7	6.866,8
23.01.10	00:15-00:30h	1.688,8	6.755,1
23.01.10	00:30-00:45h	1.660,2	6.640,8
23.01.10	00:45-01:00h	1.637,5	6.549,9
23.01.10	01:00-01:15h	1.642,1	6.568,6
23.01.10	01:15-01:30h	1.614,7	6.458,9
23.01.10	01:30-01:45h	1.592,3	6.369,4
23.01.10	01:45-02:00h	1.578,0	6.312,1
23.01.10	02:00-02:15h	1.585,1	6.340,4
23.01.10	02:15-02:30h	1.566,0	6.263,9
23.01.10	02:30-02:45h	1.546,3	6.185,2
23.01.10	02:45-03:00h	1.518,7	6.074,6
23.01.10	03:00-03:15h	1.517,1	6.068,6
23.01.10	03:15-03:30h	1.493,8	5.975,1
23.01.10	03:30-03:45h	1.486,6	5.946,4
23.01.10	03:45-04:00h	1.481,1	5.924,5
23.01.10	04:00-04:15h	1.477,2	5.908,6
23.01.10	04:15-04:30h	1.476,6	5.906,4
23.01.10	04:30-04:45h	1.471,9	5.887,8
23.01.10	04:45-05:00h	1.472,6	5.890,4
23.01.10	05:00-05:15h	1.499,2	5.996,9
23.01.10	05:15-05:30h	1.507,3	6.029,3
23.01.10	05:30-05:45h	1.529,5	6.117,9

23.01.10	05:45-06:00h	1.539,5	6.158,2
23.01.10	06:00-06:15h	1.510,2	6.040,9
23.01.10	06:15-06:30h	1.531,4	6.125,7
23.01.10	06:30-06:45h	1.570,2	6.281,0
23.01.10	06:45-07:00h	1.604,4	6.417,5
23.01.10	07:00-07:15h	1.666,9	6.667,7
23.01.10	07:15-07:30h	1.699,4	6.797,8
23.01.10	07:30-07:45h	1.713,7	6.854,8
23.01.10	07:45-08:00h	1.735,4	6.941,5
23.01.10	08:00-08:15h	1.788,4	7.153,5
23.01.10	08:15-08:30h	1.812,8	7.251,2
23.01.10	08:30-08:45h	1.838,4	7.353,6
23.01.10	08:45-09:00h	1.866,3	7.465,2
23.01.10	09:00-09:15h	1.896,3	7.585,1
23.01.10	09:15-09:30h	1.912,2	7.648,9
23.01.10	09:30-09:45h	1.923,7	7.694,8
23.01.10	09:45-10:00h	1.952,3	7.809,3
23.01.10	10:00-10:15h	1.964,7	7.858,6
23.01.10	10:15-10:30h	1.973,7	7.894,8
23.01.10	10:30-10:45h	1.988,9	7.955,4
23.01.10	10:45-11:00h	1.992,2	7.968,9
23.01.10	11:00-11:15h	2.001,2	8.004,8
23.01.10	11:15-11:30h	2.008,6	8.034,5
23.01.10	11:30-11:45h	1.990,2	7.960,7
23.01.10	11:45-12:00h	1.965,7	7.862,7
23.01.10	12:00-12:15h	1.950,5	7.801,9
23.01.10	12:15-12:30h	1.917,3	7.669,3
23.01.10	12:30-12:45h	1.904,3	7.617,3
23.01.10	12:45-13:00h	1.899,1	7.596,5
23.01.10	13:00-13:15h	1.900,2	7.600,7
23.01.10	13:15-13:30h	1.893,9	7.575,6
23.01.10	13:30-13:45h	1.879,5	7.518,1
23.01.10	13:45-14:00h	1.864,9	7.459,5
23.01.10	14:00-14:15h	1.854,2	7.416,7
23.01.10	14:15-14:30h	1.845,1	7.380,4
23.01.10	14:30-14:45h	1.838,5	7.354,0
23.01.10	14:45-15:00h	1.831,2	7.324,9
23.01.10	15:00-15:15h	1.836,7	7.346,6
23.01.10	15:15-15:30h	1.832,3	7.329,1
23.01.10	15:30-15:45h	1.831,4	7.325,8
23.01.10	15:45-16:00h	1.839,2	7.356,9
23.01.10	16:00-16:15h	1.848,2	7.392,7
23.01.10	16:15-16:30h	1.852,3	7.409,0
23.01.10	16:30-16:45h	1.877,3	7.509,4
23.01.10	16:45-17:00h	1.915,9	7.663,4
23.01.10	17:00-17:15h	1.983,1	7.932,3
23.01.10	17:15-17:30h	2.001,9	8.007,7
23.01.10	17:30-17:45h	2.012,9	8.051,8
23.01.10	17:45-18:00h	2.019,0	8.075,8
23.01.10	18:00-18:15h	2.021,3	8.085,3
23.01.10	18:15-18:30h	2.005,4	8.021,5
23.01.10	18:30-18:45h	1.994,6	7.978,2
23.01.10	18:45-19:00h	1.964,8	7.859,3
23.01.10	19:00-19:15h	1.940,9	7.763,4
23.01.10	19:15-19:30h	1.920,2	7.680,9
23.01.10	19:30-19:45h	1.909,8	7.639,4
23.01.10	19:45-20:00h	1.881,3	7.525,2
23.01.10	20:00-20:15h	1.856,4	7.425,5

23.01.10	20:15-20:30h	1.820,9	7.283,6
23.01.10	20:30-20:45h	1.806,9	7.227,6
23.01.10	20:45-21:00h	1.777,6	7.110,3
23.01.10	21:00-21:15h	1.742,1	6.968,4
23.01.10	21:15-21:30h	1.712,6	6.850,6
23.01.10	21:30-21:45h	1.693,1	6.772,4
23.01.10	21:45-22:00h	1.688,2	6.752,9
23.01.10	22:00-22:15h	1.774,4	7.097,4
23.01.10	22:15-22:30h	1.782,1	7.128,5
23.01.10	22:30-22:45h	1.751,6	7.006,3
23.01.10	22:45-23:00h	1.743,5	6.973,8
23.01.10	23:00-23:15h	1.724,7	6.898,7
23.01.10	23:15-23:30h	1.699,3	6.797,3
23.01.10	23:30-23:45h	1.660,2	6.641,0
23.01.10	23:45-00:00h	1.638,1	6.552,5
24.01.10	00:00-00:15h	1.630,1	6.520,2
24.01.10	00:15-00:30h	1.600,0	6.400,1
24.01.10	00:30-00:45h	1.577,1	6.308,3
24.01.10	00:45-01:00h	1.555,9	6.223,7
24.01.10	01:00-01:15h	1.548,7	6.194,8
24.01.10	01:15-01:30h	1.530,0	6.120,1
24.01.10	01:30-01:45h	1.503,8	6.015,1
24.01.10	01:45-02:00h	1.487,7	5.950,7
24.01.10	02:00-02:15h	1.507,7	6.030,9
24.01.10	02:15-02:30h	1.484,9	5.939,7
24.01.10	02:30-02:45h	1.467,7	5.870,9
24.01.10	02:45-03:00h	1.450,0	5.800,2
24.01.10	03:00-03:15h	1.430,4	5.721,8
24.01.10	03:15-03:30h	1.420,9	5.683,6
24.01.10	03:30-03:45h	1.412,0	5.648,0
24.01.10	03:45-04:00h	1.400,7	5.602,8
24.01.10	04:00-04:15h	1.391,8	5.567,1
24.01.10	04:15-04:30h	1.391,5	5.566,1
24.01.10	04:30-04:45h	1.382,2	5.528,9
24.01.10	04:45-05:00h	1.368,1	5.469,1
24.01.10	05:00-05:15h	1.400,2	5.600,9
24.01.10	05:15-05:30h	1.401,4	5.605,8
24.01.10	05:30-05:45h	1.408,2	5.632,7
24.01.10	05:45-06:00h	1.408,7	5.634,7
24.01.10	06:00-06:15h	1.368,9	5.475,6
24.01.10	06:15-06:30h	1.379,0	5.515,9
24.01.10	06:30-06:45h	1.404,4	5.617,5
24.01.10	06:45-07:00h	1.425,2	5.701,0
24.01.10	07:00-07:15h	1.475,7	5.902,7
24.01.10	07:15-07:30h	1.497,9	5.987,9
24.01.10	07:30-07:45h	1.513,1	6.052,3
24.01.10	07:45-08:00h	1.543,6	6.174,3
24.01.10	08:00-08:15h	1.590,0	6.359,8
24.01.10	08:15-08:30h	1.601,9	6.407,5
24.01.10	08:30-08:45h	1.629,9	6.519,5
24.01.10	08:45-09:00h	1.664,3	6.657,2
24.01.10	09:00-09:15h	1.710,6	6.842,3
24.01.10	09:15-09:30h	1.731,3	6.925,2
24.01.10	09:30-09:45h	1.759,0	7.032,9
24.01.10	09:45-10:00h	1.781,6	7.110,6
24.01.10	10:00-10:15h	1.791,6	7.166,3
24.01.10	10:15-10:30h	1.817,9	7.271,7
24.01.10	10:30-10:45h	1.830,5	7.322,7

24.01.10	10:45-11:00h	1.850,1	7.400,3
24.01.10	11:00-11:15h	1.869,3	7.477,1
24.01.10	11:15-11:30h	1.885,7	7.542,9
24.01.10	11:30-11:45h	1.881,5	7.525,9
24.01.10	11:45-12:00h	1.858,7	7.434,8
24.01.10	12:00-12:15h	1.835,6	7.342,6
24.01.10	12:15-12:30h	1.799,2	7.196,7
24.01.10	12:30-12:45h	1.775,8	7.103,4
24.01.10	12:45-13:00h	1.758,7	7.034,7
24.01.10	13:00-13:15h	1.765,3	7.061,1
24.01.10	13:15-13:30h	1.740,7	6.962,9
24.01.10	13:30-13:45h	1.730,6	6.922,5
24.01.10	13:45-14:00h	1.724,0	6.896,1
24.01.10	14:00-14:15h	1.716,4	6.865,8
24.01.10	14:15-14:30h	1.701,6	6.806,4
24.01.10	14:30-14:45h	1.681,1	6.724,5
24.01.10	14:45-15:00h	1.678,3	6.713,2
24.01.10	15:00-15:15h	1.685,4	6.741,4
24.01.10	15:15-15:30h	1.680,5	6.722,0
24.01.10	15:30-15:45h	1.679,8	6.719,0
24.01.10	15:45-16:00h	1.685,2	6.740,9
24.01.10	16:00-16:15h	1.697,8	6.791,2
24.01.10	16:15-16:30h	1.708,7	6.834,7
24.01.10	16:30-16:45h	1.735,6	6.942,4
24.01.10	16:45-17:00h	1.769,4	7.077,5
24.01.10	17:00-17:15h	1.827,5	7.310,1
24.01.10	17:15-17:30h	1.852,1	7.408,6
24.01.10	17:30-17:45h	1.867,2	7.468,9
24.01.10	17:45-18:00h	1.876,7	7.506,9
24.01.10	18:00-18:15h	1.892,9	7.571,6
24.01.10	18:15-18:30h	1.890,8	7.562,5
24.01.10	18:30-18:45h	1.890,5	7.562,1
24.01.10	18:45-19:00h	1.887,7	7.550,9
24.01.10	19:00-19:15h	1.882,2	7.528,7
24.01.10	19:15-19:30h	1.872,1	7.488,3
24.01.10	19:30-19:45h	1.860,6	7.442,6
24.01.10	19:45-20:00h	1.842,0	7.368,0
24.01.10	20:00-20:15h	1.828,8	7.315,1
24.01.10	20:15-20:30h	1.799,7	7.198,9
24.01.10	20:30-20:45h	1.773,7	7.094,7
24.01.10	20:45-21:00h	1.745,4	6.991,7
24.01.10	21:00-21:15h	1.718,5	6.873,8
24.01.10	21:15-21:30h	1.685,9	6.743,7
24.01.10	21:30-21:45h	1.663,9	6.655,5
24.01.10	21:45-22:00h	1.651,0	6.604,1
24.01.10	22:00-22:15h	1.767,8	7.071,1
24.01.10	22:15-22:30h	1.763,9	7.055,7
24.01.10	22:30-22:45h	1.729,6	6.918,2
24.01.10	22:45-23:00h	1.712,0	6.848,1
24.01.10	23:00-23:15h	1.700,5	6.801,8
24.01.10	23:15-23:30h	1.659,5	6.637,8
24.01.10	23:30-23:45h	1.637,9	6.551,4
24.01.10	23:45-00:00h	1.620,9	6.483,8
25.01.10	00:00-00:15h	1.632,1	6.528,5
25.01.10	00:15-00:30h	1.602,3	6.409,0
25.01.10	00:30-00:45h	1.575,6	6.302,6
25.01.10	00:45-01:00h	1.556,5	6.226,1
25.01.10	01:00-01:15h	1.557,7	6.230,6

25.01.10	15:45-16:00h	2.201,9	8.807,7
25.01.10	16:00-16:15h	2.213,9	8.855,8
25.01.10	16:15-16:30h	2.203,7	8.814,9
25.01.10	16:30-16:45h	2.230,8	8.923,2
25.01.10	16:45-17:00h	2.262,1	9.048,5
25.01.10	17:00-17:15h	2.325,4	9.301,6
25.01.10	17:15-17:30h	2.370,1	9.480,4
25.01.10	17:30-17:45h	2.384,4	9.537,6
25.01.10	17:45-18:00h	2.387,5	9.550,0
25.01.10	18:00-18:15h	2.366,5	9.466,1
25.01.10	18:15-18:30h	2.367,1	9.468,2
25.01.10	18:30-18:45h	2.347,8	9.391,2
25.01.10	18:45-19:00h	2.327,9	9.311,6
25.01.10	19:00-19:15h	2.291,1	9.164,3
25.01.10	19:15-19:30h	2.271,2	9.084,7
25.01.10	19:30-19:45h	2.244,1	8.976,3
25.01.10	19:45-20:00h	2.199,7	8.798,7
25.01.10	20:00-20:15h	2.152,5	8.610,1
25.01.10	20:15-20:30h	2.105,1	8.420,4
25.01.10	20:30-20:45h	2.086,5	8.346,0
25.01.10	20:45-21:00h	2.054,2	8.216,8
25.01.10	21:00-21:15h	1.988,5	7.954,0
25.01.10	21:15-21:30h	1.946,3	7.785,3
25.01.10	21:30-21:45h	1.885,9	7.543,6
25.01.10	21:45-22:00h	1.870,2	7.480,9
25.01.10	22:00-22:15h	1.948,6	7.794,2
25.01.10	22:15-22:30h	1.944,0	7.775,9
25.01.10	22:30-22:45h	1.901,3	7.605,3
25.01.10	22:45-23:00h	1.873,3	7.493,1
25.01.10	23:00-23:15h	1.836,2	7.344,9
25.01.10	23:15-23:30h	1.783,0	7.132,2
25.01.10	23:30-23:45h	1.742,7	6.970,7
25.01.10	23:45-00:00h	1.745,6	6.982,3
26.01.10	00:00-00:15h	1.737,9	6.951,6
26.01.10	00:15-00:30h	1.707,8	6.831,4
26.01.10	00:30-00:45h	1.690,3	6.761,2
26.01.10	00:45-01:00h	1.667,1	6.668,6
26.01.10	01:00-01:15h	1.663,9	6.655,4
26.01.10	01:15-01:30h	1.640,8	6.563,1
26.01.10	01:30-01:45h	1.621,7	6.486,8
26.01.10	01:45-02:00h	1.603,4	6.413,6
26.01.10	02:00-02:15h	1.614,2	6.456,6
26.01.10	02:15-02:30h	1.596,3	6.385,0
26.01.10	02:30-02:45h	1.574,9	6.299,7
26.01.10	02:45-03:00h	1.565,2	6.280,8
26.01.10	03:00-03:15h	1.555,1	6.220,3
26.01.10	03:15-03:30h	1.541,0	6.164,0
26.01.10	03:30-03:45h	1.532,5	6.130,1
26.01.10	03:45-04:00h	1.533,4	6.133,5
26.01.10	04:00-04:15h	1.554,2	6.217,0
26.01.10	04:15-04:30h	1.561,9	6.247,5
26.01.10	04:30-04:45h	1.572,2	6.288,6
26.01.10	04:45-05:00h	1.601,6	6.406,6
26.01.10	05:00-05:15h	1.645,6	6.582,3
26.01.10	05:15-05:30h	1.678,2	6.712,6
26.01.10	05:30-05:45h	1.728,6	6.914,3
26.01.10	05:45-06:00h	1.797,6	7.190,4
26.01.10	06:00-06:15h	1.833,5	7.333,8

25.01.10	01:15-01:30h	1.542,4	6.169,6
25.01.10	01:30-01:45h	1.514,9	6.059,4
25.01.10	01:45-02:00h	1.502,6	6.010,5
25.01.10	02:00-02:15h	1.523,9	6.095,5
25.01.10	02:15-02:30h	1.509,8	6.039,4
25.01.10	02:30-02:45h	1.494,2	5.977,0
25.01.10	02:45-03:00h	1.485,5	5.942,2
25.01.10	03:00-03:15h	1.482,5	5.930,1
25.01.10	03:15-03:30h	1.473,7	5.895,0
25.01.10	03:30-03:45h	1.461,4	5.845,6
25.01.10	03:45-04:00h	1.459,8	5.839,2
25.01.10	04:00-04:15h	1.467,1	5.868,6
25.01.10	04:15-04:30h	1.480,5	5.922,1
25.01.10	04:30-04:45h	1.500,7	6.002,9
25.01.10	04:45-05:00h	1.519,0	6.076,1
25.01.10	05:00-05:15h	1.582,9	6.331,4
25.01.10	05:15-05:30h	1.639,7	6.559,0
25.01.10	05:30-05:45h	1.694,9	6.779,5
25.01.10	05:45-06:00h	1.746,6	6.986,5
25.01.10	06:00-06:15h	1.800,0	7.199,8
25.01.10	06:15-06:30h	1.886,0	7.543,9
25.01.10	06:30-06:45h	1.949,3	7.797,3
25.01.10	06:45-07:00h	2.026,2	8.104,8
25.01.10	07:00-07:15h	2.126,1	8.504,5
25.01.10	07:15-07:30h	2.181,8	8.727,3
25.01.10	07:30-07:45h	2.201,2	8.804,7
25.01.10	07:45-08:00h	2.214,0	8.856,2
25.01.10	08:00-08:15h	2.247,6	8.990,5
25.01.10	08:15-08:30h	2.261,2	9.044,9
25.01.10	08:30-08:45h	2.269,4	9.077,5
25.01.10	08:45-09:00h	2.294,8	9.179,1
25.01.10	09:00-09:15h	2.285,9	9.143,5
25.01.10	09:15-09:30h	2.308,8	9.235,2
25.01.10	09:30-09:45h	2.322,4	9.289,5
25.01.10	09:45-10:00h	2.320,4	9.281,7
25.01.10	10:00-10:15h	2.331,6	9.326,4
25.01.10	10:15-10:30h	2.338,0	9.352,1
25.01.10	10:30-10:45h	2.337,8	9.351,2
25.01.10	10:45-11:00h	2.347,5	9.390,1
25.01.10	11:00-11:15h	2.343,8	9.375,3
25.01.10	11:15-11:30h	2.350,1	9.400,4
25.01.10	11:30-11:45h	2.342,4	9.369,4
25.01.10	11:45-12:00h	2.319,1	9.276,3
25.01.10	12:00-12:15h	2.294,5	9.178,0
25.01.10	12:15-12:30h	2.280,7	9.122,7
25.01.10	12:30-12:45h	2.244,6	8.978,3
25.01.10	12:45-13:00h	2.247,2	8.989,8
25.01.10	13:00-13:15h	2.267,2	9.068,7
25.01.10	13:15-13:30h	2.261,0	9.043,9
25.01.10	13:30-13:45h	2.257,5	9.029,9
25.01.10	13:45-14:00h	2.253,1	9.012,4
25.01.10	14:00-14:15h	2.249,5	8.997,9
25.01.10	14:15-14:30h	2.237,7	8.951,0
25.01.10	14:30-14:45h	2.231,7	8.926,7
25.01.10	14:45-15:00h	2.221,2	8.884,9
25.01.10	15:00-15:15h	2.219,0	8.876,2
25.01.10	15:15-15:30h	2.220,8	8.883,4
25.01.10	15:30-15:45h	2.196,9	8.787,8

26.01.10	06:15-06:30h	1.911,0	7.644,1
26.01.10	06:30-06:45h	1.994,4	7.777,7
26.01.10	06:45-07:00h	2.076,9	8.307,7
26.01.10	07:00-07:15h	2.153,0	8.612,2
26.01.10	07:15-07:30h	2.196,2	8.784,9
26.01.10	07:30-07:45h	2.223,2	8.892,9
26.01.10	07:45-08:00h	2.239,4	8.957,6
26.01.10	08:00-08:15h	2.275,3	9.101,1
26.01.10	08:15-08:30h	2.292,6	9.170,6
26.01.10	08:30-08:45h	2.301,5	9.206,0
26.01.10	08:45-09:00h	2.304,5	9.218,2
26.01.10	09:00-09:15h	2.305,1	9.220,5
26.01.10	09:15-09:30h	2.314,0	9.256,1
26.01.10	09:30-09:45h	2.331,4	9.325,6
26.01.10	09:45-10:00h	2.340,1	9.360,4
26.01.10	10:00-10:15h	2.346,1	9.384,5
26.01.10	10:15-10:30h	2.353,7	9.414,7
26.01.10	10:30-10:45h	2.363,1	9.452,4
26.01.10	10:45-11:00h	2.358,8	9.435,4
26.01.10	11:00-11:15h	2.366,4	9.465,7
26.01.10	11:15-11:30h	2.378,7	9.514,7
26.01.10	11:30-11:45h	2.362,6	9.450,6
26.01.10	11:45-12:00h	2.343,8	9.375,3
26.01.10	12:00-12:15h	2.325,4	9.301,4
26.01.10	12:15-12:30h	2.288,1	9.152,5
26.01.10	12:30-12:45h	2.282,5	9.130,0
26.01.10	12:45-13:00h	2.274,6	9.098,3
26.01.10	13:00-13:15h	2.291,3	9.165,1
26.01.10	13:15-13:30h	2.295,7	9.183,0
26.01.10	13:30-13:45h	2.289,7	9.158,6
26.01.10	13:45-14:00h	2.278,0	9.112,2
26.01.10	14:00-14:15h	2.282,1	9.128,4
26.01.10	14:15-14:30h	2.260,7	9.042,7
26.01.10	14:30-14:45h	2.249,2	8.996,7
26.01.10	14:45-15:00h	2.234,4	8.937,8
26.01.10	15:00-15:15h	2.227,7	8.907,7
26.01.10	15:15-15:30h	2.228,7	8.914,6
26.01.10	15:30-15:45h	2.227,1	8.908,4
26.01.10	15:45-16:00h	2.222,0	8.888,0
26.01.10	16:00-16:15h	2.220,9	8.883,7
26.01.10	16:15-16:30h	2.237,4	8.949,5
26.01.10	16:30-16:45h	2.252,4	9.009,6
26.01.10	16:45-17:00h	2.278,4	9.113,6
26.01.10	17:00-17:15h	2.348,3	9.393,1
26.01.10	17:15-17:30h	2.393,5	9.515,5
26.01.10	17:30-17:45h	2.408,8	9.627,0
26.01.10	17:45-18:00h	2.408,2	9.632,9
26.01.10	18:00-18:15h	2.386,9	9.547,6
26.01.10	18:15-18:30h	2.382,8	9.531,1
26.01.10	18:30-18:45h	2.378,1	9.512,3
26.01.10	18:45-19:00h	2.370,9	9.483,5
26.01.10	19:00-19:15h	2.328,9	9.215,7
26.01.10	19:15-19:30h	2.306,6	9.226,6
26.01.10	19:30-19:45h	2.284,5	9.137,8
26.01.10	19:45-20:00h	2.990,7	10.940,7
26.01.10	20:00-20:15h	2.195,6	8.782,4
26.01.10	20:15-20:30h	2.144,6	8.578,3
26.01.10	20:30-20:45h	2.115,4	8.461,1

26.01.10	20:45-21:00h	2.064,0	8.256,2
26.01.10	21:00-21:15h	2.038,8	8.155,0
26.01.10	21:15-21:30h	1.996,9	7.987,6
26.01.10	21:30-21:45h	1.943,3	7.773,1
26.01.10	21:45-22:00h	1.923,3	7.693,0
26.01.10	22:00-22:15h	2.018,6	8.074,3
26.01.10	22:15-22:30h	2.003,0	8.012,2
26.01.10	22:30-22:45h	1.966,9	7.867,7
26.01.10	22:45-23:00h	1.925,3	7.701,3
26.01.10	23:00-23:15h	1.888,1	7.552,5
26.01.10	23:15-23:30h	1.849,5	7.397,9
26.01.10	23:30-23:45h	1.818,4	7.273,7
26.01.10	23:45-00:00h	1.786,3	7.145,1
27.01.10	00:00-00:15h	1.800,6	7.202,4
27.01.10	00:15-00:30h	1.779,2	7.117,0
27.01.10	00:30-00:45h	1.736,2	6.944,7
27.01.10	00:45-01:00h	1.718,8	6.875,4
27.01.10	01:00-01:15h	1.718,3	6.873,3
27.01.10	01:15-01:30h	1.695,9	6.793,6
27.01.10	01:30-01:45h	1.676,7	6.706,9
27.01.10	01:45-02:00h	1.661,2	6.644,9
27.01.10	02:00-02:15h	1.669,3	6.677,1
27.01.10	02:15-02:30h	1.651,6	6.606,4
27.01.10	02:30-02:45h	1.630,7	6.522,8
27.01.10	02:45-03:00h	1.613,3	6.453,1
27.01.10	03:00-03:15h	1.611,3	6.445,0
27.01.10	03:15-03:30h	1.596,2	6.384,9
27.01.10	03:30-03:45h	1.586,4	6.346,6
27.01.10	03:45-04:00h	1.584,5	6.338,1
27.01.10	04:00-04:15h	1.594,1	6.376,2
27.01.10	04:15-04:30h	1.603,1	6.412,5
27.01.10	04:30-04:45h	1.612,5	6.450,1
27.01.10	04:45-05:00h	1.635,1	6.540,6
27.01.10	05:00-05:15h	1.680,0	6.720,0
27.01.10	05:15-05:30h	1.715,9	6.863,7
27.01.10	05:30-05:45h	1.771,0	7.084,1
27.01.10	05:45-06:00h	1.830,0	7.319,9
27.01.10	06:00-06:15h	1.882,3	7.529,3
27.01.10	06:15-06:30h	1.955,3	7.821,4
27.01.10	06:30-06:45h	2.049,2	8.196,8
27.01.10	06:45-07:00h	2.113,1	8.452,3
27.01.10	07:00-07:15h	2.199,0	8.795,9
27.01.10	07:15-07:30h	2.244,0	8.975,9
27.01.10	07:30-07:45h	2.256,6	9.026,4
27.01.10	07:45-08:00h	2.266,3	9.065,2
27.01.10	08:00-08:15h	2.302,0	9.208,1
27.01.10	08:15-08:30h	2.321,0	9.283,9
27.01.10	08:30-08:45h	2.339,9	9.359,5
27.01.10	08:45-09:00h	2.337,5	9.349,9
27.01.10	09:00-09:15h	2.330,2	9.321,0
27.01.10	09:15-09:30h	2.333,0	9.331,9
27.01.10	09:30-09:45h	2.343,5	9.373,9
27.01.10	09:45-10:00h	2.344,7	9.378,9
27.01.10	10:00-10:15h	2.350,7	9.403,0
27.01.10	10:15-10:30h	2.357,6	9.430,2
27.01.10	10:30-10:45h	2.362,2	9.448,7
27.01.10	10:45-11:00h	2.368,5	9.474,1
27.01.10	11:00-11:15h	2.372,6	9.490,3

27.01.10	11:15-11:30h	2.356,9	9.427,5
27.01.10	11:30-11:45h	2.344,0	9.376,6
27.01.10	11:45-12:00h	2.327,2	9.308,9
27.01.10	12:00-12:15h	2.298,4	9.193,8
27.01.10	12:15-12:30h	2.275,6	9.102,5
27.01.10	12:30-12:45h	2.273,0	9.092,0
27.01.10	12:45-13:00h	2.254,4	9.017,5
27.01.10	13:00-13:15h	2.263,9	9.055,5
27.01.10	13:15-13:30h	2.261,1	9.044,4
27.01.10	13:30-13:45h	2.262,4	9.049,6
27.01.10	13:45-14:00h	2.251,7	9.006,8
27.01.10	14:00-14:15h	2.249,8	8.999,2
27.01.10	14:15-14:30h	2.252,0	9.008,0
27.01.10	14:30-14:45h	2.245,4	8.994,7
27.01.10	14:45-15:00h	2.236,1	8.944,5
27.01.10	15:00-15:15h	2.232,1	8.928,5
27.01.10	15:15-15:30h	2.234,8	8.939,3
27.01.10	15:30-15:45h	2.225,5	8.901,8
27.01.10	15:45-16:00h	2.233,2	8.932,8
27.01.10	16:00-16:15h	2.229,2	8.916,7
27.01.10	16:15-16:30h	2.241,4	8.965,7
27.01.10	16:30-16:45h	2.253,8	9.015,2
27.01.10	16:45-17:00h	2.306,5	9.226,0
27.01.10	17:00-17:15h	2.355,2	9.420,7
27.01.10	17:15-17:30h	2.387,5	9.549,9
27.01.10	17:30-17:45h	2.418,2	9.672,8
27.01.10	17:45-18:00h	2.437,2	9.749,0
27.01.10	18:00-18:15h	2.432,5	9.729,9
27.01.10	18:15-18:30h	2.423,6	9.694,5
27.01.10	18:30-18:45h	2.411,1	9.644,3
27.01.10	18:45-19:00h	2.383,6	9.534,3
27.01.10	19:00-19:15h	2.353,5	9.413,9
27.01.10	19:15-19:30h	2.326,0	9.304,0
27.01.10	19:30-19:45h	2.279,0	9.116,1
27.01.10	19:45-20:00h	2.253,8	9.015,2
27.01.10	20:00-20:15h	2.214,2	8.856,6
27.01.10	20:15-20:30h	2.151,4	8.605,6
27.01.10	20:30-20:45h	2.133,6	8.534,6
27.01.10	20:45-21:00h	2.085,3	8.341,3
27.01.10	21:00-21:15h	2.049,5	8.198,1
27.01.10	21:15-21:30h	1.998,6	7.994,5
27.01.10	21:30-21:45h	1.980,9	7.923,6
27.01.10	21:45-22:00h	1.949,4	7.797,6
27.01.10	22:00-22:15h	2.025,3	8.101,2
27.01.10	22:15-22:30h	2.018,1	8.072,2
27.01.10	22:30-22:45h	1.982,0	7.928,2
27.01.10	22:45-23:00h	1.956,3	7.825,1
27.01.10	23:00-23:15h	1.918,7	7.614,9
27.01.10	23:15-23:30h	1.884,2	7.536,8
27.01.10	23:30-23:45h	1.844,3	7.377,3
27.01.10	23:45-00:00h	1.819,3	7.277,3
28.01.10	00:00-00:15h	1.825,0	7.300,2
28.01.10	00:15-00:30h	1.799,6	7.198,5
28.01.10	00:30-00:45h	1.769,0	7.076,2
28.01.10	00:45-01:00h	1.756,2	7.024,8
28.01.10	01:00-01:15h	1.754,8	7.019,3
28.01.10	01:15-01:30h	1.726,2	6.904,9
28.01.10	01:30-01:45h	1.701,4	6.805,7

28.01.10	01:45-02:00h	1.667,5	6.670,2
28.01.10	02:00-02:15h	1.691,7	6.766,7
28.01.10	02:15-02:30h	1.673,7	6.695,0
28.01.10	02:30-02:45h	1.657,6	6.630,5
28.01.10	02:45-03:00h	1.637,2	6.548,8
28.01.10	03:00-03:15h	1.623,7	6.494,7
28.01.10	03:15-03:30h	1.612,0	6.448,2
28.01.10	03:30-03:45h	1.593,3	6.373,3
28.01.10	03:45-04:00h	1.590,2	6.360,7
28.01.10	04:00-04:15h	1.598,1	6.392,3
28.01.10	04:15-04:30h	1.611,4	6.445,8
28.01.10	04:30-04:45h	1.618,0	6.471,9
28.01.10	04:45-05:00h	1.632,3	6.529,1
28.01.10	05:00-05:15h	1.688,4	6.753,7
28.01.10	05:15-05:30h	1.717,9	6.871,5
28.01.10	05:30-05:45h	1.783,0	7.132,1
28.01.10	05:45-06:00h	1.820,0	7.279,8
28.01.10	06:00-06:15h	1.867,4	7.469,6
28.01.10	06:15-06:30h	1.945,5	7.781,9
28.01.10	06:30-06:45h	2.017,4	8.069,7
28.01.10	06:45-07:00h	2.087,1	8.348,3
28.01.10	07:00-07:15h	2.184,1	8.736,5
28.01.10	07:15-07:30h	2.222,2	8.888,8
28.01.10	07:30-07:45h	2.247,7	8.990,8
28.01.10	07:45-08:00h	2.266,7	9.066,8
28.01.10	08:00-08:15h	2.312,8	9.251,0
28.01.10	08:15-08:30h	2.324,7	9.299,0
28.01.10	08:30-08:45h	2.331,7	9.326,9
28.01.10	08:45-09:00h	2.339,6	9.358,3
28.01.10	09:00-09:15h	2.341,6	9.366,2
28.01.10	09:15-09:30h	2.353,1	9.412,4
28.01.10	09:30-09:45h	2.353,4	9.413,7
28.01.10	09:45-10:00h	2.361,1	9.444,5
28.01.10	10:00-10:15h	2.372,2	9.488,8
28.01.10	10:15-10:30h	2.365,1	9.460,3
28.01.10	10:30-10:45h	2.380,4	9.521,7
28.01.10	10:45-11:00h	2.389,9	9.559,6
28.01.10	11:00-11:15h	2.398,1	9.592,6
28.01.10	11:15-11:30h	2.387,0	9.548,1
28.01.10	11:30-11:45h	2.370,6	9.482,4
28.01.10	11:45-12:00h	2.345,0	9.380,2
28.01.10	12:00-12:15h	2.333,8	9.335,1
28.01.10	12:15-12:30h	2.305,4	9.221,7
28.01.10	12:30-12:45h	2.290,8	9.163,2
28.01.10	12:45-13:00h	2.283,5	9.134,1
28.01.10	13:00-13:15h	2.296,8	9.187,1
28.01.10	13:15-13:30h	2.290,8	9.163,3
28.01.10	13:30-13:45h	2.286,1	9.144,4
28.01.10	13:45-14:00h	2.263,2	9.052,8
28.01.10	14:00-14:15h	2.279,0	9.115,9
28.01.10	14:15-14:30h	2.276,1	9.104,4
28.01.10	14:30-14:45h	2.272,9	9.091,5
28.01.10	14:45-15:00h	2.263,3	9.053,3
28.01.10	15:00-15:15h	2.254,8	9.019,3
28.01.10	15:15-15:30h	2.250,2	9.000,9
28.01.10	15:30-15:45h	2.251,2	9.004,8
28.01.10	15:45-16:00h	2.252,7	9.010,9
28.01.10	16:00-16:15h	2.247,7	8.990,6

28.01.10	16:15-16:30h	2.249,8	8.999,3
28.01.10	16:30-16:45h	2.256,3	9.025,0
28.01.10	16:45-17:00h	2.289,5	9.158,0
28.01.10	17:00-17:15h	2.331,3	9.325,3
28.01.10	17:15-17:30h	2.363,9	9.455,5
28.01.10	17:30-17:45h	2.385,4	9.541,4
28.01.10	17:45-18:00h	2.385,1	9.540,5
28.01.10	18:00-18:15h	2.361,1	9.444,3
28.01.10	18:15-18:30h	2.349,8	9.399,1
28.01.10	18:30-18:45h	2.349,3	9.397,0
28.01.10	18:45-19:00h	2.336,2	9.344,8
28.01.10	19:00-19:15h	2.302,8	9.211,3
28.01.10	19:15-19:30h	2.272,6	9.090,3
28.01.10	19:30-19:45h	2.237,0	8.947,8
28.01.10	19:45-20:00h	2.202,7	8.811,0
28.01.10	20:00-20:15h	2.161,1	8.644,4
28.01.10	20:15-20:30h	2.109,1	8.436,4
28.01.10	20:30-20:45h	2.078,9	8.315,5
28.01.10	20:45-21:00h	2.047,2	8.188,8
28.01.10	21:00-21:15h	2.006,8	8.027,3
28.01.10	21:15-21:30h	1.960,4	7.841,5
28.01.10	21:30-21:45h	1.921,8	7.687,2
28.01.10	21:45-22:00h	1.887,0	7.547,9
28.01.10	22:00-22:15h	1.963,2	7.852,9
28.01.10	22:15-22:30h	1.952,6	7.810,3
28.01.10	22:30-22:45h	1.920,9	7.683,7
28.01.10	22:45-23:00h	1.892,3	7.569,0
28.01.10	23:00-23:15h	1.858,8	7.435,0
28.01.10	23:15-23:30h	1.812,6	7.250,5
28.01.10	23:30-23:45h	1.791,5	7.165,8
28.01.10	23:45-00:00h	1.762,3	7.049,0
29.01.10	00:00-00:15h	1.758,4	7.033,5
29.01.10	00:15-00:30h	1.723,0	6.891,9
29.01.10	00:30-00:45h	1.695,6	6.782,5
29.01.10	00:45-01:00h	1.703,7	6.863,7
29.01.10	01:00-01:15h	1.671,9	6.687,6
29.01.10	01:15-01:30h	1.640,1	6.560,6
29.01.10	01:30-01:45h	1.616,6	6.466,4
29.01.10	01:45-02:00h	1.597,1	6.388,3
29.01.10	02:00-02:15h	1.594,4	6.377,7
29.01.10	02:15-02:30h	1.589,3	6.357,2
29.01.10	02:30-02:45h	1.569,8	6.279,4
29.01.10	02:45-03:00h	1.557,0	6.227,8
29.01.10	03:00-03:15h	1.544,0	6.144,0
29.01.10	03:15-03:30h	1.534,8	6.139,3
29.01.10	03:30-03:45h	1.521,3	6.085,2
29.01.10	03:45-04:00h	1.524,6	6.098,4
29.01.10	04:00-04:15h	1.541,5	6.166,0
29.01.10	04:15-04:30h	1.542,0	6.188,0
29.01.10	04:30-04:45h	1.554,2	6.216,7
29.01.10	04:45-05:00h	1.566,7	6.266,6
29.01.10	05:00-05:15h	1.495,4	5.981,7
29.01.10	05:15-05:30h	1.469,9	5.855,6
29.01.10	05:30-05:45h	1.719,3	6.817,9
29.01.10	05:45-06:00h	1.756,1	7.024,4
29.01.10	06:00-06:15h	1.812,6	7.250,6
29.01.10	06:15-06:30h	1.896,6	7.586,6
29.01.10	06:30-06:45h	1.960,8	7.843,9

29.01.10	06:45-07:00h	2.036,1	8.144,5
29.01.10	07:00-07:15h	2.112,0	8.447,9
29.01.10	07:15-07:30h	2.144,1	8.576,4
29.01.10	07:30-07:45h	2.156,7	8.626,9
29.01.10	07:45-08:00h	2.169,5	8.678,1
29.01.10	08:00-08:15h	2.207,5	8.830,0
29.01.10	08:15-08:30h	2.225,4	8.901,5
29.01.10	08:30-08:45h	2.244,7	8.978,7
29.01.10	08:45-09:00h	2.256,2	9.024,7
29.01.10	09:00-09:15h	2.254,3	9.017,1
29.01.10	09:15-09:30h	2.255,5	9.022,0
29.01.10	09:30-09:45h	2.275,2	9.100,8
29.01.10	09:45-10:00h	2.267,3	9.069,1
29.01.10	10:00-10:15h	2.273,3	9.093,4
29.01.10	10:15-10:30h	2.284,4	9.137,5
29.01.10	10:30-10:45h	2.295,6	9.182,6
29.01.10	10:45-11:00h	2.298,5	9.193,9
29.01.10	11:00-11:15h	2.294,7	9.178,9
29.01.10	11:15-11:30h	2.294,8	9.179,0
29.01.10	11:30-11:45h	2.293,6	9.174,5
29.01.10	11:45-12:00h	2.260,9	9.043,6
29.01.10	12:00-12:15h	2.246,6	8.986,3
29.01.10	12:15-12:30h	2.218,8	8.875,1
29.01.10	12:30-12:45h	2.189,8	8.759,2
29.01.10	12:45-13:00h	2.170,8	8.683,0
29.01.10	13:00-13:15h	2.164,0	8.656,0
29.01.10	13:15-13:30h	2.155,8	8.623,2
29.01.10	13:30-13:45h	2.145,8	8.583,1
29.01.10	13:45-14:00h	2.131,2	8.524,6
29.01.10	14:00-14:15h	2.123,7	8.495,0
29.01.10	14:15-14:30h	2.101,3	8.405,1
29.01.10	14:30-14:45h	2.098,5	8.394,0
29.01.10	14:45-15:00h	2.086,9	8.347,4
29.01.10	15:00-15:15h	2.075,3	8.301,3
29.01.10	15:15-15:30h	2.072,7	8.290,6
29.01.10	15:30-15:45h	2.070,0	8.279,9
29.01.10	15:45-16:00h	2.078,1	8.312,4
29.01.10	16:00-16:15h	2.076,3	8.305,4
29.01.10	16:15-16:30h	2.079,2	8.317,0
29.01.10	16:30-16:45h	2.105,9	8.423,5
29.01.10	16:45-17:00h	2.145,8	8.583,2
29.01.10	17:00-17:15h	2.200,9	8.803,5
29.01.10	17:15-17:30h	2.246,5	8.986,0
29.01.10	17:30-17:45h	2.260,6	9.042,5
29.01.10	17:45-18:00h	2.269,8	9.079,3
29.01.10	18:00-18:15h	2.269,3	9.077,2
29.01.10	18:15-18:30h	2.254,4	9.017,5
29.01.10	18:30-18:45h	2.246,1	8.984,3
29.01.10	18:45-19:00h	2.220,5	8.882,0
29.01.10	19:00-19:15h	2.195,5	8.782,1
29.01.10	19:15-19:30h	2.163,3	8.653,1
29.01.10	19:30-19:45h	2.124,4	8.497,7
29.01.10	19:45-20:00h	2.084,7	8.338,6
29.01.10	20:00-20:15h	2.040,0	8.160,0
29.01.10	20:15-20:30h	1.996,9	7.987,6
29.01.10	20:30-20:45h	1.969,9	7.879,5
29.01.10	20:45-21:00h	1.936,9	7.747,5
29.01.10	21:00-21:15h	1.896,9	7.587,7

29.01.10	21:15-21:30h	1.861,7	7.447,0
29.01.10	21:30-21:45h	1.835,0	7.340,1
29.01.10	21:45-22:00h	1.807,2	7.228,8
29.01.10	22:00-22:15h	1.899,0	7.595,8
29.01.10	22:15-22:30h	1.898,3	7.593,3
29.01.10	22:30-22:45h	1.861,8	7.447,1
29.01.10	22:45-23:00h	1.839,0	7.356,0
29.01.10	23:00-23:15h	1.809,0	7.236,0
29.01.10	23:15-23:30h	1.767,3	7.069,4
29.01.10	23:30-23:45h	1.738,5	6.953,8
29.01.10	23:45-00:00h	1.721,2	6.884,7
30.01.10	00:00-00:15h	1.715,4	6.861,7
30.01.10	00:15-00:30h	1.680,9	6.723,6
30.01.10	00:30-00:45h	1.660,7	6.642,7
30.01.10	00:45-01:00h	1.630,3	6.521,1
30.01.10	01:00-01:15h	1.622,0	6.488,0
30.01.10	01:15-01:30h	1.601,7	6.406,9
30.01.10	01:30-01:45h	1.578,7	6.314,9
30.01.10	01:45-02:00h	1.564,0	6.255,9
30.01.10	02:00-02:15h	1.568,6	6.274,3
30.01.10	02:15-02:30h	1.551,5	6.206,1
30.01.10	02:30-02:45h	1.531,7	6.126,9
30.01.10	02:45-03:00h	1.513,6	6.054,4
30.01.10	03:00-03:15h	1.493,3	5.973,1
30.01.10	03:15-03:30h	1.478,6	5.914,4
30.01.10	03:30-03:45h	1.465,1	5.860,5
30.01.10	03:45-04:00h	1.463,1	5.852,4
30.01.10	04:00-04:15h	1.457,7	5.830,9
30.01.10	04:15-04:30h	1.462,5	5.849,9
30.01.10	04:30-04:45h	1.470,8	5.883,0
30.01.10	04:45-05:00h	1.470,8	5.883,1
30.01.10	05:00-05:15h	1.483,4	5.933,6
30.01.10	05:15-05:30h	1.504,8	6.019,2
30.01.10	05:30-05:45h	1.524,8	6.099,4
30.01.10	05:45-06:00h	1.525,6	6.102,5
30.01.10	06:00-06:15h	1.508,0	6.032,0
30.01.10	06:15-06:30h	1.539,5	6.157,8
30.01.10	06:30-06:45h	1.560,6	6.242,4
30.01.10	06:45-07:00h	1.597,9	6.391,5
30.01.10	07:00-07:15h	1.651,7	6.606,6
30.01.10	07:15-07:30h	1.688,1	6.752,4
30.01.10	07:30-07:45h	1.708,6	6.834,5
30.01.10	07:45-08:00h	1.744,1	6.976,4
30.01.10	08:00-08:15h	1.777,2	7.108,7
30.01.10	08:15-08:30h	1.803,5	7.214,1
30.01.10	08:30-08:45h	1.826,6	7.306,5
30.01.10	08:45-09:00h	1.852,6	7.410,5
30.01.10	09:00-09:15h	1.885,7	7.542,9
30.01.10	09:15-09:30h	1.912,4	7.649,5
30.01.10	09:30-09:45h	1.917,5	7.670,1
30.01.10	09:45-10:00h	1.924,9	7.699,5
30.01.10	10:00-10:15h	1.931,1	7.724,5
30.01.10	10:15-10:30h	1.935,6	7.742,2
30.01.10	10:30-10:45h	1.948,3	7.793,4
30.01.10	10:45-11:00h	1.950,2	7.800,7
30.01.10	11:00-11:15h	1.950,3	7.801,2
30.01.10	11:15-11:30h	1.947,8	7.791,3
30.01.10	11:30-11:45h	1.956,3	7.825,3

30.01.10	11:45-12:00h	1.940,2	7.760,9
30.01.10	12:00-12:15h	1.932,4	7.729,5
30.01.10	12:15-12:30h	1.900,5	7.602,1
30.01.10	12:30-12:45h	1.878,8	7.515,2
30.01.10	12:45-13:00h	1.859,7	7.438,9
30.01.10	13:00-13:15h	1.864,3	7.457,2
30.01.10	13:15-13:30h	1.854,3	7.417,2
30.01.10	13:30-13:45h	1.838,0	7.352,1
30.01.10	13:45-14:00h	1.819,9	7.279,7
30.01.10	14:00-14:15h	1.814,7	7.258,9
30.01.10	14:15-14:30h	1.816,8	7.267,0
30.01.10	14:30-14:45h	1.821,4	7.285,7
30.01.10	14:45-15:00h	1.808,0	7.231,9
30.01.10	15:00-15:15h	1.810,5	7.242,0
30.01.10	15:15-15:30h	1.804,9	7.219,5
30.01.10	15:30-15:45h	1.802,2	7.208,6
30.01.10	15:45-16:00h	1.793,4	7.173,6
30.01.10	16:00-16:15h	1.815,1	7.260,4
30.01.10	16:15-16:30h	1.826,6	7.306,2
30.01.10	16:30-16:45h	1.835,6	7.342,5
30.01.10	16:45-17:00h	1.868,2	7.472,9
30.01.10	17:00-17:15h	1.899,5	7.597,9
30.01.10	17:15-17:30h	1.954,9	7.819,7
30.01.10	17:30-17:45h	1.974,2	7.896,7
30.01.10	17:45-18:00h	1.978,0	7.911,9
30.01.10	18:00-18:15h	1.978,2	7.912,7
30.01.10	18:15-18:30h	1.963,4	7.853,4
30.01.10	18:30-18:45h	1.939,8	7.759,1
30.01.10	18:45-19:00h	1.927,2	7.708,8
30.01.10	19:00-19:15h	1.900,5	7.602,0
30.01.10	19:15-19:30h	1.876,3	7.505,2
30.01.10	19:30-19:45h	1.875,6	7.502,5
30.01.10	19:45-20:00h	1.839,7	7.359,0
30.01.10	20:00-20:15h	1.817,5	7.269,9
30.01.10	20:15-20:30h	1.775,9	7.103,5
30.01.10	20:30-20:45h	1.758,4	7.033,6
30.01.10	20:45-21:00h	1.733,5	6.933,9
30.01.10	21:00-21:15h	1.699,0	6.796,0
30.01.10	21:15-21:30h	1.664,1	6.656,4
30.01.10	21:30-21:45h	1.645,8	6.583,0
30.01.10	21:45-22:00h	1.628,4	6.513,5
30.01.10	22:00-22:15h	1.729,7	6.918,6
30.01.10	22:15-22:30h	1.734,7	6.939,0
30.01.10	22:30-22:45h	1.703,0	6.812,1
30.01.10	22:45-23:00h	1.674,8	6.699,2
30.01.10	23:00-23:15h	1.657,4	6.629,8
30.01.10	23:15-23:30h	1.622,9	6.491,6
30.01.10	23:30-23:45h	1.588,2	6.352,6
30.01.10	23:45-00:00h	1.578,3	6.313,2
31.01.10	00:00-00:15h	1.558,8	6.235,3
31.01.10	00:15-00:30h	1.532,4	6.129,7
31.01.10	00:30-00:45h	1.511,2	6.044,9
31.01.10	00:45-01:00h	1.489,3	5.957,1
31.01.10	01:00-01:15h	1.485,9	5.943,8
31.01.10	01:15-01:30h	1.456,2	5.824,9
31.01.10	01:30-01:45h	1.443,2	5.772,7
31.01.10	01:45-02:00h	1.416,9	5.667,4
31.01.10	02:00-02:15h	1.435,1	5.740,5

31.01.10	02:15-02:30h	1.427,7	5.710,9
31.01.10	02:30-02:45h	1.404,0	5.615,8
31.01.10	02:45-03:00h	1.395,5	5.581,8
31.01.10	03:00-03:15h	1.375,3	5.501,0
31.01.10	03:15-03:30h	1.363,4	5.453,7
31.01.10	03:30-03:45h	1.351,5	5.406,0
31.01.10	03:45-04:00h	1.341,1	5.364,5
31.01.10	04:00-04:15h	1.342,5	5.369,9
31.01.10	04:15-04:30h	1.338,7	5.354,7
31.01.10	04:30-04:45h	1.340,9	5.363,8
31.01.10	04:45-05:00h	1.335,6	5.342,4
31.01.10	05:00-05:15h	1.354,8	5.419,3
31.01.10	05:15-05:30h	1.359,9	5.435,8
31.01.10	05:30-05:45h	1.374,0	5.495,9
31.01.10	05:45-06:00h	1.367,3	5.469,1
31.01.10	06:00-06:15h	1.323,7	5.294,8
31.01.10	06:15-06:30h	1.337,9	5.351,8
31.01.10	06:30-06:45h	1.361,7	5.446,8
31.01.10	06:45-07:00h	1.388,4	5.553,7
31.01.10	07:00-07:15h	1.432,7	5.730,8
31.01.10	07:15-07:30h	1.461,2	5.844,6
31.01.10	07:30-07:45h	1.479,3	5.917,0
31.01.10	07:45-08:00h	1.511,8	6.047,2
31.01.10	08:00-08:15h	1.549,4	6.197,5
31.01.10	08:15-08:30h	1.558,9	6.235,6
31.01.10	08:30-08:45h	1.568,0	6.352,0
31.01.10	08:45-09:00h	1.620,6	6.482,4
31.01.10	09:00-09:15h	1.662,1	6.648,5
31.01.10	09:15-09:30h	1.693,9	6.775,7
31.01.10	09:30-09:45h	1.714,9	6.859,6
31.01.10	09:45-10:00h	1.733,0	6.932,2
31.01.10	10:00-10:15h	1.760,2	7.040,8
31.01.10	10:15-10:30h	1.776,8	7.107,2
31.01.10	10:30-10:45h	1.793,5	7.174,0
31.01.10	10:45-11:00h	1.818,1	7.243,3
31.01.10	11:00-11:15h	1.824,0	7.295,6
31.01.10	11:15-11:30h	1.831,3	7.325,2
31.01.10	11:30-11:45h	1.831,8	7.327,3
31.01.10	11:45-12:00h	1.803,7	7.214,8
31.01.10	12:00-12:15h	1.782,9	7.131,5
31.01.10	12:15-12:30h	1.746,3	6.985,4
31.01.10	12:30-12:45h	1.733,0	6.931,9
31.01.10	12:45-13:00h	1.721,9	6.887,5
31.01.10	13:00-13:15h	1.720,9	6.883,6
31.01.10	13:15-13:30h	1.699,4	6.809,4
31.01.10	13:30-13:45h	1.686,8	6.741,1
31.01.10	13:45-14:00h	1.681,8	6.727,2
31.01.10	14:00-14:15h	1.672,4	6.689,4
31.01.10	14:15-14:30h	1.658,1	6.632,6
31.01.10	14:30-14:45h	1.642,9	6.571,6
31.01.10	14:45-15:00h	1.626,1	6.504,4
31.01.10	15:00-15:15h	1.623,3	6.493,1
31.01.10	15:15-15:30h	1.622,9	6.491,5
31.01.10	15:30-15:45h	1.620,6	6.446,8
31.01.10	15:45-16:00h	1.619,0	6.476,0
31.01.10	16:00-16:15h	1.630,2	6.520,6
31.01.10	16:15-16:30h	1.628,5	6.513,9
31.01.10	16:30-16:45h	1.652,2	6.608,9

31.01.10	16:45-17:00h	1.691,3	6.765,2
31.01.10	17:00-17:15h	1.747,6	6.990,2
31.01.10	17:15-17:30h	1.804,9	7.219,8
31.01.10	17:30-17:45h	1.830,8	7.323,2
31.01.10	17:45-18:00h	1.853,8	7.415,2
31.01.10	18:00-18:15h	1.876,8	7.507,0
31.01.10	18:15-18:30h	1.891,2	7.524,7
31.01.10	18:30-18:45h	1.875,3	7.501,4
31.01.10	18:45-19:00h	1.871,1	7.484,3
31.01.10	19:00-19:15h	1.874,9	7.499,6
31.01.10	19:15-19:30h	1.876,7	7.506,6
31.01.10	19:30-19:45h	1.853,6	7.414,5
31.01.10	19:45-20:00h	1.837,9	7.351,5
31.01.10	20:00-20:15h	1.821,1	7.284,3
31.01.10	20:15-20:30h	1.787,8	7.151,1
31.01.10	20:30-20:45h	1.765,4	7.061,5
31.01.10	20:45-21:00h	1.734,0	6.936,2
31.01.10	21:00-21:15h	1.727,7	6.910,8
31.01.10	21:15-21:30h	1.691,1	6.764,5
31.01.10	21:30-21:45h	1.657,5	6.630,0
31.01.10	21:45-22:00h	1.664,6	6.658,3
31.01.10	22:00-22:15h	1.770,6	7.082,5
31.01.10	22:15-22:30h	1.773,1	7.092,4
31.01.10	22:30-22:45h	1.754,7	7.018,7
31.01.10	22:45-23:00h	1.728,0	6.911,9
31.01.10	23:00-23:15h	1.697,6	6.790,2
31.01.10	23:15-23:30h	1.668,6	6.674,6
31.01.10	23:30-23:45h	1.644,4	6.577,7
31.01.10	23:45-00:00h	1.625,3	6.501,2

Bilanz der Öffentlichen Elektrizitätsversorgung an den 3. Mittwoch im Jahr 2010
[stündliche Leistungsmittelwerte in MW]

Mittwoch, Jänner 20, 2010

Datum	Zeit	Laufkraftwerke	Speicher-kraftwerke	Kalorische Kraftwerke	Sonstige Erzeugung	Physikalische Importe	Abgabe an Endverbr. inkl. Netzverluste und EB aus dem Netz	Verbrauch für Pumpspeicherung	Physikalische Exporte	Electricity supply 2050 – constant szenario	Electricity supply 2050 – growth szenario
20.01.2010	0:00	1.523	562	3.131	928	3.277	6.794	514	2.112	6.530	9.323
20.01.2010	1:00	1.522	578	3.041	838	3.399	6.462	698	2.218	6.210	8.867
20.01.2010	2:00	1.493	478	3.039	863	3.230	6.249	834	2.020	6.006	8.575
20.01.2010	3:00	1.498	323	2.999	887	3.508	6.086	1.468	1.660	5.849	8.351
20.01.2010	4:00	1.496	319	2.993	933	3.488	6.040	1.481	1.709	5.804	8.287
20.01.2010	5:00	1.511	404	2.985	767	3.449	6.402	683	2.032	6.153	8.785
20.01.2010	6:00	1.509	461	3.235	819	3.658	7.209	525	1.948	6.928	9.891
20.01.2010	7:00	1.733	1.712	3.641	1.000	2.965	8.384	303	2.365	8.058	11.504
20.01.2010	8:00	1.766	1.939	3.725	1.256	2.922	8.815	385	2.407	8.472	12.095
20.01.2010	9:00	1.766	1.668	3.917	1.132	3.067	8.950	210	2.389	8.601	12.280
20.01.2010	10:00	1.796	1.551	3.864	1.135	3.218	9.093	164	2.308	8.739	12.478
20.01.2010	11:00	1.816	1.685	3.788	1.144	3.227	9.155	163	2.341	8.798	12.562
20.01.2010	12:00	1.831	1.529	3.606	1.180	3.153	9.002	191	2.106	8.651	12.352
20.01.2010	13:00	1.837	1.363	3.515	1.117	3.289	8.869	162	2.091	8.523	12.169
20.01.2010	14:00	1.830	1.065	3.510	1.302	3.477	8.720	430	2.033	8.381	11.966
20.01.2010	15:00	1.802	1.006	3.486	1.258	3.545	8.611	385	2.102	8.276	11.816
20.01.2010	16:00	1.773	912	3.596	1.201	3.572	8.634	479	1.940	8.298	11.848
20.01.2010	17:00	1.778	1.789	3.671	1.266	3.098	9.103	300	2.198	8.749	12.491
20.01.2010	18:00	1.837	1.926	3.750	1.189	2.718	9.237	159	2.024	8.878	12.675
20.01.2010	19:00	1.817	1.705	3.693	1.141	2.851	8.997	160	2.050	8.647	12.345
20.01.2010	20:00	1.773	819	3.598	1.202	3.339	8.447	239	2.045	8.118	11.591
20.01.2010	21:00	1.699	728	3.371	1.071	3.466	7.824	251	2.262	7.519	10.736
20.01.2010	22:00	1.614	738	3.320	1.204	3.425	7.753	285	2.263	7.451	10.638
20.01.2010	23:00	1.586	785	3.137	1.207	3.333	7.332	303	2.412	7.047	10.061

184.688

Höchstlast am Berichtstag	
Zeit	MW
18:00	9.237,4
Niedrigstlast am Berichtstag	
Zeit	MW
4:00	6.039,7

Electricity Supply

PV monthly electricity supply (GWh)

month	PV 2050		PV 2050	
	annual electricity production		annual electricity production	
	(constant scenario)		(growth scenario)	
	GWh	shares in %	GWh	shares in %
January	417	4%	550	4%
February	669	6%	882	6%
March	1.101	9%	1.453	9%
April	1.279	11%	1.687	11%
May	1.372	12%	1.810	12%
June	1.383	12%	1.825	12%
July	1.307	11%	1.725	11%
August	1.205	10%	1.591	10%
September	1.193	10%	1.575	10%
October	838	7%	1.106	7%
November	476	4%	629	4%
December	356	3%	470	3%
Stat. Korr. (a)				
Jahreszusatz (b)				
Jahr	11.595	100%	15.303	100%

legend:
 data from feasibility study energy autarky 2050
 calculated from given data (constant szenario)
 calculated from given data (growth szenario)

Daily electricity supply from PV (MWh)

Installed capacity

constant szenario³ 17.675 MW

growth szenario⁴ 21.463 MW

average efficiency⁷ 11,5%

Technical potential area

153,7 km²⁶

186,6 km²⁵

northerst point (49.020703°N, 15.020773°E)¹

estern point (48.006691°N, 17.160749°E)¹

southern point (46.372132°N, 14.563494°E)¹

western point (47.270581°N, 9.530768°E)¹

Wh/m2 month	January	February	March	April	May	June	July	August	September	October	November	December
north	836	1.480	2.560	3.750	4.830	4.900	5.240	4.430	2.970	2.040	905	622
east	917	1.620	2.790	4.270	5.280	5.720	5.860	4.900	3.630	2.250	1.070	677
south	1.160	1.850	2.920	4.090	4.850	5.150	5.290	4.680	3.500	2.240	1.330	895
west	1.190	2.060	3.260	4.400	5.030	5.600	5.640	4.870	3.600	2.510	1.360	938
average	1.026	1.753	2.883	4.128	4.998	5.343	5.508	4.720	3.425	2.260	1.166	783

Daily electricity supply (MWh) Constant

January	February	March	April	May	June	July	August	September	October	November	December
18.124,7	30.966,2	50.933,1	72.931,9	88.304,6	94.400,6	97.316,1	83.401,2	60.518,9	39.933,6	20.607,3	13.835,4

Daily electricity supply (MWh) Growth

January	February	March	April	May	June	July	August	September	October	November	December
22.008,6	37.601,9	61.847,3	88.560,2	107.227,0	114.629,3	118.169,6	101.272,9	73.487,2	48.490,8	25.023,2	16.800,1

PV average daily electricity supply january (MW/MWh)

northerst point (49.020703°N, 15.020773°E)¹
estern point (48.006691°N, 17.160749°E)¹
southern point (46.372132°N, 14.563494°E)¹
western point (47.270581°N, 9.530768°E)¹

Installed capacity	
constant szenario ³	17.675 MW
growth szenario ⁴	21.463 MW
average efficiency ⁷	11,5%

Technical potential area	
153,7 km ² ⁵	
186,6 km ² ⁵	

Time	January (N) W/m ²	January (E) W/m ²	January (S) W/m ²	January (W) W/m ²	av. daily rad. January W/m2	total MW for whole area incl. Eff. PV Modules ²	PV ele. Generation MW (constant)	total MW for whole area incl. Eff. PV Modules ²	PV ele. Generation MW (growth)
4:22									
4:37									
4:52									
5:07									
5:22									
5:37									
5:52									
6:07									
6:22									
6:37									
6:52									
7:07									
7:22									
7:37									
7:52			30	38	34,0	600,8	600,8	729,5	729,5
8:07	29	34	40	58	40,3	711,2	711,2	863,6	863,6
8:22	44	47	48	74	53,3	940,9	940,9	1.142,5	1.142,5
8:37	56	60	56	89	65,3	1.153,0	1.153,0	1.400,0	1.400,0
8:52	68	73	64	103	77,0	1.360,6	1.360,6	1.652,1	1.652,1
9:07	79	85	117	117	99,5	1.758,1	1.758,1	2.134,9	2.134,9
9:22	90	97	132	130	112,3	1.983,4	1.983,4	2.408,5	2.408,5
9:37	99	108	146	141	123,5	2.182,2	2.182,2	2.649,8	2.649,8
9:52	108	119	159	152	134,5	2.376,6	2.376,6	2.885,8	2.885,8
10:07	117	128	170	161	144,0	2.544,4	2.544,4	3.089,7	3.089,7
10:22	124	136	180	169	152,3	2.690,2	2.690,2	3.266,7	3.266,7
10:37	130	143	189	176	159,5	2.818,3	2.818,3	3.422,3	3.422,3
10:52	135	149	197	182	165,8	2.928,8	2.928,8	3.556,4	3.556,4
11:07	139	154	203	187	170,8	3.017,1	3.017,1	3.663,6	3.663,6
11:22	142	157	207	190	174,0	3.074,5	3.074,5	3.733,4	3.733,4
11:37	145	160	210	192	176,8	3.123,1	3.123,1	3.792,4	3.792,4
11:52	146	161	212	193	178,0	3.145,2	3.145,2	3.819,2	3.819,2
12:07	146	161	212	193	178,0	3.145,2	3.145,2	3.819,2	3.819,2
12:22	145	160	210	192	176,8	3.123,1	3.123,1	3.792,4	3.792,4
12:37	142	157	207	190	174,0	3.074,5	3.074,5	3.733,4	3.733,4
12:52	139	154	203	187	170,8	3.017,1	3.017,1	3.663,6	3.663,6
13:07	135	149	197	182	165,8	2.928,8	2.928,8	3.556,4	3.556,4
13:22	130	143	189	176	159,5	2.818,3	2.818,3	3.422,3	3.422,3
13:37	124	136	180	169	152,3	2.690,2	2.690,2	3.266,7	3.266,7
13:52	117	128	170	161	144,0	2.544,4	2.544,4	3.089,7	3.089,7
14:07	108	119	159	152	134,5	2.376,6	2.376,6	2.885,8	2.885,8
14:22	99	108	146	141	123,5	2.182,2	2.182,2	2.649,8	2.649,8
14:37	90	97	76	130	98,3	1.736,1	1.736,1	2.108,1	2.108,1
14:52	79	85	70	117	87,8	1.550,5	1.550,5	1.882,8	1.882,8
15:07	68	73	64	103	77,0	1.360,6	1.360,6	1.652,1	1.652,1
15:22	56	60	56	89	65,3	1.153,0	1.153,0	1.400,0	1.400,0
15:37	44	47	48	74	53,3	940,9	940,9	1.142,5	1.142,5
15:52	29	34	40	49	38,0	671,5	671,5	815,3	815,3
16:07	20	22	30	38	27,5	485,9	485,9	590,0	590,0
16:22			19	27	23,0	406,4	406,4	493,5	493,5
16:37									
16:52									
17:07									
17:22									
17:37									
17:52									
18:07									
18:22									
18:37									
18:52									
19:07									
19:22									
19:37									
19:52									

	data from http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php
	data from feasibility study
	calculated from given data (feasibility study EA 2050) - constant szenario
	calculated from given data (feasibility study EA 2050) - growth szenario

1 http://toolserver.org/~geohack/geohack.php?pagename=Geographie_Österreichs&language=de¶ms=46.372132_N_14.563494_E_region:AT-2_type:landmark&title=Südlichster+Punkt+Österreichs
2 Efficiencies assumed in feasibility study: between 7% and 16% resulting in an average of 11,5%
3 ele generation from PV in constant szenario = 70% of average technical capacity potential (15,3 - 35,2 GW) is 17,7 GW
4 ele generation from PV in growth szenario = 85% of technical supply potential; 85% of average technical capacity potential (15,3 - 35,2 GW) is 21,5 GW
5 technical potential area = 219,5; 85% of area = 186,6 km²
6 technical potential area = 219,5; 70% of area = 153,7 km²
7 average efficiency of PV modules between 7% and 16% (as stated in feasibility study EA 2050)

Time	PV ele. Generation MW (constant)	PV ele. Generation MW (growth)
0:00		
1:00		
2:00		
3:00		
4:00		
5:00		
6:00		
7:00		
8:00	711,2	863,6
9:00	1.758,1	2.134,9
10:00	2.544,4	3.089,7
11:00	3.017,1	3.663,6
12:00	3.145,2	3.819,2
13:00	2.928,8	3.556,4
14:00	2.376,6	2.885,8
15:00	1.360,6	1.652,1
16:00	485,9	590,0
17:00		
18:00		
19:00		
20:00		
21:00		
22:00		
23:00		

Wind electricity supply

Month	wind 2050		GWh/day	wind 2050		
	annual electricity production			annual electricity production		
	(constant scenario)			(growth scenario)		
	GWh	shares in %		GWh	shares in %	
January	1.089	11%	35,13	1.111	11%	35,84
February	990	10%	35,36	1.010	10%	33,67
March	990	10%	31,94	1.010	10%	32,58
April	990	10%	33,00	1.010	10%	33,67
May	495	5%	15,97	505	5%	16,29
June	248	3%	8,25	253	3%	8,42
July	248	3%	7,98	253	3%	8,15
August	248	3%	7,98	253	3%	8,15
September	1.089	11%	35,13	1.111	11%	35,84
October	1.139	12%	36,73	1.162	12%	37,47
November	1.089	11%	35,13	1.111	11%	35,84
December	1.089	11%	35,13	1.111	11%	35,84
Stat. Korr. (a)						
Jahreszusatz (b)						
Jahr	9.702	100%		9.898	100%	

legend:
 data from feasibility study energy autarky 2050
 calculated from given data (constant szenario)
 calculated from given data (growth szenario)

January	wind 2050 daily electricity production (MW)	wind 2050 daily electricity production (MW)
Hour	constant szenario	growth szenario
0:00	1.464	1.493
1:00	1.464	1.493
2:00	1.464	1.493
3:00	1.464	1.493
4:00	1.464	1.493
5:00	1.464	1.493
6:00	1.464	1.493
7:00	1.464	1.493
8:00	1.464	1.493
9:00	1.464	1.493
10:00	1.464	1.493
11:00	1.464	1.493
12:00	1.464	1.493
13:00	1.464	1.493
14:00	1.464	1.493
15:00	1.464	1.493
16:00	1.464	1.493
17:00	1.464	1.493
18:00	1.464	1.493
19:00	1.464	1.493
20:00	1.464	1.493
21:00	1.464	1.493
22:00	1.464	1.493
23:00	1.464	1.493

Run-off river HPP electricity supply

Month	run-off river HPP 2050			run-off river HPP 2050		
	annual electricity production			annual electricity production		
	(constant szenario)		GWh/day	(growth szenario)		
	GWh	shares in %		GWh	shares in %	
January	915	5%	29,53	1.022	5%	32,98
Febuary	849	5%	30,32	948	5%	31,61
March	1.606	9%	51,79	1.793	9%	57,85
April	2.121	11%	70,69	2.369	11%	78,96
May	2.313	12%	74,60	2.583	12%	83,33
June	1.933	10%	64,43	2.159	10%	71,97
July	2.114	11%	68,20	2.361	11%	76,18
August	1.759	9%	56,73	1.964	9%	63,37
September	1.541	8%	49,70	1.721	8%	55,52
October	1.304	7%	42,08	1.457	7%	47,00
November	1.136	6%	36,63	1.269	6%	40,92
December	1.211	6%	39,05	1.352	6%	43,62
Stat. Korr. (a)						
Jahreszusatz (b)						
Jahr	18.800	100%		21.000	100%	

legend:

	data from feasibility study energy autarky 2050
	calculated from given data (constant szenario)
	calculated from given data (growth szenario)

January	run-off HP 2050 daily electricity production (MW)	run-off HP 2050 daily electricity production (MW)
Hour	constant szenario	growth szenario
0:00	1.230	1.374
1:00	1.230	1.374
2:00	1.230	1.374
3:00	1.230	1.374
4:00	1.230	1.374
5:00	1.230	1.374
6:00	1.230	1.374
7:00	1.230	1.374
8:00	1.230	1.374
9:00	1.230	1.374
10:00	1.230	1.374
11:00	1.230	1.374
12:00	1.230	1.374
13:00	1.230	1.374
14:00	1.230	1.374
15:00	1.230	1.374
16:00	1.230	1.374
17:00	1.230	1.374
18:00	1.230	1.374
19:00	1.230	1.374
20:00	1.230	1.374
21:00	1.230	1.374
22:00	1.230	1.374
23:00	1.230	1.374

HP storage electricity supply

Month	HP storage 2050			HP storage 2050		
	annual electricity production			annual electricity production		
	(constant szenario)			(growth szenario)		
	GWh	shares in %	GWh/day	GWh	shares in %	
January	910	7%	29,36	910	7%	29,36
Febuary	759	6%	27,12	759	6%	25,31
March	894	7%	28,84	894	7%	28,84
April	1.039	8%	34,64	1.039	8%	34,64
May	1.334	10%	43,05	1.334	10%	43,05
June	1.487	11%	49,55	1.487	11%	49,55
July	1.386	11%	44,72	1.386	11%	44,72
August	1.470	11%	47,43	1.470	11%	47,43
September	1.183	9%	38,15	1.183	9%	38,15
October	1.073	8%	34,60	1.073	8%	34,60
November	622	5%	20,06	622	5%	20,06
December	842	6%	27,17	842	6%	27,17
Stat. Korr. (a)						
Jahreszusatz (b)						
Jahr	13.000	100%		13.000	100%	

legend:

	data from feasibility study energy autarky 2050
	calculated from given data (constant szenario)
	calculated from given data (growth szenario)

January	stored HP 2050 daily electricity production (MW)	stored HP 2050 daily electricity production (MW)
Hour	constant szenario	growth szenario
0:00	1.223	1.223
1:00	1.223	1.223
2:00	1.223	1.223
3:00	1.223	1.223
4:00	1.223	1.223
5:00	1.223	1.223
6:00	1.223	1.223
7:00	1.223	1.223
8:00	1.223	1.223
9:00	1.223	1.223
10:00	1.223	1.223
11:00	1.223	1.223
12:00	1.223	1.223
13:00	1.223	1.223
14:00	1.223	1.223
15:00	1.223	1.223
16:00	1.223	1.223
17:00	1.223	1.223
18:00	1.223	1.223
19:00	1.223	1.223
20:00	1.223	1.223
21:00	1.223	1.223
22:00	1.223	1.223
23:00	1.223	1.223

CHP electricity supply

month	CHP 2050			CHP 2050		
	annual electricity production			annual electricity production		
	(constant szenario)			(growth szenario)		
	GWh	shares in %	GWh/day	GWh	shares in %	
January	519	19,95%	16,73	319	19,95%	10,30
Febuary	423	16,27%	15,11	260	16,27%	8,68
March	361	13,89%	11,65	222	13,89%	7,17
April	181	6,96%	6,03	111	6,96%	3,71
May	52	2,01%	1,69	32	2,01%	1,04
June	7	0,28%	0,24	4	0,28%	0,15
July	1	0,03%	0,03	0	0,03%	0,02
August	1	0,03%	0,03	0	0,03%	0,02
September	34	1,30%	1,09	21	1,30%	0,67
October	199	7,67%	6,43	123	7,67%	3,96
November	351	13,49%	11,31	216	13,49%	6,96
December	471	18,13%	15,20	290	18,13%	9,36
Stat. Korr. (a)						
Jahreszusatz (b)						
Jahr	2.600	100%		1.600	100%	

legend:

	data from feasibility study energy autarky 2050
	calculated from given data (constant szenario)
	calculated from given data (growth szenario)

January	CHP 2050 daily electricity production (MW)	run-off HP 2050 daily electricity production (MW)
Hour	constant szenario	growth szenario
0:00	697	429
1:00	697	429
2:00	697	429
3:00	697	429
4:00	697	429
5:00	697	429
6:00	697	429
7:00	697	429
8:00	697	429
9:00	697	429
10:00	697	429
11:00	697	429
12:00	697	429
13:00	697	429
14:00	697	429
15:00	697	429
16:00	697	429
17:00	697	429
18:00	697	429
19:00	697	429
20:00	697	429
21:00	697	429
22:00	697	429
23:00	697	429

geothermal storage electricity supply

	geothermal 2050		geothermal 2050	
	annual electricity production		annual electricity production	
	(constant scenario)		(growth scenario)	
month	GWh	shares in %	GWh	shares in %
January	192	8%	1.250	8%
February	192	8%	1.250	8%
March	192	8%	1.250	8%
April	192	8%	1.250	8%
May	192	8%	1.250	8%
June	192	8%	1.250	8%
July	192	8%	1.250	8%
August	192	8%	1.250	8%
September	192	8%	1.250	8%
October	192	8%	1.250	8%
November	192	8%	1.250	8%
December	192	8%	1.250	8%
daily supply	6		40	
per hour (MW)	258		1.680	
Jahr	2.300	100%	15.000	100%

legend:

	data from feasibility study energy autarky 2050
	calculated from given data (constant szenario)
	calculated from given data (growth szenario)

	geothermal 2050	geothermal 2050
	daily electricity production (MW)	daily electricity production (MW)
Hour	constant szenario	growth szenario
0:00	258	1.680
1:00	258	1.680
2:00	258	1.680
3:00	258	1.680
4:00	258	1.680
5:00	258	1.680
6:00	258	1.680
7:00	258	1.680
8:00	258	1.680
9:00	258	1.680
10:00	258	1.680
11:00	258	1.680
12:00	258	1.680
13:00	258	1.680
14:00	258	1.680
15:00	258	1.680
16:00	258	1.680
17:00	258	1.680
18:00	258	1.680
19:00	258	1.680
20:00	258	1.680
21:00	258	1.680
22:00	258	1.680
23:00	258	1.680