CEER

Council of European Energy Regulators

Fostering energy markets, empowering **consumers**.

Energy Quality of Supply Work Stream (EQS WS)

CEER Benchmarking Report 6.1 on the Continuity of Electricity and Gas Supply

Data update 2015/2016

Ref: C18-EQS-86-03

26-July-2018

Council of European Energy Regulators asbl
Cours Saint-Michel 30a, Box F – 1040 Brussels, Belgium
Arrondissement judiciaire de Bruxelles – RPM 0861.035.445

INFORMATION PAGE

Abstract

This document (C18-EQS-86-03) provides an update of key data related to continuity of electricity and gas supply found in the more extensive 6th CEER Benchmarking Report published in 2016. CEER aims to provide such updates in between the more detailed reports, in order to provide accurate and up-to-date data on a more regular basis.

Target Audience

European Commission, energy suppliers, traders, gas/electricity customers, gas/electricity industry, consumer representative groups, network operators, Member States, academics and other interested parties.

Keywords

Electricity; Gas; quality of supply; continuity; benchmarking; SAIDI; SAIFI; CAIDI; interruptions

If you have any queries relating to this paper please contact:
CEER Secretariat
Tel. +32 (0)2 788 73 30
Email: brussels@ceer.eu

Table of Contents

Related Documents

CEER documents

- 6th Benchmarking Report on the Quality of Electricity and Gas Supply (September 2016)
- Benchmarking Report 5.2 on the Continuity of Electricity Supply (January 2015)
- Benchmarking Report 5.1 on the Continuity of Electricity Supply (February 2014)
- 5th Benchmarking Report on Quality of Electricity Supply (December 2011)
- 4th Benchmarking Report on Quality of Electricity Supply (December 2008)
- 3rd Benchmarking Report on Quality of Electricity Supply (December 2005)
- 2nd Benchmarking Report on Quality of Electricity Supply (September 2003)
- Quality of Electricity supply: Initial Benchmarking on actual levels, standards and regulatory strategies – 1st Benchmarking Report (April 2001)

List of Figures

List of Tables

Executive Summary

Since 2001, the Council of European Energy Regulators (CEER) has repeatedly undertaken a survey and analysis of the quality of electricity supply in its member and observer countries, the results of which are presented in its Benchmarking Reports, the latest of which was the 6th CEER Benchmarking Report (6th BR), published in 2016. While the 6th BR addressed three areas of the Quality of Supply of electricity networks (Continuity of Supply, Voltage Quality and Commercial Quality) and three areas of the Quality of Supply of gas networks (Technical Operational Quality, Natural Gas Quality, and Commercial Quality), this Benchmarking Report 6.1 (BR 6.1) only updates key data in Continuity of Supply of electricity and Technical Operational Quality of gas. All other areas of the Quality of Supply will again be addressed in detail in the 7th CEER Benchmarking Report.

For this update, the CEER Energy Quality of Supply Work Stream mainly focused on recent Continuity of Supply data. Compared to the 6th CEER Benchmarking Report, the BR 6.1 includes several additional figures, such as aggregated box-plot summary graphs. These additional figures illustrate the range of values over the last seven years (provided that the data for at least four of those years are available) in addition to the mean and the latest available value (in this case from 2016). Other figures are similar to those presented in the 6th CEER Benchmarking Report while comprehensive additional information can be found in tables included as annex. In addition to the update of the Continuity of Supply indicators, the most recent data on circuit length and share of underground cables is presented for each responding country.

Since the 6th CEER Benchmarking Report included chapters dedicated to gas for the first time, countries were asked to submit data for the same indicators as in 6th BR, but this time for a longer time period (2010 to 2016). These indicators are

- System Average Interruption Duration Index (SAIDI),
- System Average Interruption Frequency Index (SAIFI) and
- Customer Average Interruption Duration Index (CAIDI).

The values of unplanned electricity SAIDI and SAIFI seem to be stable or improving over time. In 2016, unplanned SAIDI including exceptional events had a range between 9 and 371 minutes per customer while unplanned SAIDI without exceptional events was between 9 and 290 minutes per customer. The former indicator includes all interruptions regardless of their cause and is possibly more reliable for benchmarking because of significant differences in definitions of exceptional events across Europe. The 2016 values of unplanned SAIFI including exceptional events were between 0,08 and 4,35 interruptions per customer while unplanned SAIFI excluding exceptional events ranged from 0,05 and 3,83 interruptions per customer.

As in the 6th BR, the comparison of continuity indicators is complicated by the fact that voltage levels are taken into account in different ways across reporting countries. The goal was to include interruptions on all voltage levels, but this proved difficult due to differences in collecting and reporting the data across Europe.

Even though the gas indicators are borrowed from the electricity sector, they should not be interpreted the same way. Due to the possibility of storage in gas grids and very high technical requirements of these grids, continuity of supply is not the main factor influencing decisions of the network operators. Nevertheless, the typically used interruption indicators are good tools for international benchmarking of continuity of supply.

Continuity of Supply indicators for gas are monitored in significantly less European countries than for electricity. Moreover, SAIDI values are generally much lower in gas than in electricity. This is due to underground gas pipelines which are not exposed to forces of nature in the same way as overhead power cables. In 2016, unplanned SAIDI ranged from 0,008 to 6,043 minutes per customer (with the country with the highest value including major incidents in their interruption indicator). In all other countries, unplanned SAIDI was significantly below 2. Planned SAIDI values in 2016 were between 0,026 and 23,389 minutes per customer. Similarly, values of planned SAIFI (between 0,0023 – 0,196) were greater than the values of unplanned SAIFI (0,0021 – 0,02 interruptions per customer).

Finally, in addition to the update of Continuity of Supply indicators in gas, the latest available data for gas transmission and distribution pipeline length is included for each responding country.

1 Introduction

This Benchmarking Report 6.1 (BR 6.1) aims to provide a partial update of the indicators related to Continuity of Supply (CoS) for Electricity and Gas included in the 6th CEER Benchmarking Report (6th BR), published in 2016. Where the full Benchmarking Report addresses three areas of the Quality of Supply of electricity networks (Continuity of Supply, Voltage Quality and Commercial Quality) and three areas on the Quality of Supply of gas networks (Technical Operational Quality, Natural Gas Quality, and Commercial Quality), this BR 6.1 does not include Voltage Quality and Commercial Quality and Natural Gas Quality. All these areas of the Quality of Supply will be addressed in detail in the 7th CEER Benchmarking Report, which is tentatively planned for publication in 2020.

Therefore, the CEER Energy Quality of Supply Work Stream (EQS WS) focuses on recent CoS data only for this update. This report does not include a thorough analysis of the data submitted by the NRAs, it draws no conclusions and gives no recommendations. This report only serves to present the most recent data on CoS and technical characteristics in electricity and technical operational quality and technical characteristics in gas networks.

This report contains data from all CEER Members except Iceland and Cyprus, as well as from CEER Observer Switzerland. The Slovak Republic, which is neither a Member nor an Observer of CEER, also responded to the questionnaire. Overall, 29 countries responded to the CEER questionnaire. Participation in this exercise has significantly increased since CEER's 1st Benchmarking Report in 2001.

It is important to emphasise that indicators for CoS are currently not perfectly harmonised between different countries. Definitions of the indicators described in this report can be found in the 6th CEER BR. Notably, the following definitions might differ depending on the country:

- The voltage levels EHV, HV, MV and LV;
- Exceptional events; and
- Indicators such as SAIDI, SAIFI, MAIFI, AIT, ENS can be calculated with slightly different methods depending on the country (for example due to national legislation).

Previous Benchmarking Reports are available on the CEER website as listed in "Related Documents". The 4th CEER Benchmarking Report (2008) includes precise definitions of continuity indicators (from page 20) and detailed content about exceptional events (from page 42).

Compared to the 6th BR, the BR 6.1 includes several additional figures, such as aggregated box-plot-like summary graphs. The box-plot figures illustrate the range of values over the last seven years (provided that the data for at least four of those years are available) in addition to the mean and the latest available value (in this case from 2016). Hence, many figures have two parts: a tracking of the value over time and box-plots with min-max ranges and mean values. Other figures are similar to those presented in the 6th BR, while additional information can be found in tables included in Annex 3. Note that this report uses comma decimalisation, e.g., 0,1 = 10%.

2 Main results – electricity

As in the 6th BR, there are cases where values of indicators differ not only because of a different duration or number of interruptions, but because of that fact that different voltage levels might be included depending on the country. The goal was to include interruptions on all voltage levels, but this proved difficult due to differences in collecting and reporting the data across Europe.[1]

A few examples of the distinctiveness of indicators in surveyed countries are:

In the **Czech Republic**, all values correspond only to TSO and/or 3 largest DSOs which represent the vast majority of the territory of the country.
In **Denmark**, the definition of LV, MV, HV and EHV differ between the SAIDI/SAIFI values and the reported length of circuits at different voltage intervals. When considering SAIDI/SAIFI values, the following definitions apply: LV = 0,4 kV, MV = 1–24 kV, HV = 25–99 kV, EHV = none. When considering circuit length: LV = 0,4 kV, MV = 0,4–10 kV, HV = 10–50 kV, EHV = 50–132 kV.
Bulgaria, Croatia, Germany, **Greece** and **Latvia** only include low and medium voltage in their SAIDI and SAIFI values.
Finland only includes medium voltage in their unplanned SAIDI and SAIFI.
As of 2016, **France** does not include medium and low voltage in their unplanned SAIFI.
Ireland, Romania and **Sweden** do not include extra high voltage in their data.
In **Malta**, planned and unplanned SAIDI (including exceptional events) values show interruptions at 11 kV or above. The same applies to planned and unplanned SAIFI (including exceptional events).
In **the Netherlands**, the data provided for SAIDI/SAIFI take into account all interruptions longer than 5 seconds.
In **Norway**, low voltage interruptions have only been registered since 2014.
In **Poland**, low voltage is not included in SAIDI.
In **Portugal**, overall SAIDI and SAIFI only include low voltage.
In **Slovenia**, unplanned SAIDI and SAIFI without exceptional events only include interruptions on EHV and HV levels. Indicators such as planned/unplanned SAIDI and SAIFI including all interruptions only refer to medium voltage.

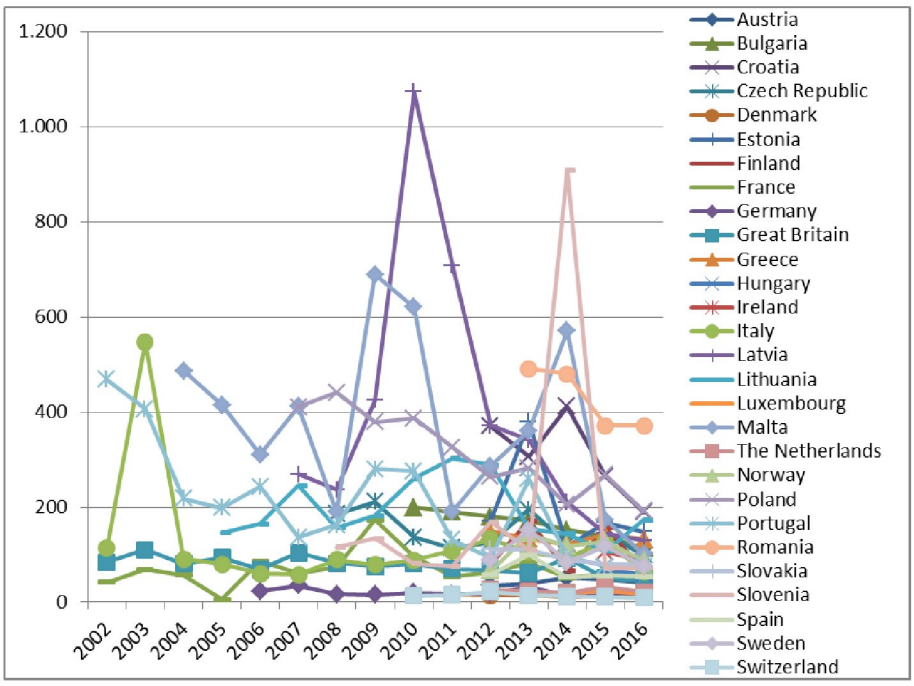
[1] The electricity SAIDI and SAIFI values for Belgium, although monitored, could not be included in figures and tables since a single value for the entire country has not been provided to the EQS Work Stream.

2.1 System Average Interruption Duration Index – SAIDI

Figure 1 shows SAIDI for all unplanned interruptions including exceptional events. The shown values show variations due to extreme weather situations of the past years but tend to stabilise in the years 2015 and 2016 with the highest value just under 400 minutes per customer per year.

As mentioned in the introduction, the box-plots show the range of values between the years 2010 and 2016 (provided that the values for at least four of those years were available) in addition to the mean and the latest available value (2016).

Figure 1 – Electricity: unplanned SAIDI, including exceptional events (minutes per customer) – time series and min-max



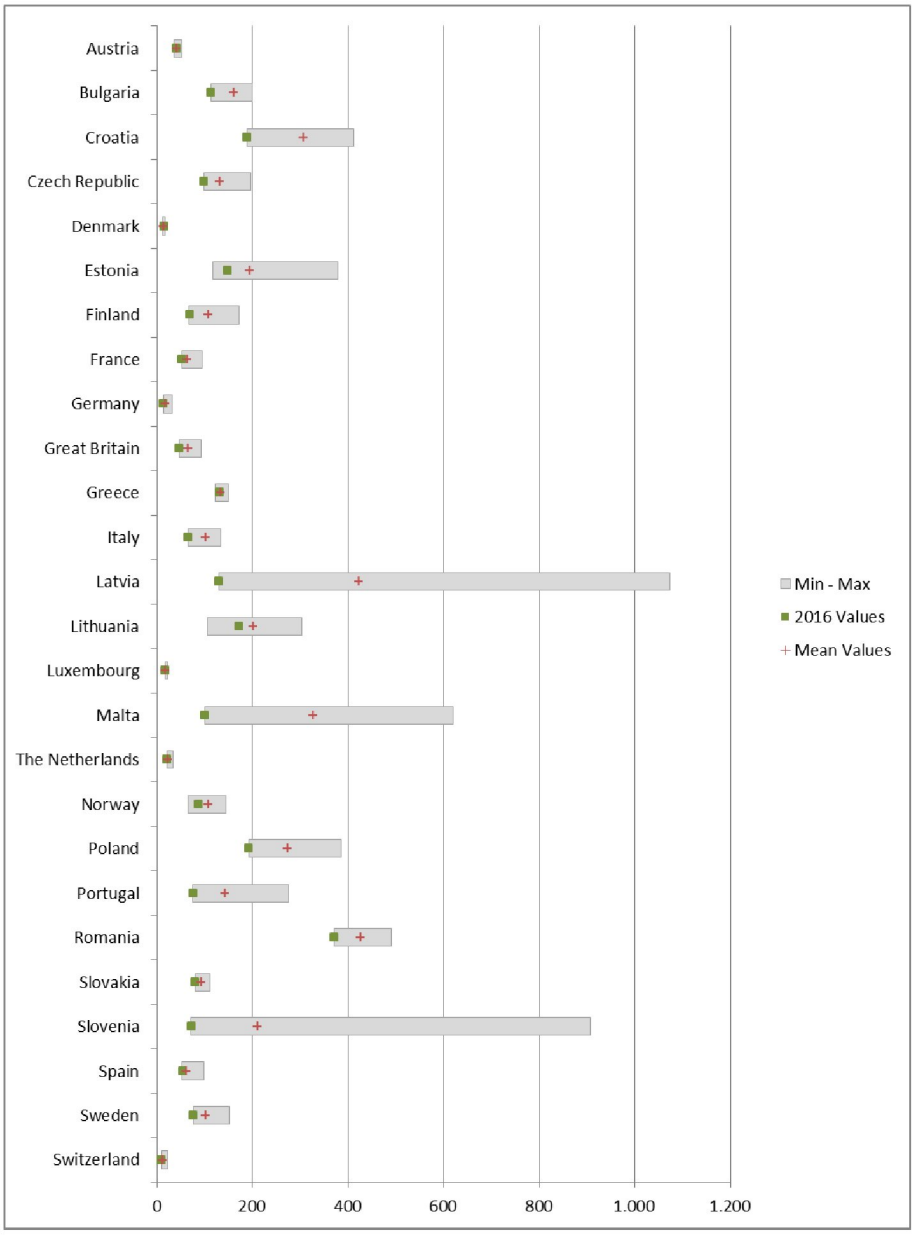
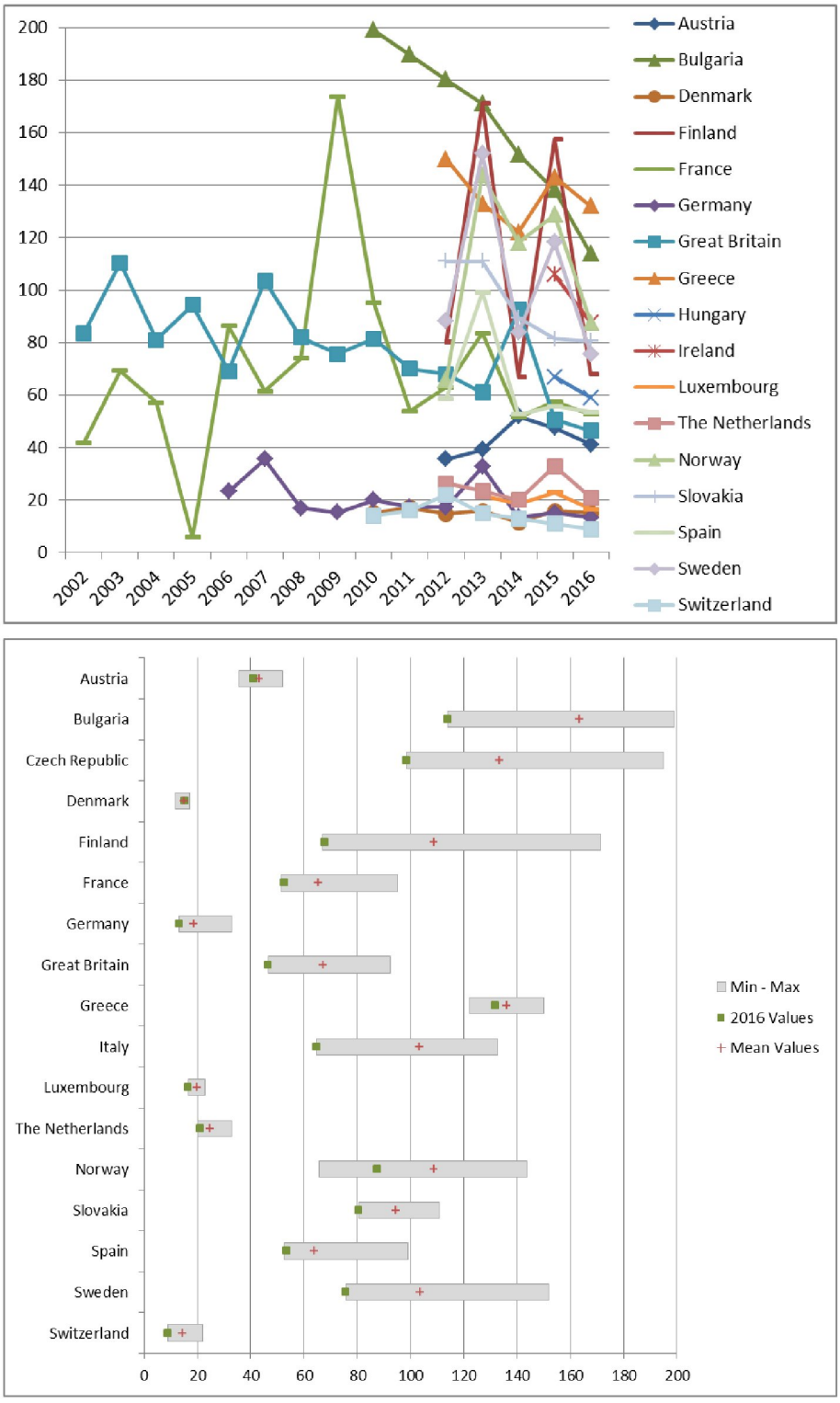

Austria
Bulgaria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
0
200
400
600
800
1.000
1.200
Min - Max
2016 Values
Mean Values

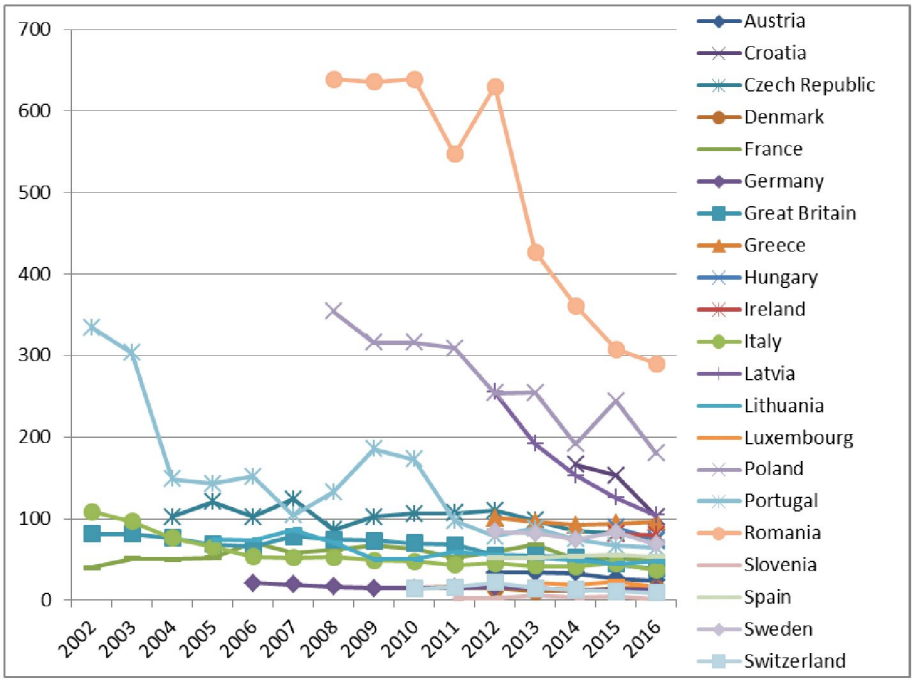
Figure 2 – Electricity: unplanned SAIDI, including exceptional events, only countries not exceeding 200 minutes (minutes per customer) – time series and min-max

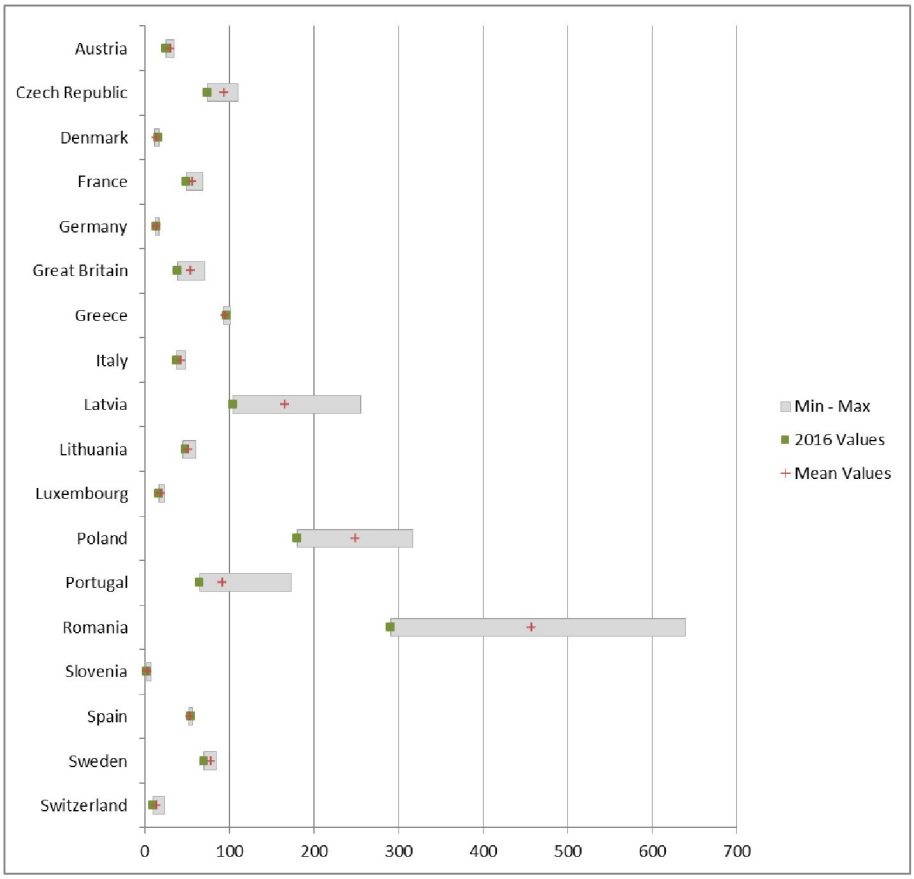


Since a wide spread of indicator values makes the reading of the lower half of some graphs more difficult, certain figures show only the countries where the worst values do not exceed a chosen limit (e.g. 200 minutes) in any of the observed years as is the case with Figure 2. This has no effect on data and was only done to simplify the reading of the graphs. It is important to note that, in case of graphs with a limit, different countries may be appearing in a box-plot with the same limit. The reason for this is that a country not exceeding a certain limit in the past seven years (since 2010) is a condition less strict than a country not exceeding the same limit in any of the years since 2002. Figure 3 shows the SAIDI for unplanned interruptions with the exception of interruptions caused by exceptional events. For most countries, the 2016 values are at the bottom of their seven-year range showing tendency for improvement. Please refer to Annex A of the 6th BR for a detailed overview about the definitions of exceptional events.

As already mentioned, indicators are not always calculated the same way in every country. One example of this is Slovenia, which only includes EHV and HV in their unplanned SAIDI (and correspondingly SAIFI) without exceptional events. They have a separate SAIDI value for medium voltage, but these two values cannot simply be added due to different methodologies in calculating them. The SAIDI values for Slovenia in Figure 3 only refer to their TSO. In 2014, Slovenia experienced sleet resulting in increased interruptions but the way this was reported depends on whether interruptions were reported by the DSO or the TSO which highlights the distinctiveness of methodology in Slovenia. For distribution, the 2014 sleet is treated as *force majeure*. For transmission, the same event is treated as third party and would normally be included in SAIDI without exceptional events. For this reason (and to simplify comparison of these transmission SAIDI values to those of distribution in Table 12), it was decided to exclude interruptions caused by a third party from Slovenian values in Figure 3. In other words, SAIDI for Slovenia only includes the values for interruptions which were caused by the system operator.

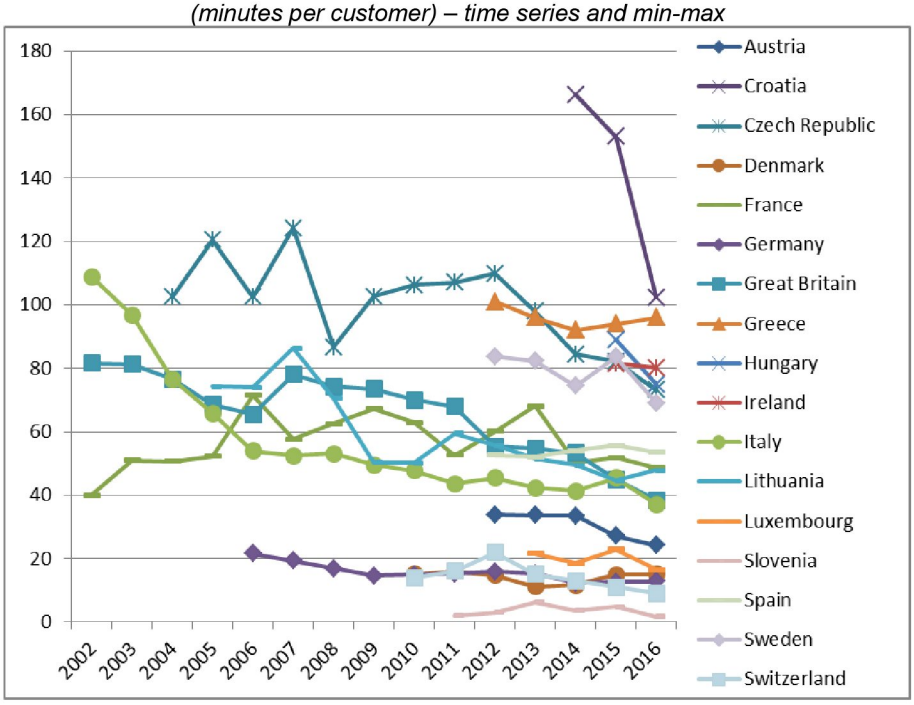
Figure 3 – Electricity: unplanned SAIDI, without exceptional events (minutes per customer) – time series and min-max





A better illustration of countries with lower values can be seen in Figure 4, which includes only countries not exceeding 200 minutes per year in the entire observed period. Most countries show stable or improving values with Croatia experiencing significant progress since 2014.

Figure 4 – Electricity: unplanned SAIDI, without exceptional events, only countries not exceeding 200 minutes (minutes per customer) – time series and min-max



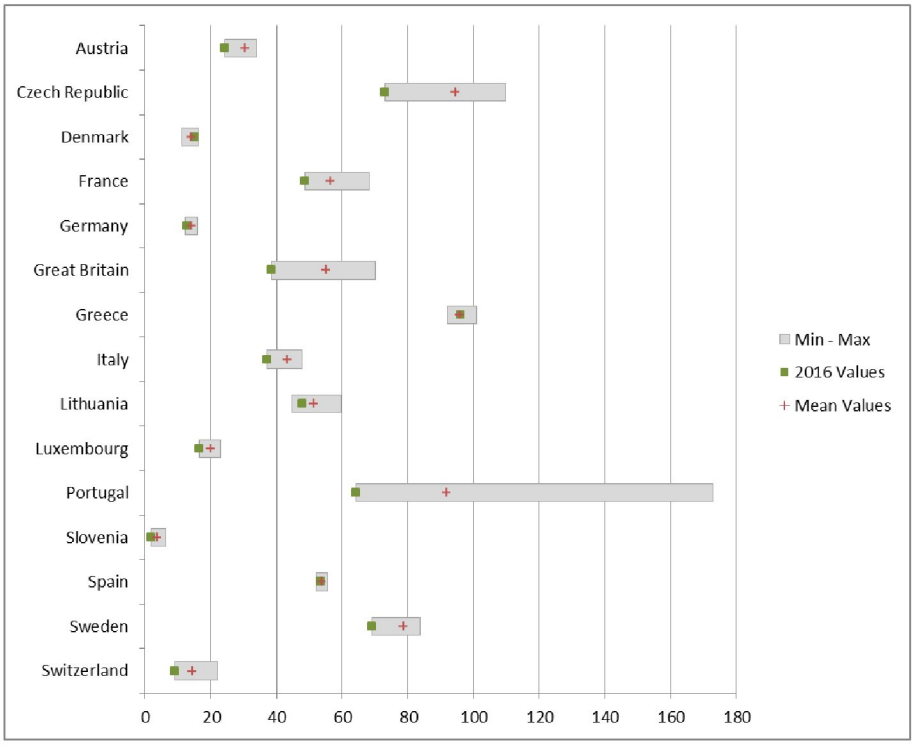
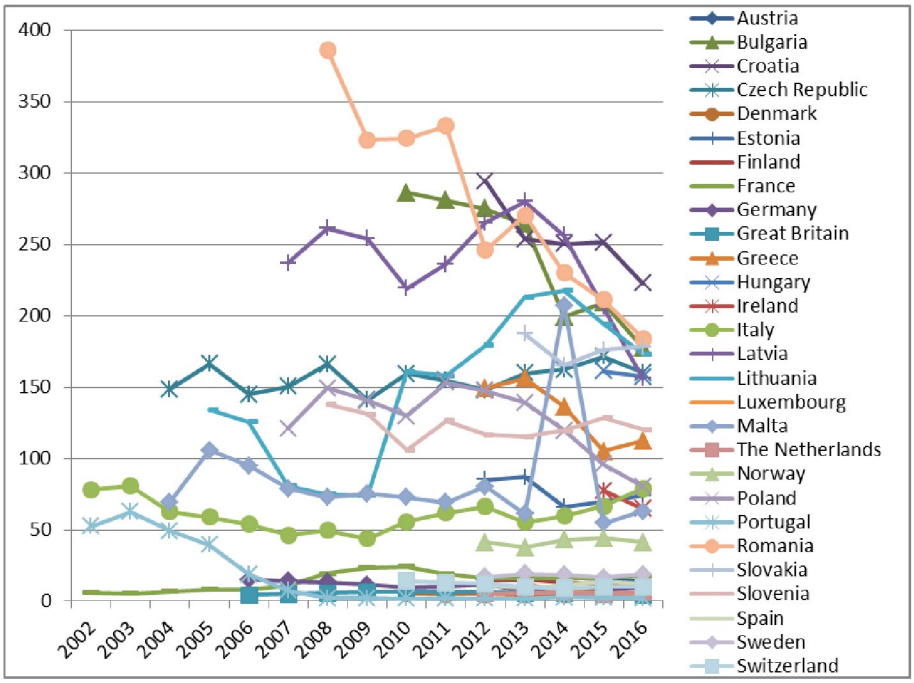
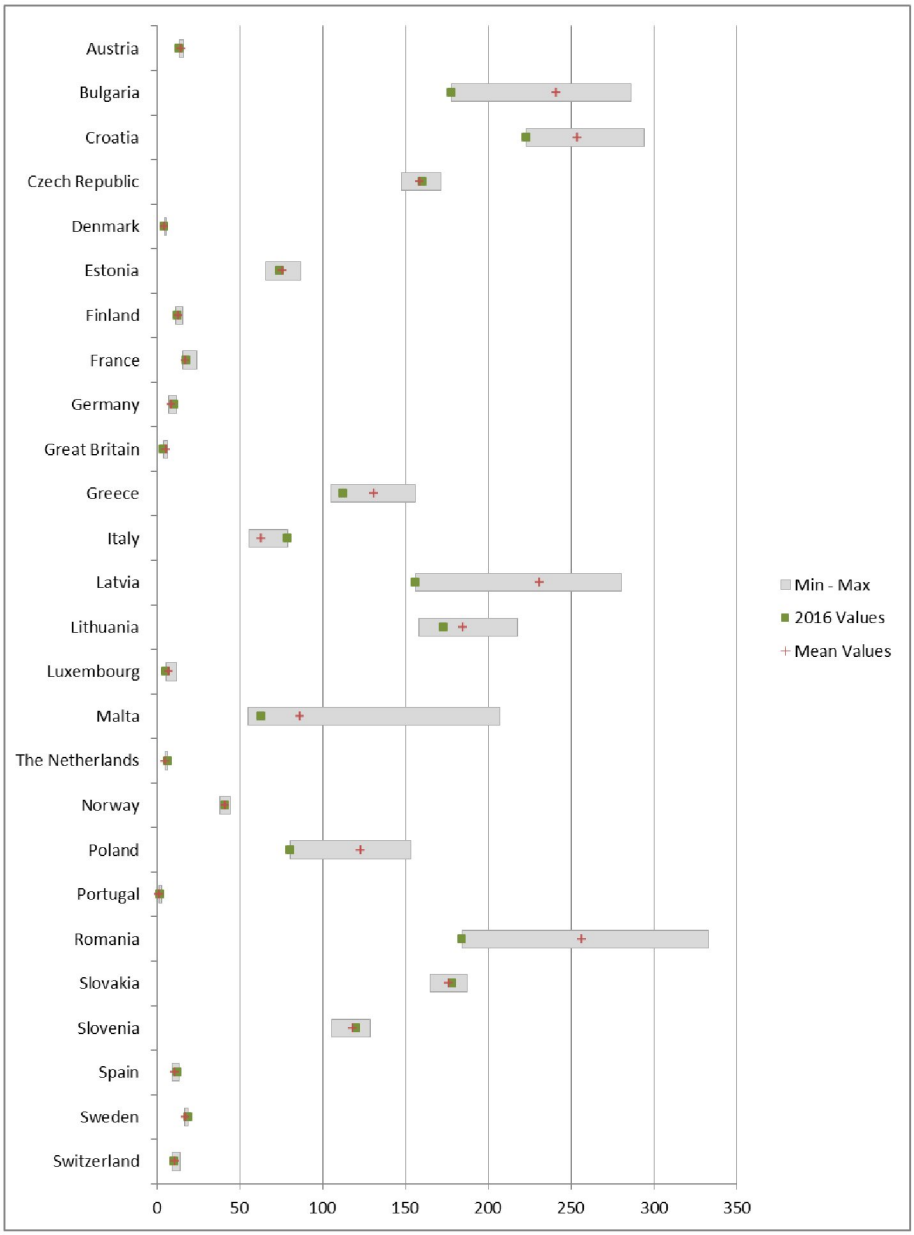


Figure 5 – Electricity: planned SAIDI

(minutes per customer) – times series and min-max





Planned interruptions relate to those minutes without supply experienced by network users who were given prior notice about the interruption. The rules related to definition and treatment of planned interruptions can be found in Table 2.2 of the 6th Benchmarking Report.

Looking at the values for planned SAIDI in Figure 5, the only visible trend is that the spread between the countries is narrowing. In the two years since the 6th BR, the highest SAIDI value was 251.

Figure 6 – Electricity: planned SAIDI, only countries not exceeding 100 minutes (minutes per customer) – time series and min-max

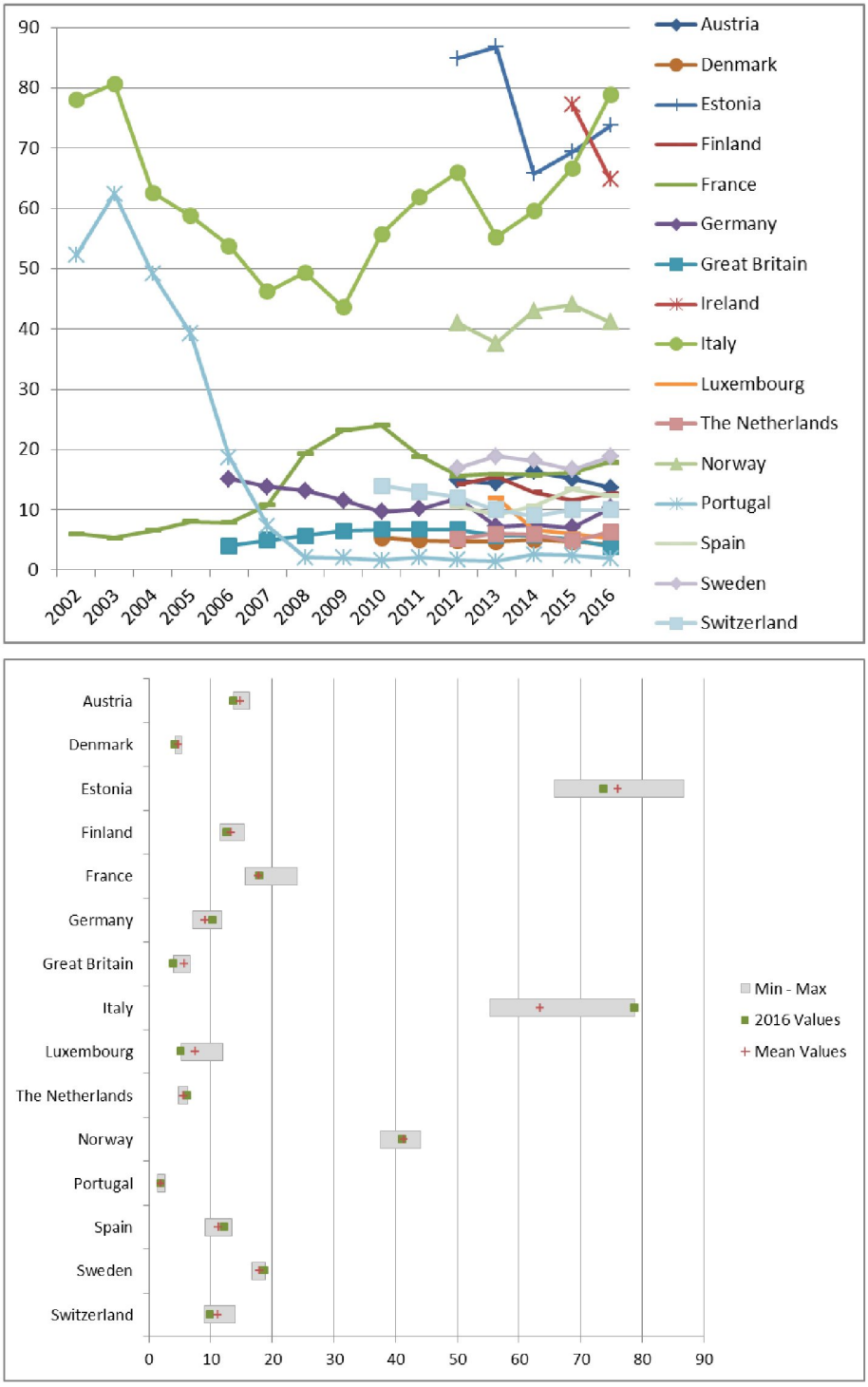
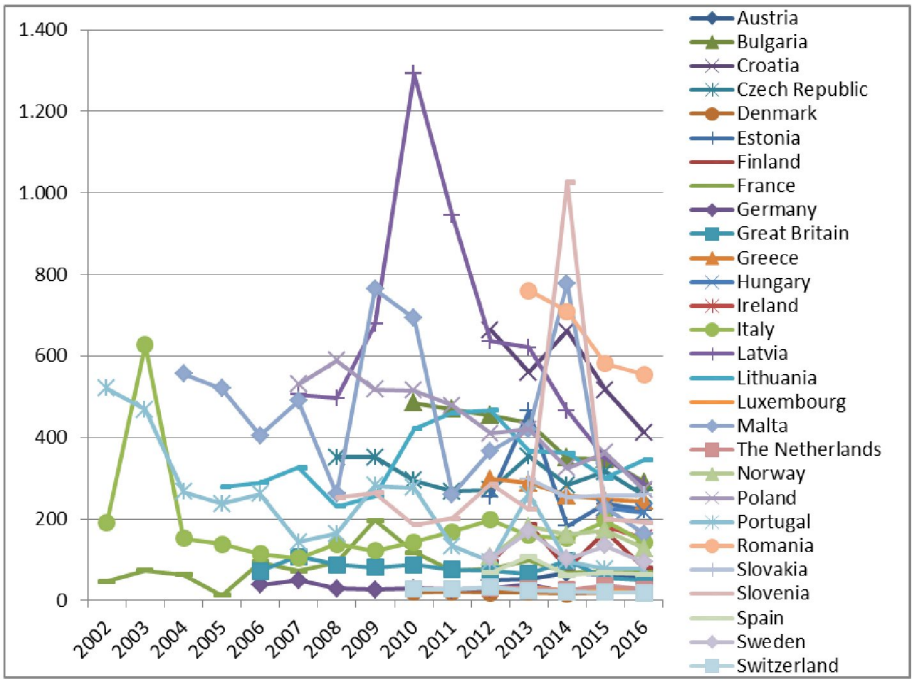


Figure 7 shows the total SAIDI for all interruptions (originating from all voltage levels), including planned and unplanned interruptions with exceptional events. No trends are visible since exceptional events are included, in addition to planned and unplanned interruptions.

Figure 7 – Electricity: planned and unplanned SAIDI, including exceptional events (minutes per customer) – time series and min-max



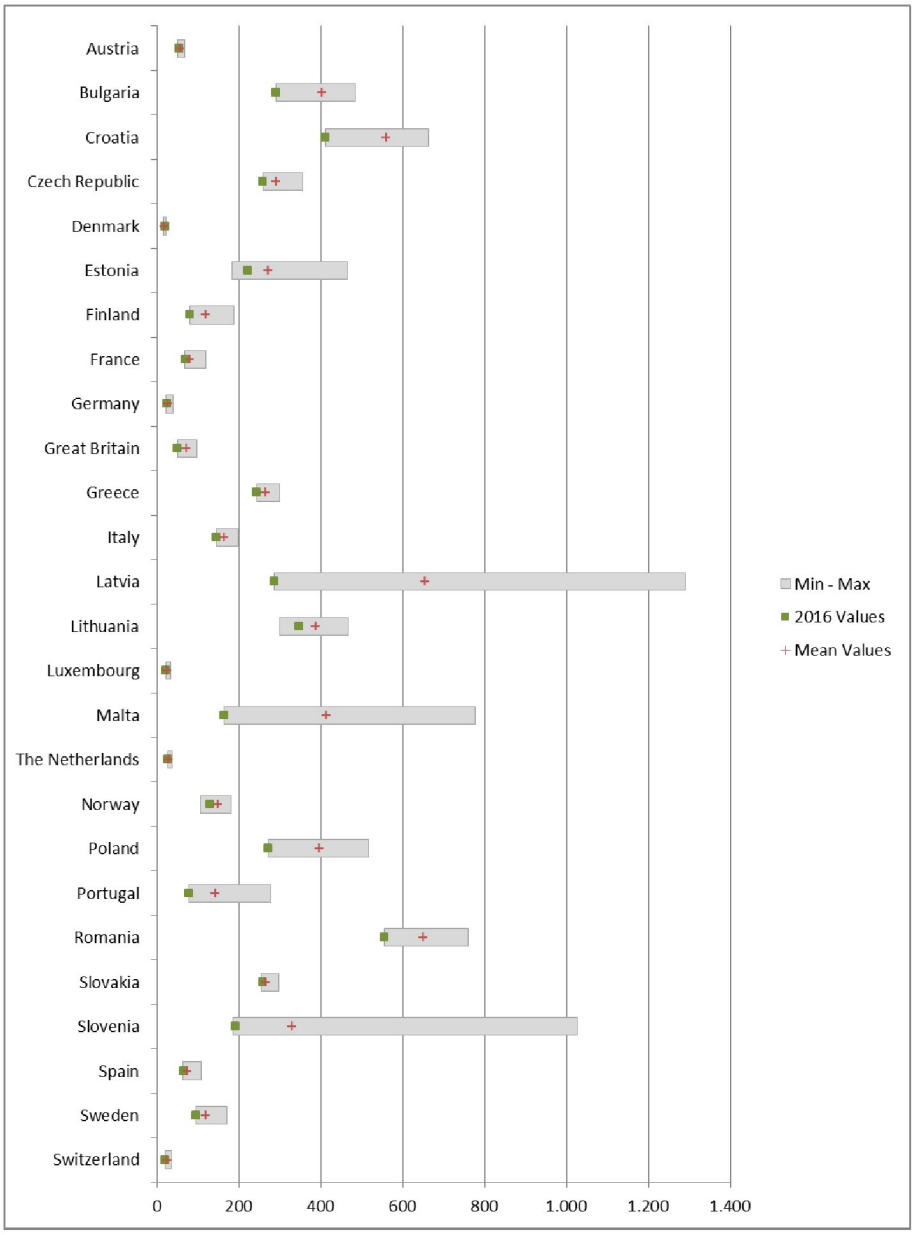
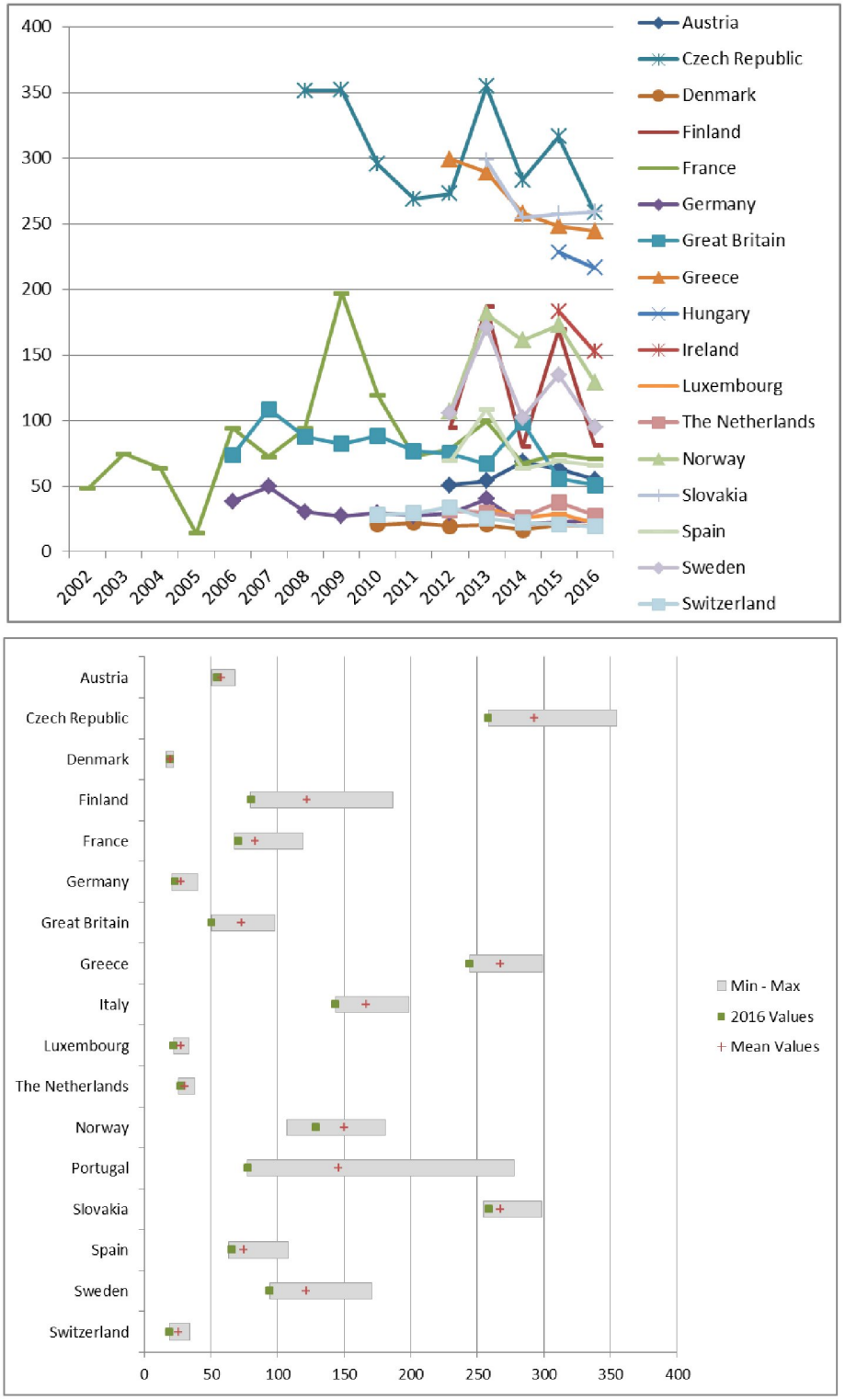

Austria
Bulgaria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
0
200
400
600
800
1.000
1.200
1.400
Min - Max
2016 Values
Mean Values

Figure 8 – Electricity: planned and unplanned SAIDI, including exceptional events, only countries not exceeding 400 minutes (minutes per customer) – time series and min-max

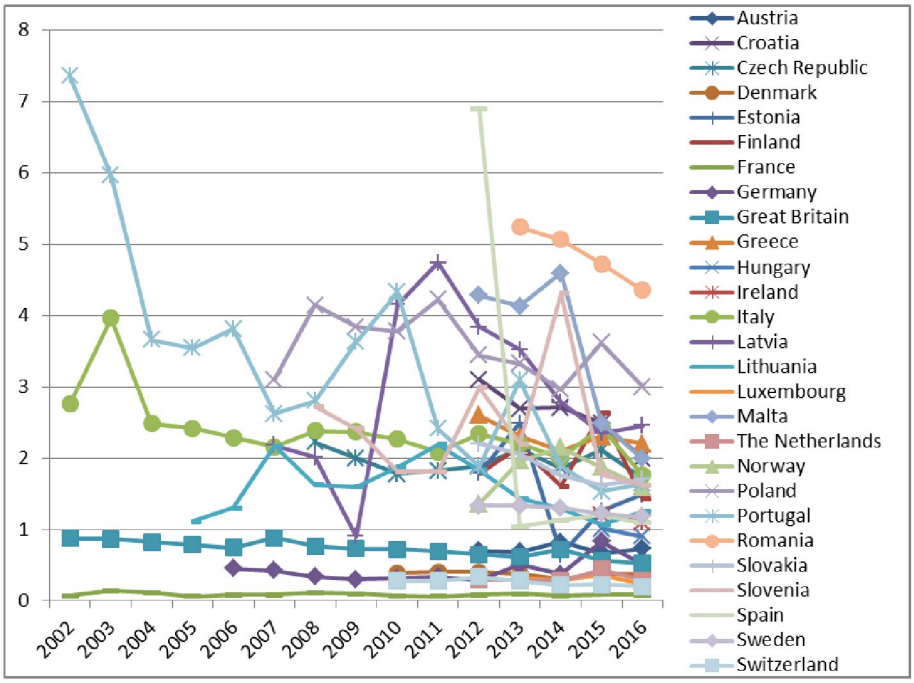


2.2 System Average Interruption Frequency Index – SAIFI

Figure 9 shows SAIFI for all unplanned interruptions (originating from all voltage levels, unless otherwise noted) including exceptional events. For additional information about which countries include which voltage levels in this indicator, please refer to the list of countries at the beginning of Chapter 2.

It should be noted that indicators representing the number of interruptions are not always easily comparable among countries. The reason for this is that the aggregation rules for interruptions differ across Europe. In some countries, all interruptions occurring during a specific defined time period are considered to be a single interruption.

Figure 9 – Electricity: unplanned SAIFI, including exceptional events (interruptions per customer) – time series and min-max



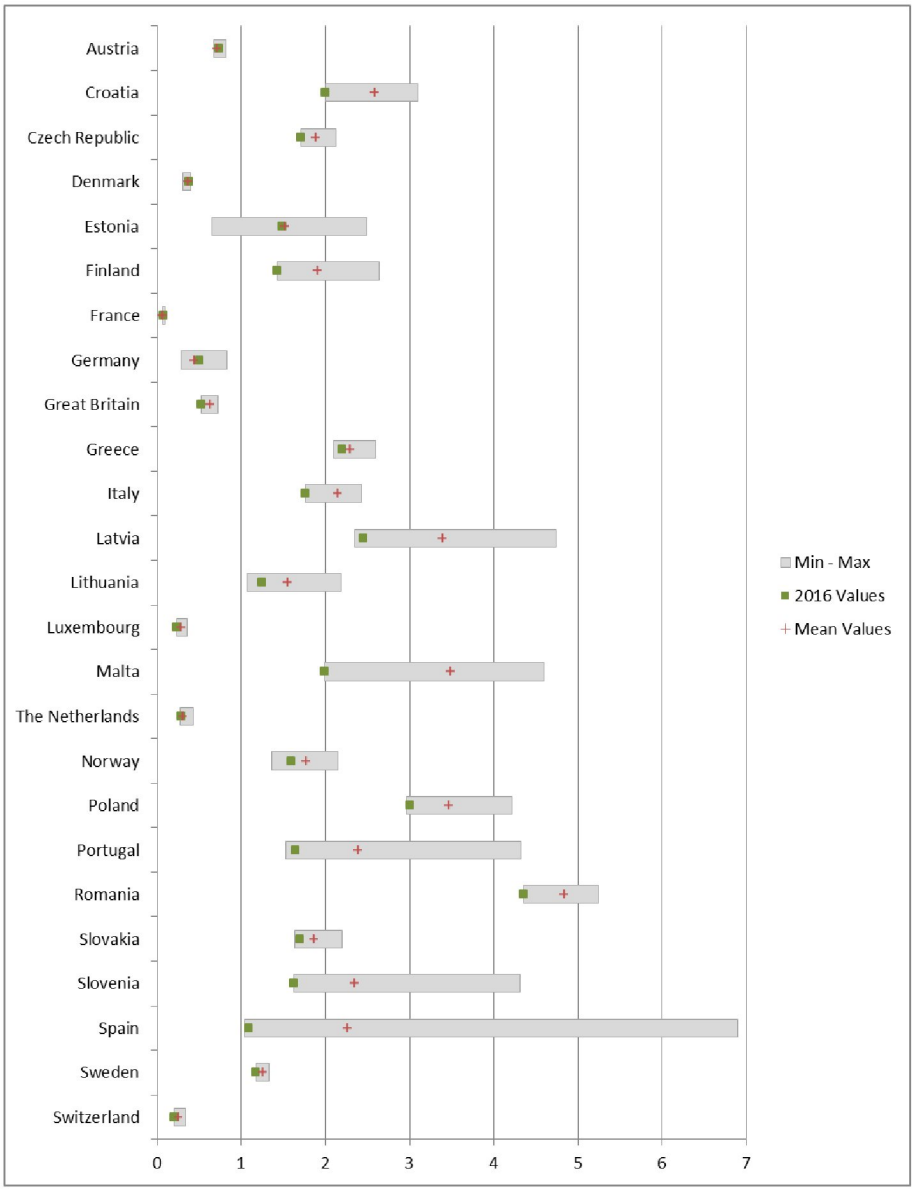
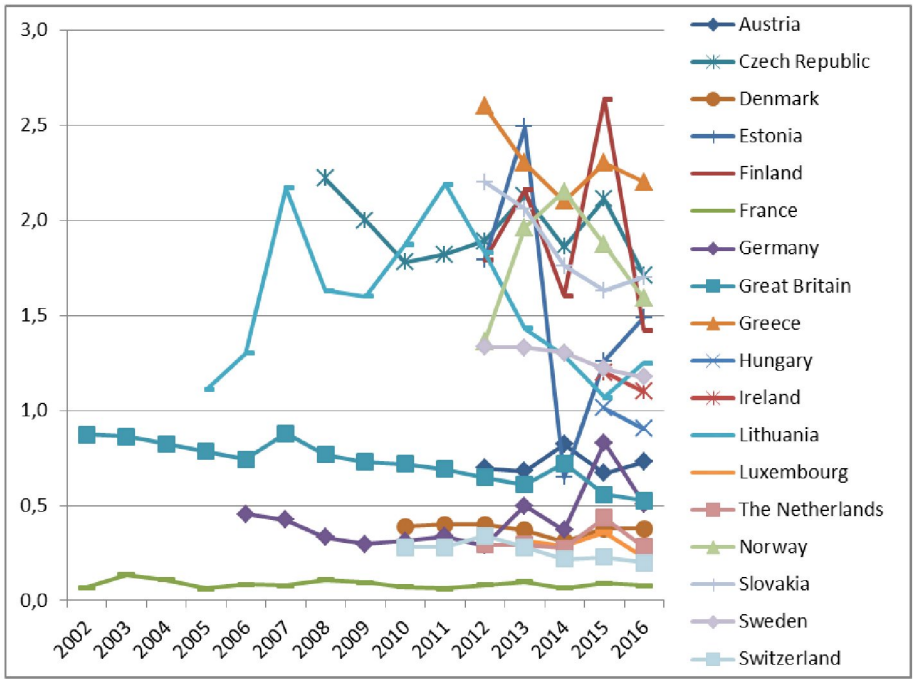

Austria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
0
1
2
3
4
5
6
7
Min - Max
2016 Values
Mean Values

Figure 10 – Electricity: unplanned SAIFI, including exceptional events, only countries not exceeding 3 interruptions(interruptions per customer) – time series and min-max



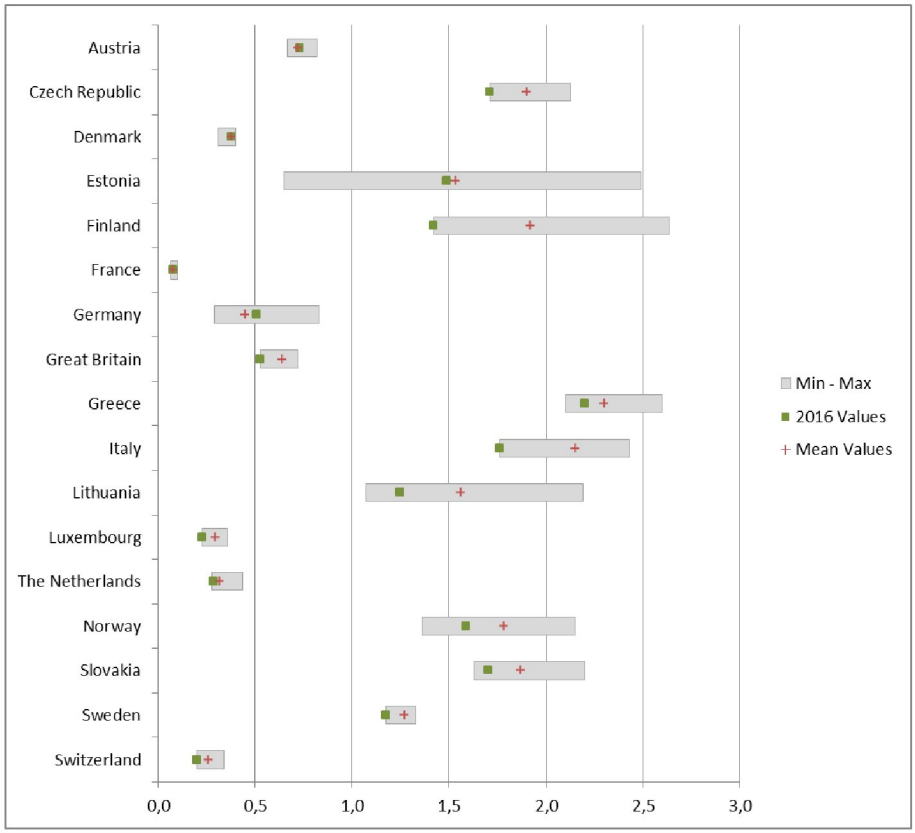
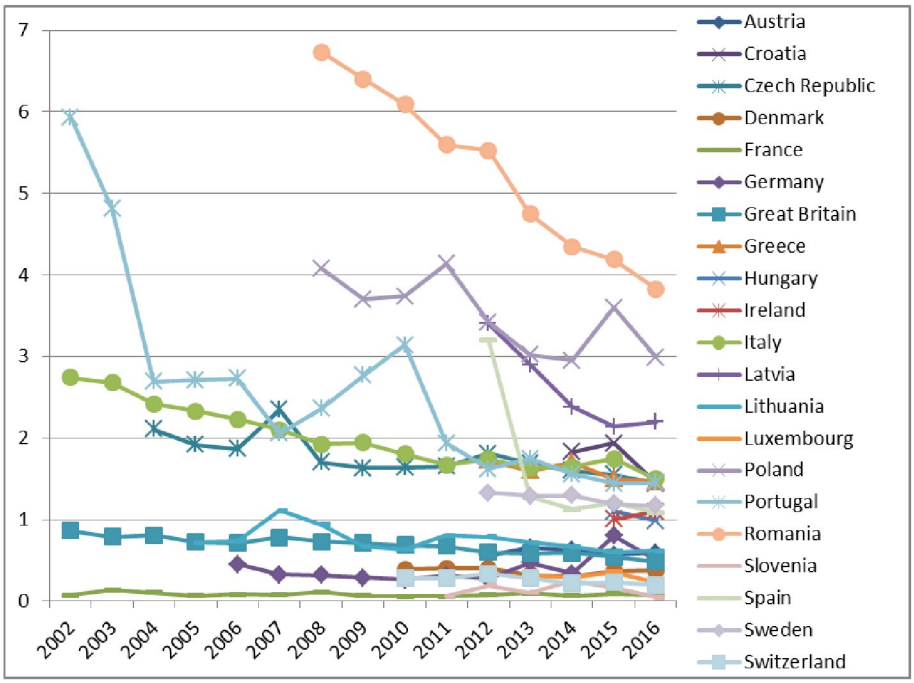
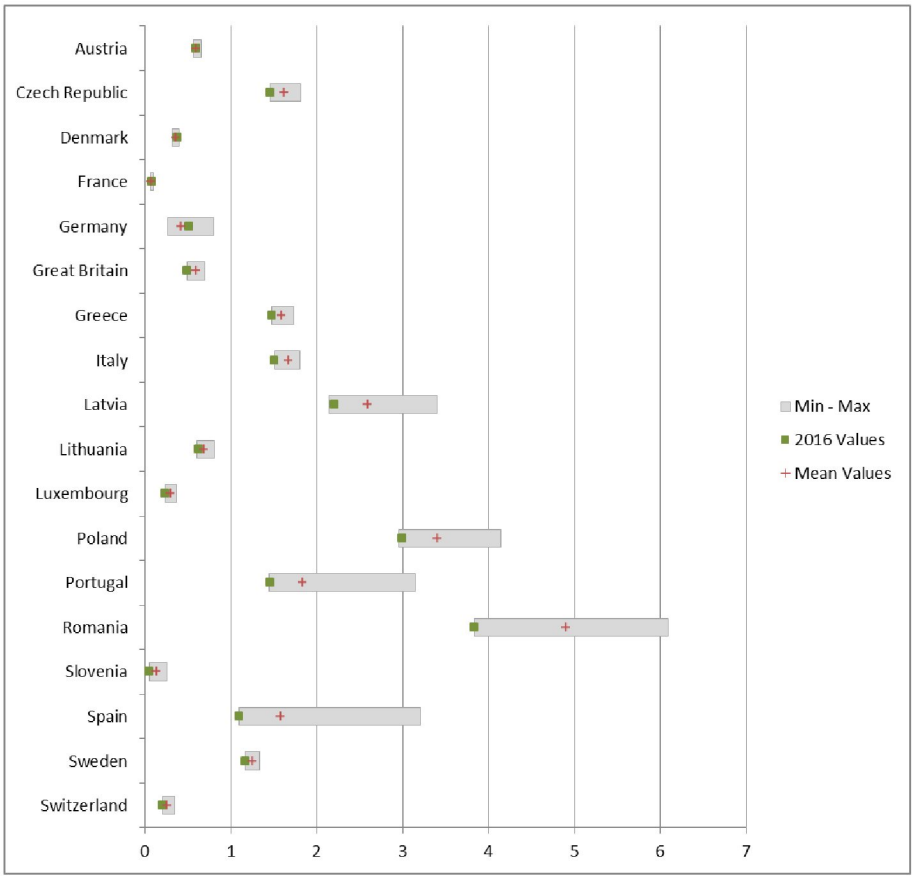


Figure 11 shows SAIFI for unplanned interruptions with the exception of interruptions caused by exceptional events. In 2016, most countries had values that were at the bottom of their seven-year range showing a decrease in SAIFI levels over time.

Again, Slovenia, only includes EHV and HV in their unplanned SAIFI without exceptional events. They have a separate SAIFI value for medium voltage, but these two values cannot simply be added due to different methodologies in calculating them. Corresponding to what was presented in Figure 3, the SAIFI values for Slovenia in Figure 11 only refer to their TSO and exclude interruptions caused by third parties. This makes comparison with the SAIFI values in distribution (Table 20) easier.

Figure 11 – Electricity: unplanned SAIFI, without exceptional events (interruptions per customer) – time series and min-max





A better illustration of countries with lower values can be seen in Figure 12, which includes only countries not exceeding three interruptions per year in the entire observed period. Most countries show stable to decreasing values with Italy experiencing significant improvement since 2002.

Figure 12 – Electricity: unplanned SAIFI, without exceptional events, only countries not exceeding 3 interruptions (interruptions per customer) – time series and min-max

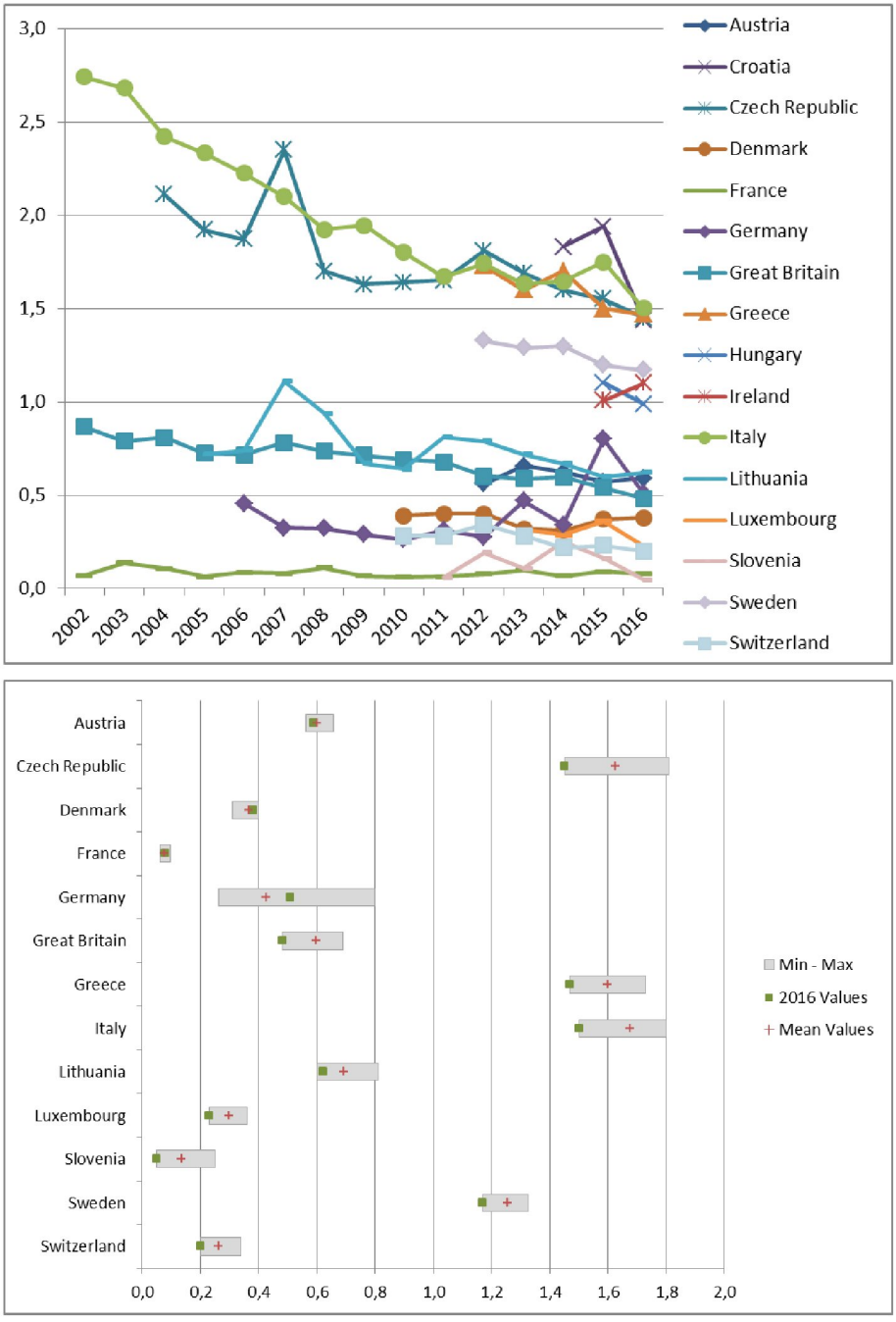
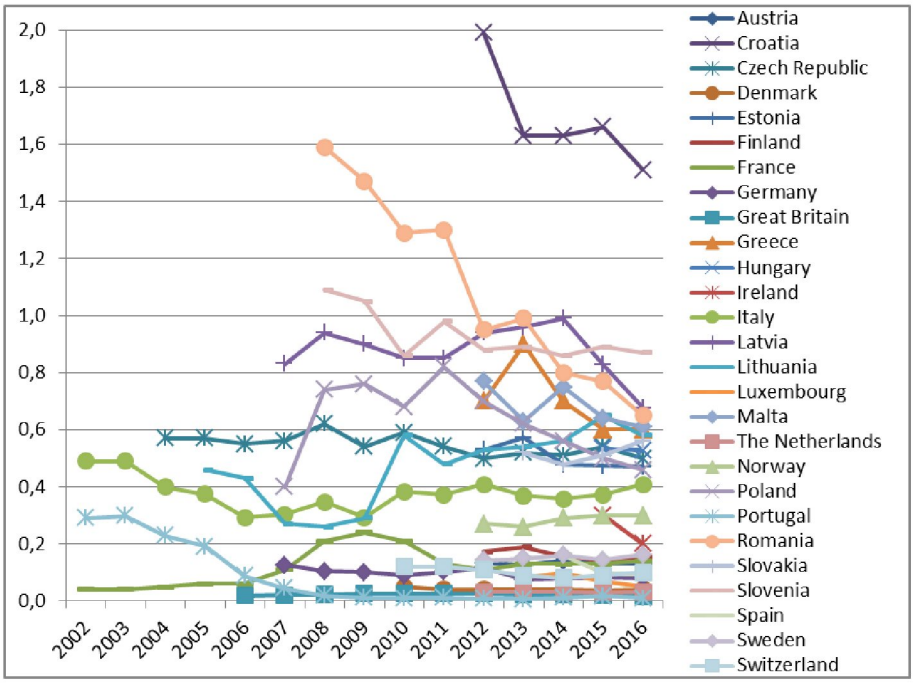


Figure 13 shows SAIFI for planned interruptions (originating from all voltage levels, unless otherwise noted). A temporary high level of planned interruptions could be a sign of high investment in distribution networks with the aim of reducing the number of unplanned interruptions in the future. More frequent planned interruptions can also be due to replacement and repair of components or a widespread replacement of energy meters.

Figure 13 – Electricity: planned SAIFI (interruptions per customer) – time series and min-max



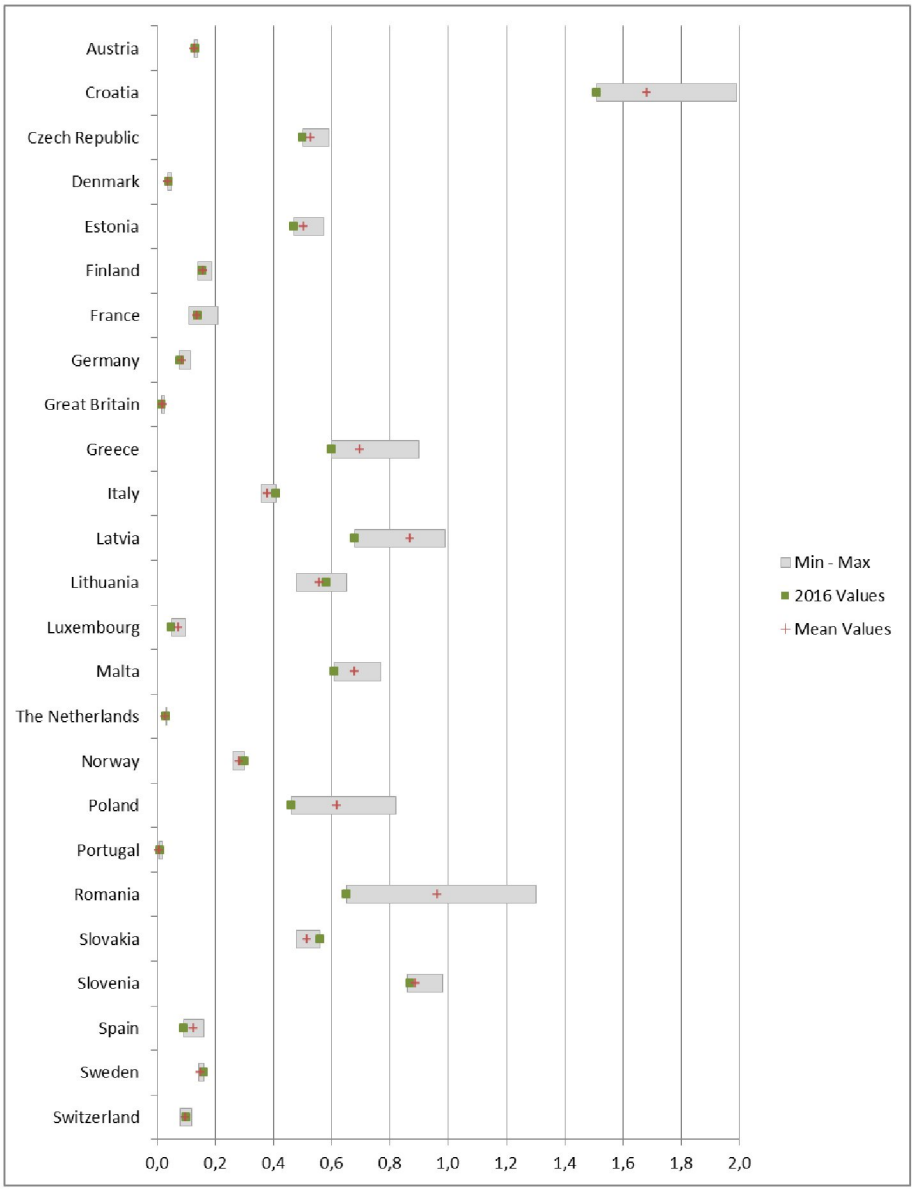
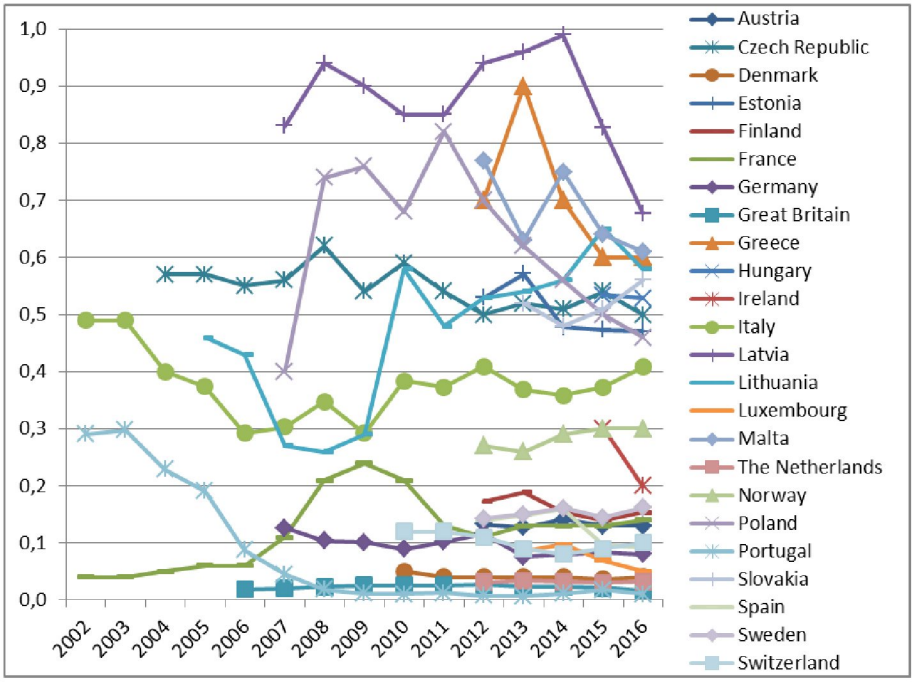

Austria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
0,0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
1,6
1,8
2,0
Min - Max
2016 Values
Mean Values

Figure 14 – Electricity: planned SAIFI, only countries not exceeding 1 interruption (interruptions per customer) – time series and min-max



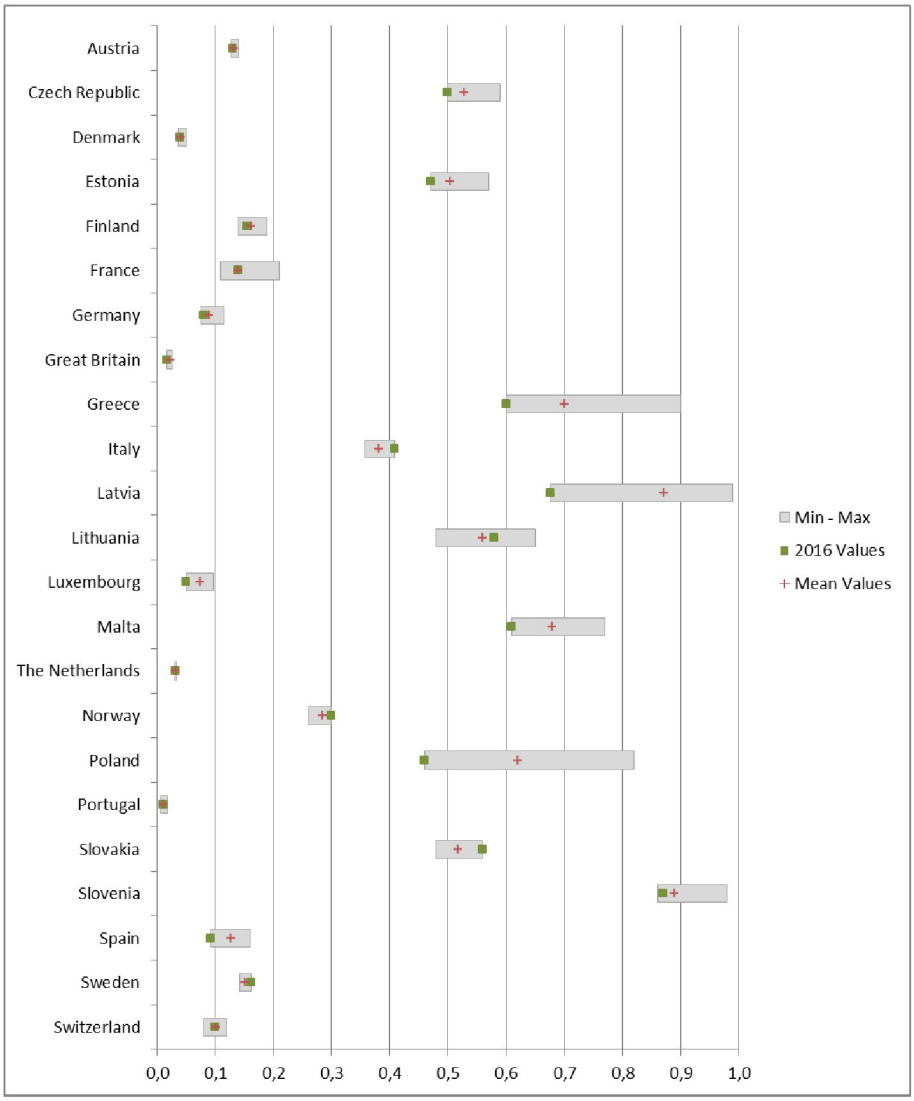
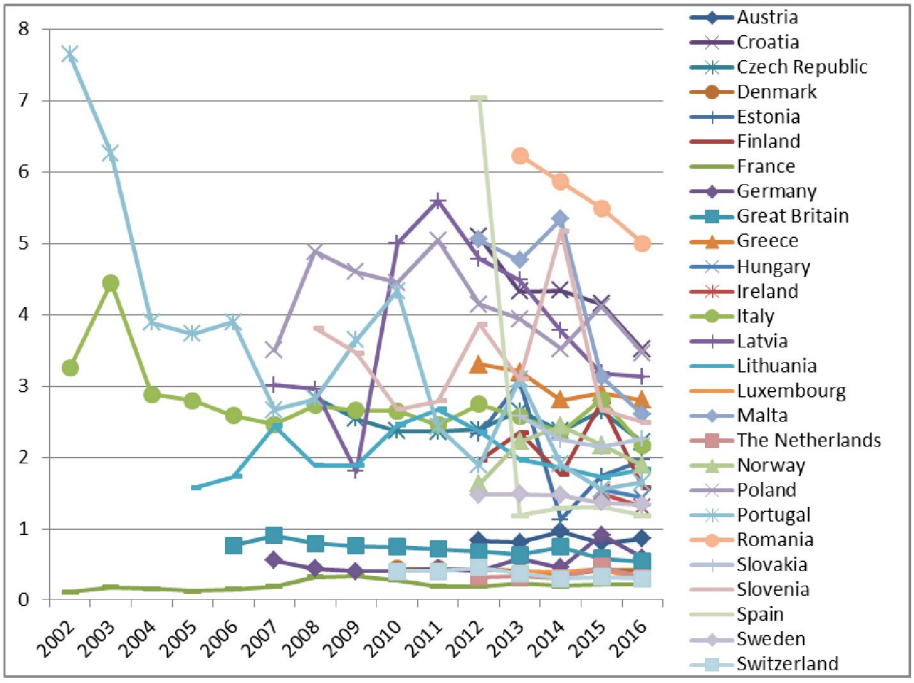

Austria
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Slovakia
Slovenia
Spain
Sweden
Switzerland
0,0
0,1
0,2
0,3
0,4
0,5
0,6
0,7
0,8
0,9
1,0
Min - Max
2016 Values
Mean Values

Figure 15 – Electricity: planned and unplanned SAIFI, including exceptional events (interruptions per customer) – time series and min-max



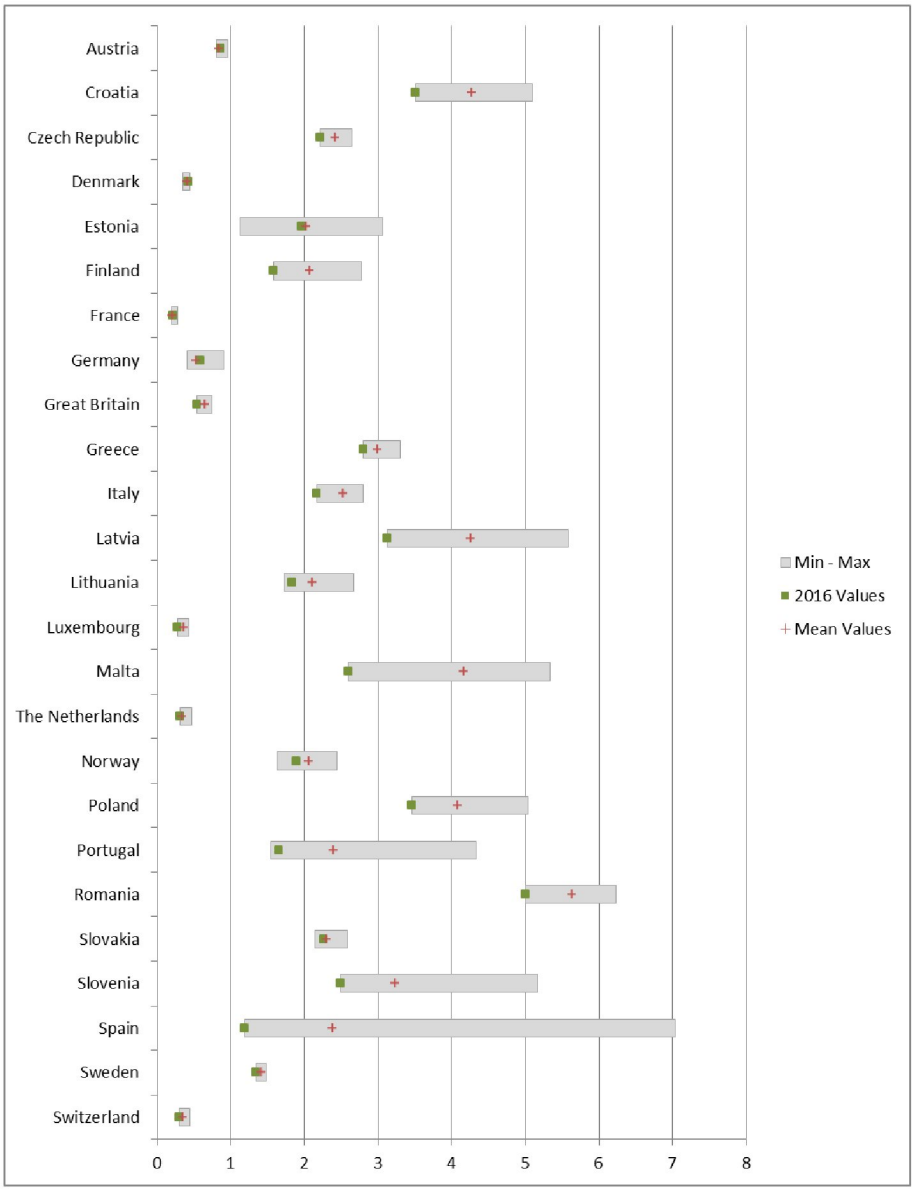
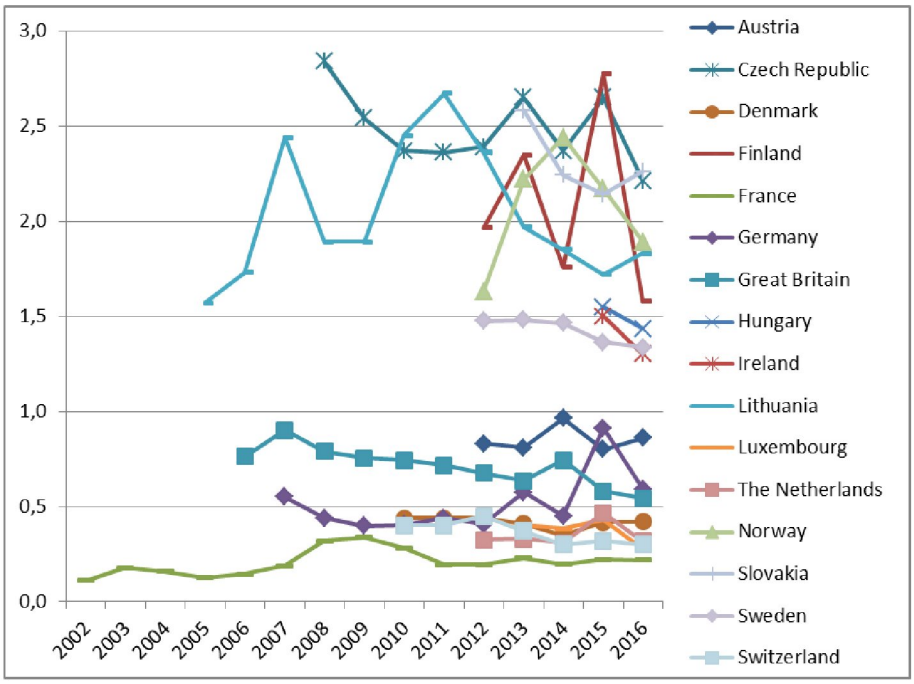
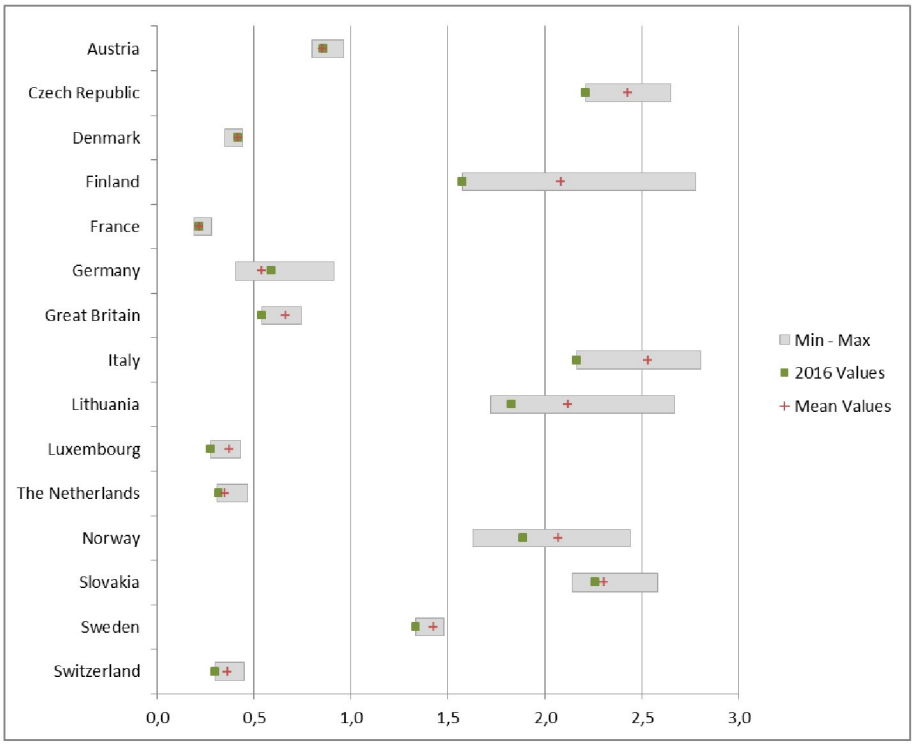

Austria
Croatia
Czech Republic
Denmark
Estonia
Finland
France
Germany
Great Britain
Greece
Italy
Latvia
Lithuania
Luxembourg
Malta
The Netherlands
Norway
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden
Switzerland
0
1
2
3
4
5
6
7
8
Min - Max
2016 Values
Mean Values

Figure 16 – Electricity: planned and unplanned SAIFI, including exceptional events, only countries not exceeding 3 interruptions

(interruptions per customer) – time series and min-max





2.3 Interruptions on the transmission networks

The most common indicators for measuring continuity of supply in transmission networks are ENS (energy not supplied) and AIT (average interruption time). ENS gives the total amount of energy that would have been supplied to interrupted users had there be no interruption. AIT is expressed in minutes per year and calculated as 60 times the ENS (in MWh) divided by the average power supplied by the system (in MW). The data are presented in Table 1 and Table 2, but readers should keep in mind that the definition of transmission networks vary across Europe and these differences can significantly affect comparison of data. For exact definitions of transmission network in each country, please refer to Table 2.3 in the 6th BR.

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Belgium											2,18	1,76	3,45	1,25	1,90
Czech Republic								5,50	5,00	15,40	4,00	18,38	15,83	17,50	16,00
Estonia											1.756,00	2.719,00	410,30	552,00	1.404,66
Finland											0,44	1,24	4,40	1,54	1,22
France	2,38	4,20	3,77	2,44	1,89	2,52	4,35	6,35	2,89	1,73	2,28	3,02	2,77	7,02	2,90
Greece											13,61	23,78	19,65	30,61	20,93
Hungary														0,03	0,03
Italy					5,28	12,80	3,68	3,82	3,41	4,88	6,17	4,65	2,68	5,29	2,69
Lithuania								0,06	0,49	0,35	0,34	0,31	0,25	0,22	0,04
Norway											19,15	4.370,77	102,65	11,00	5,97
Poland						0,00	468,45	0,00	4,57	252,33	161,89	0,00	1.249,78	86,77	84,44
Portugal	1,07	2,02	6,68	0,52	0,78	0,81	1,35	0,44	1,16	0,28	0,00	0,09	0,02	0,00	0,12
Romania							1,80	0,81	3,10	1,06	1,19	0,35	0,82	0,36	2,11
Slovakia											0,26	3,85	1,45	1,02	11,09
Slovenia		0,10	4,03	0,11	6,33	1,35	0,06	0,36	2,95	0,40	0,37	1,08	0,04	2,67	0,27
Spain											0,24	0,24	0,44	0,11	0,14
Sweden											0,03	0,00	0,05	0,04	0,01

Table 1 – Unplanned AIT (transmission), without exceptional events (minutes)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Belgium											293,81	237,48	453,79	161,09	242,33
Czech Republic								41,00	7,00	161,30	4,50	167,50	231,00	64,00	16,00
Estonia											148,21	58,41	27,56	11,93	67,54
Finland											60,00	150,00	490,00	170,00	139,67
France	1.753,00	3.211,00	2.950,00	1.937,00	1.512,00	2.002,00	3.563,00	5.089,00	2.429,00	1.374,00	1.865,00	2.499,00	2.150,00	5.540,00	2.320,00
Greece											1.275,00	2.050,63	1.672,13	2.645,03	1.806,75
Hungary														2,45	2,73
Italy					3.477,00	8.465,00	2.430,00	2.372,00	2.175,00	3.131,00	3.886,00	2.839,00	1.593,00	3.209,00	1.623,00
Lithuania								2,24	11,63	7,53	7,36	6,70	5,36	4,54	1,03
Norway											106,25	8.608,00	188,55	14,49	18,92
Poland						0,00	1.925,14	0,00	18,98	1.134,28	755,13	0,00	5.375,17	388,99	425,10
Portugal	75,90	141,78	496,00	40,20	262,59	75,90	130,16	42,09	116,20	27,00	0,00	8,60	1,80	0,40	11,00
Romania							167,00	69,30	267,90	98,80	107,12	30,89	82,51	38,36	224,69
Slovenia		2,33	94,54	2,54	156,76	34,02	1,34	7,69	67,94	9,71	8,85	26,69	0,82	64,47	6,42
Spain											113,00	1.126,00	204,00	232,00	524,30
Sweden											6,90	0,20	10,60	9,30	1,10

Table 2 – Unplanned ENS (transmission), without exceptional events (MWh)

2.4 Technical characteristics of electricity networks

Figure 17 and Figure 18 show the length of the circuits in the low-voltage and medium-voltage networks across Europe in 2016. In addition to the total length of circuits, the respective lengths of underground cables and overhead lines are also distinguished. Readers should keep in mind that voltage levels have different definitions in different countries and should consult Table 2.3 in the 6th BR for exact definitions (with the exception of updated definitions of voltage levels in Malta which are listed in Section 2.5 of this report).

Figure 17 – Length of LV circuits (lines and cables) in 2016 (km)

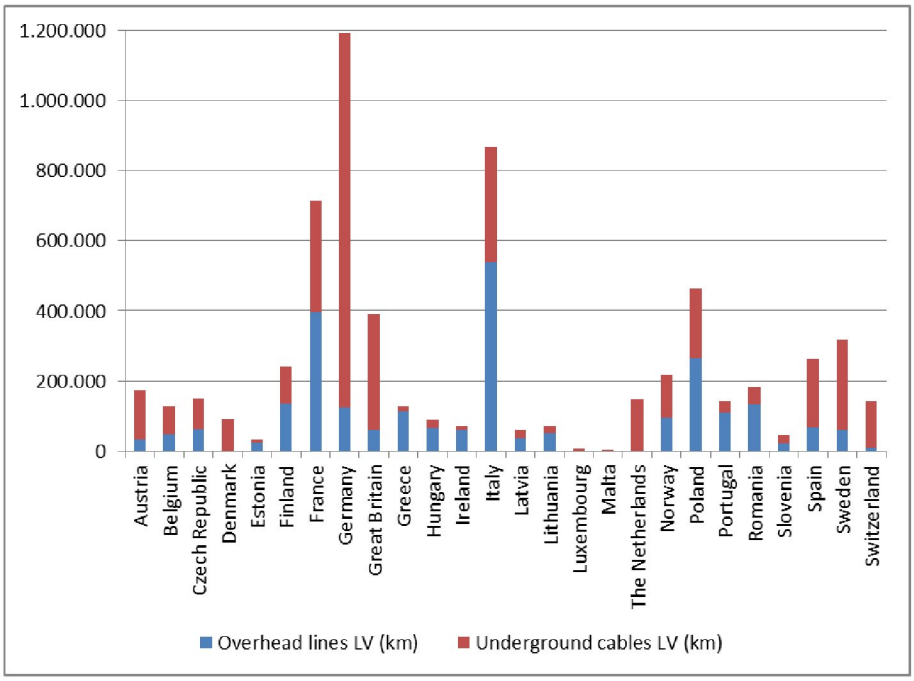
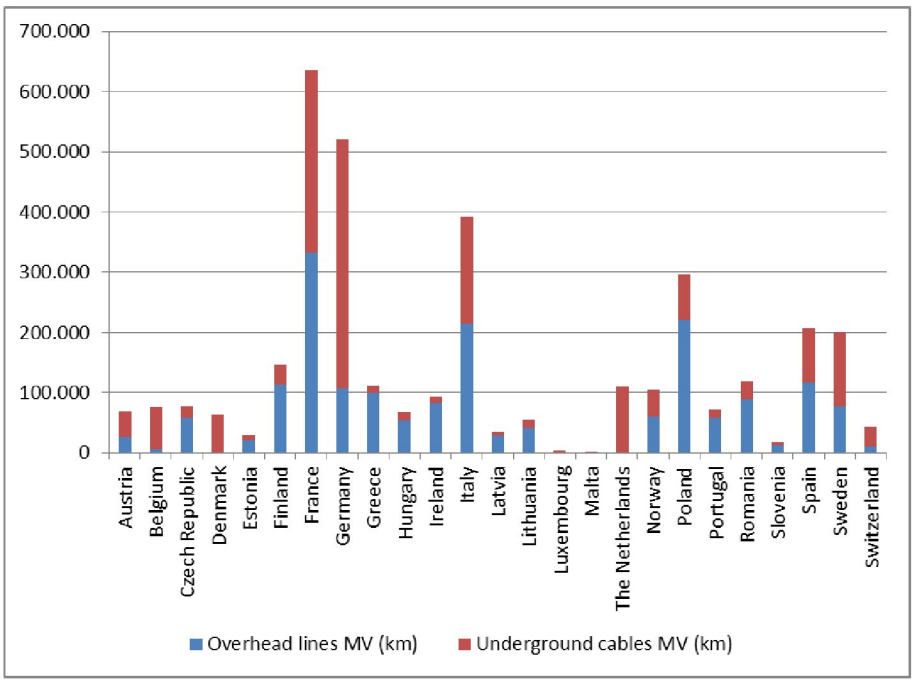


Figure 18 – Length of MV circuits (lines and cables) in 2016 (km)



The values provided for Great Britain refer to distribution only. This includes voltages up to 132 kV in England and Wales but excludes 132 kV from Scotland. In England and Wales, 132 kV is part of distribution, hence, the inclusion of these circuits. In Scotland, 132 kV is part of transmission and has been excluded from the total circuit length.

In Greece, the total length of (underground) cable circuits in low and medium voltage includes submarine cables but excludes overhead cables (insulated conductors). Overhead cables are included in the total circuit length which consists of underground cables, submarine cables, overhead lines (bare conductors) and overhead cables (insulated conductors).

The circuit lengths in Romania are route lengths and do not take into consideration the number of circuits per route.

Circuit lengths on high- and extra-high voltage levels are presented in Figure 19 and Figure 20 below.

Figure 19 – Length of HV circuits in 2016

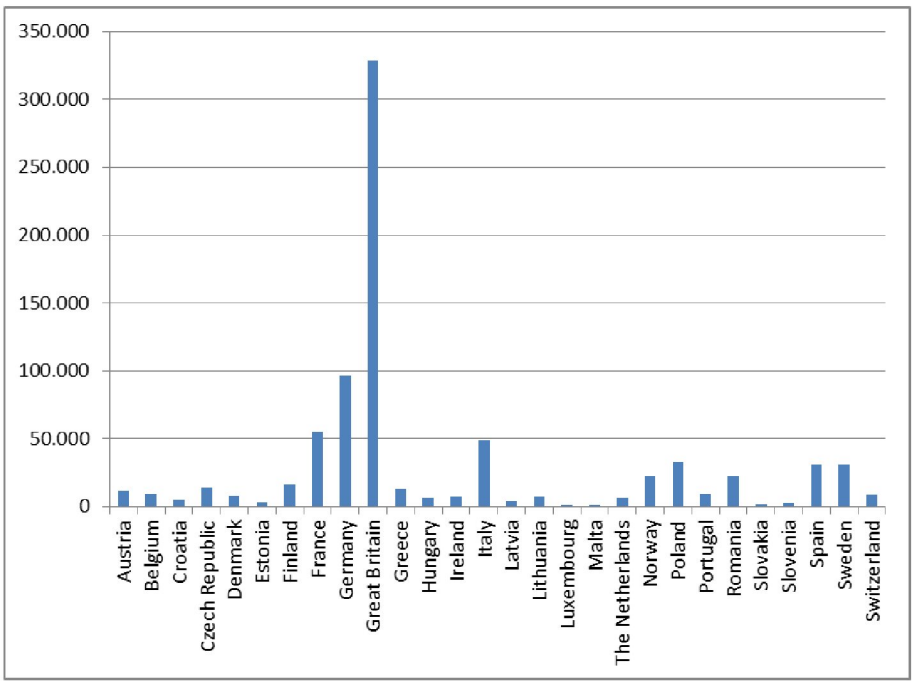


Figure 20 – Length of EHV circuits in 2016 (km)

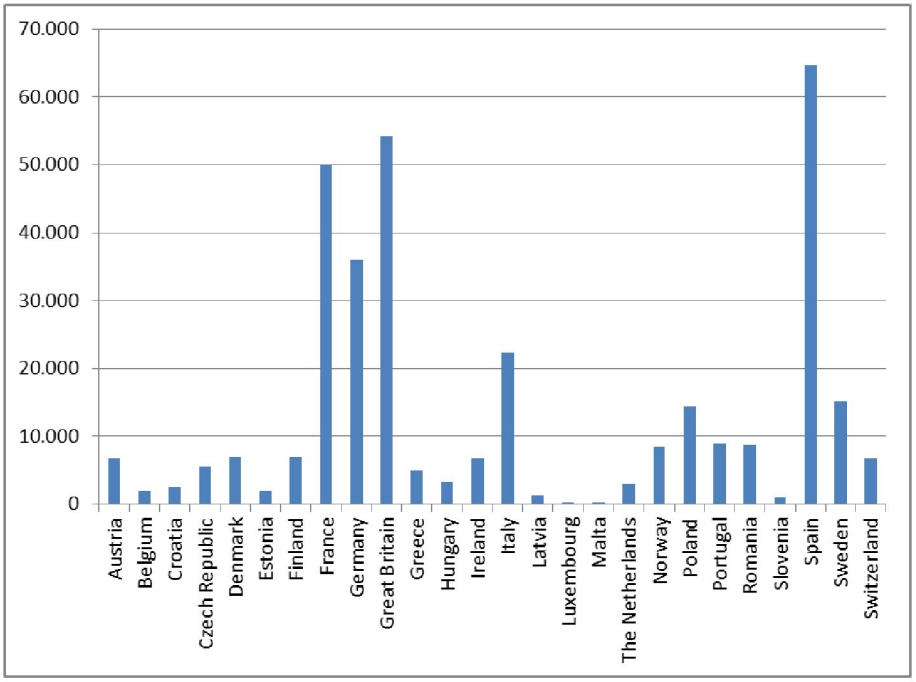
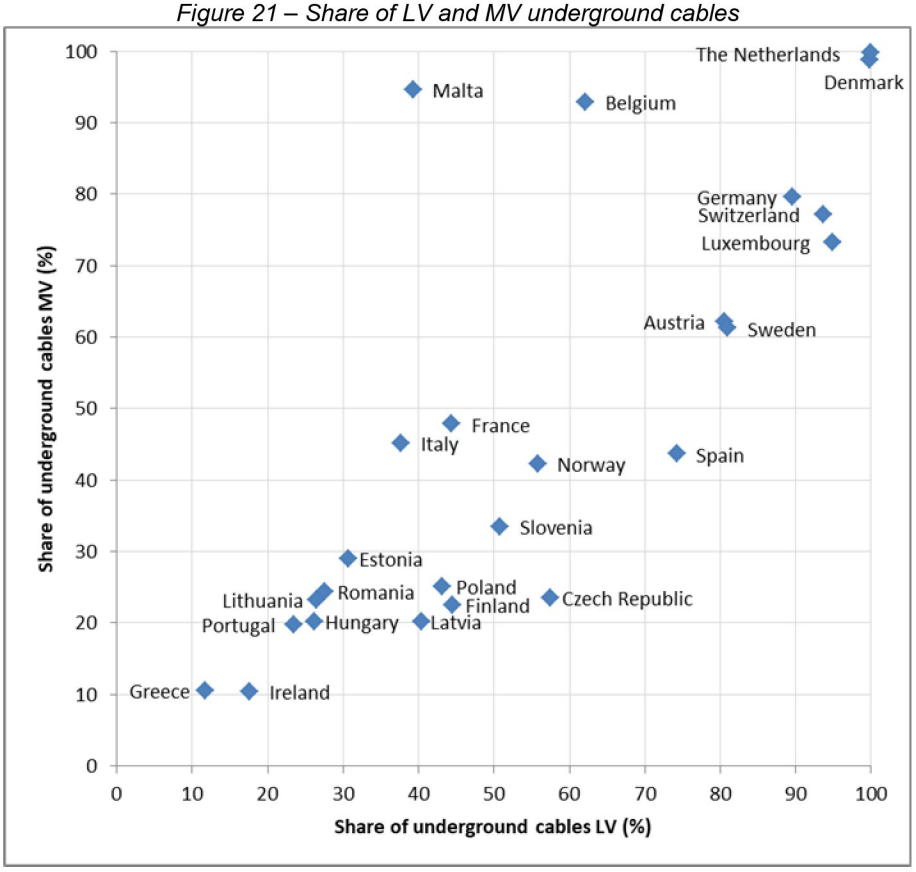


Figure 21 shows a clustering of European countries according to the percentage of underground cables in the medium- and low-voltage networks. Groups of countries that have similar network characteristics may make it easier to compare the values of their indicators. The proportion of cable circuits has direct impact on the continuity of supply indicators. Countries that have a high percentage of underground cables (especially on medium voltage) generally have lower values of the corresponding interruption indicators.

Figure 21 – Share of LV and MV underground cables



2.5 Additional information

The following gives some additional information about indicators used (or monitored) and circuit length in the responding countries:

- **Austria**: ASIDI, ASIFI (average interruption time weighted by the rated power), CAIDI and ENS are used as additional indicators for continuity of supply.
- **Czech Republic**: The values submitted regarding unplanned AIT (without exceptional events) are not exactly AIT as defined in 4th BR. The calculation is done as an arithmetic mean.
- **Finland**: SAIDI and SAIFI without exceptional events are not available
- **Great Britain**: The values noted do not include 132 kV.
- **Greece**: The distribution network (including the non-interconnected islands) consists of HV network. In recent years the DSO HV network length is: 950 km in 2016, 945 km in 2015, 944 km in 2014, 967 km in 2013.

- **Ireland**: Instead of AIT and ENS, System Minutes Lost is used to measure interruptions on the Irish Transmission System.
- **Luxembourg**: Past SAIDI and SAIFI values have been adapted based on corrected numbers of connection points. Corrected numbers are only available as of 2013.
- **Malta**: The voltage levels are as follows: low voltage: 400 V; medium voltage 11 kV & 33 kV; high voltage: 132 kV; extra-high voltage: 220 kV.
- **The Netherlands**: The definition of interruption in the Netherlands differs. It is called an interruption when the electricity supply is interrupted for at least five seconds. Exceptional events did not occur in 2012-2016 and were not separately reported by network operators.
- **Norway**: Low-voltage interruptions have only been registered since 2014. There is no definition of exceptional events in Norway.
- **Poland:** Indicators are not available for individual voltage levels.
- **Romania**: "Without exceptional events" means all events for which the operator is responsible, not including exceptional weather events or events caused by others.
- **Slovak Republic**: SAIDI and SAIFI are not monitored per voltage level.
- **Slovenia:** Continuity of supply monitoring on LV level is not yet implemented
- **Spain:** SAIDI and SAIFI do not exist in Spain as continuity index numbers. Instead, only TIEPI and NIEPI are used, which are equivalent to ASIDI and ASIFI.

3 Main results – gas

CEER's 6th Benchmarking Report, published in 2016, covered gas for the first time. For this Benchmarking Report 6.1, Member States were asked to submit data for the same indicators as in the last edition of the report, but this time for a longer time period.

The following sections give an overview of continuity of supply indicators between 2010 and 2016. The monitored indicators are

- System Average Interruption Duration Index (SAIDI),
- System Average Interruption Frequency Index (SAIFI) and
- Customer Average Interruption Duration Index (CAIDI).

3.1 System Average Interruption Duration Index – SAIDI

The following table shows what type of SAIDI indicators are monitored in each country as well as how the indicator is defined in the respective country.[2] "Planned SAIDI" means that SAIDI is calculated for planned interruptions with various definitions of how much in advance a customer should be informed. For example, the Netherlands has stated that a planned interruption has to be announced at least three working days in advance. "Unplanned SAIDI" is calculated for unplanned interruptions of supply, whereas "SAIDI total" stands for planned and unplanned together.

Country	Planned SAIDI monitored	Unplanned SAIDI monitored	Total SAIDI monitored	Definition
Austria	No	Yes	No	SAIDI = (sum of all unplanned customer interruption durations) / (total number of customers served); Not adjusted for cases of *force majeure*;
Bulgaria	Yes	Yes	Yes	SAIDI =Total breaks duration / Total number of connected user
Croatia	No	No	No	
Czech Republic	No	No	No	
Denmark	No	No	No	
Estonia	No	No	No	
Finland	Yes	Yes	Yes	SAIDI = ∑(Ni * ri) / Nt Ni - number of customers interrupted by each incident, Nt - total Number of customers in the system for which the index is calculated,

[2] The gas SAIDI values for Belgium, although monitored, could not be included in figures and tables since a single value for the entire country has not been provided to the EQS Work Stream.

				ri - restoration time for each incident
France	No	No	No	
Germany	Yes	Yes	Yes	SAIDI (System Average Interruption Duration Index); without exceptional events and planned events.
Great Britain	Yes	Yes	Yes	The indicator derived using formula: sum of all customer interruption durations/total number of customers on the network
Greece	No	No	No	
Hungary	No	No	No	
Ireland	No	No	No	
Italy	Yes	Yes	Yes	The overall duration of interruption for the end customer is defined by means of the following formula: Total duration of interruption for customer = ΣCi x ti / Ctot where the sum includes all n outages occurred in the calendar year, and where: • Ci is the number of end users involved in the i-th interruption without notice considered; • ti it is the corresponding duration of the interruption without notice for customers Ci; • Ctot is the total number of end customers served by the distribution company at the end of the calendar year.
Latvia	No	No	Yes	Planned + Unplanned, hours
Lithuania	Yes	Yes	Yes	It is average disruption duration for one customer, calculated as: Sum of all customers who encountered not planned disruption times the length of duration (minutes) in the numerator and total number of customers in the denominator.
Luxembourg	No	No	No	
Malta	No	No	No	
The Netherlands	Yes	Yes	Yes	A planned interruption should be announced at least three working days in advance. The legal definition: SAIFI = Σ (GA × T) / TA In this formula Σ(GA × T) is the sum (over all interruptions) of the amount of the customers affected by the interruption multiplied by the duration of

				the interruption. TA is the total amount of customers.
Norway	No	No	No	
Poland	No	No	No	
Portugal	Yes	Yes	Yes	Average duration of interruptions per exit point (min/exit point): the quotient of the overall duration of interruptions of the exit points over a specific period and the total number of exit points at the end of the period considered.
Romania	No	No	No	
Slovakia	No	Yes	No	SAIDI – unplanned – average duration of interruptions in the distribution system, calculated by the formula $\text{SAIDI} = \frac{\sum_{i=1}^{n} Z_i * t_i}{N}$ Zi - the number of the affected supply points in the interruption of gas distribution, N – the total number of supply points of the distribution system operator, ti – the duration of the i-th interruption of gas distribution in hours
Slovenia	No	No	No	
Spain	No	No	No	
Sweden	No	No	No	
Switzerland	No	No	No	

Table 3 – Gas: monitoring and definition of SAIDI across countries

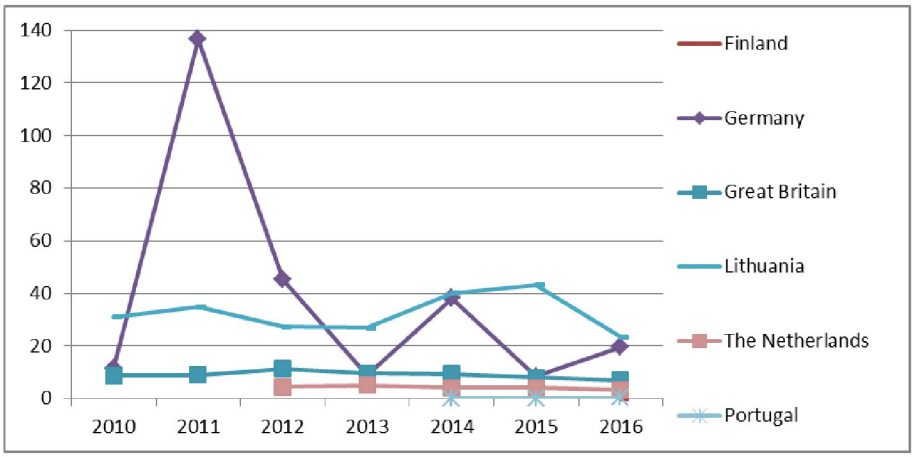
The table above shows that planned SAIDI is monitored in eight countries, unplanned SAIDI in ten and SAIDI total in nine countries. These numbers are higher than the numbers of countries included in corresponding figures because there are countries that monitor SAIDI in gas but did not provide the values of the indicators. The unit for SAIDI is usually minutes, but sometimes values have been given in hours (e.g. Latvia) and had to be converted to minutes for the following graphs.

Despite the definition of SAIDI being quite similar in each country, there are still some minor differences. For example, Austria includes potential cases of *force majeure* in the given values, whereas Germany calculates SAIDI values without exceptional events.

Although Italy and Bulgaria stated that they monitor such supply indicators, they have not provided any values for the requested years. For Italy, this is due to the fact that they have only recently decided to set up the monitoring of unplanned and planned SAIDI and SAIFI. At the time of writing of this report, Italy's NRA (ARERA) was calibrating the data collection and does not yet have reliable data at their disposal. The Norwegian NRA (NVE) has explained that there are only two gas DSOs and only a few customers in their country. Therefore, there is currently no registration of system data or continuity of supply for gas in Norway.

SAIDI values are usually much lower for gas than for electricity. This is due to several reasons, one of which is that underground gas pipelines are not exposed to forces of nature in the same way as overhead power cables. Additionally, there are obligatory technical rules and guidelines which are very strict and which affect the structure and the operation of gas networks much more than electricity networks, simply to avoid life-endangering (in the worst case) incidents.

Figure 22 – Gas: planned SAIDI
(minutes per customer)



For Finland, the values of planned and unplanned SAIDI are only available for 2016. They stated that such data was collected for the first time in 2016. Earlier data did not distinguish between planned and unplanned disturbances.

Figure 23 – Gas: unplanned SAIDI
(minutes per customer)

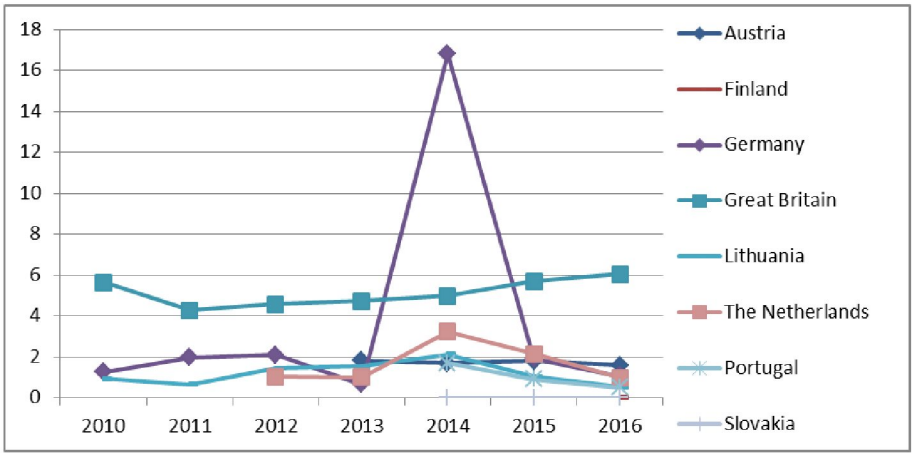
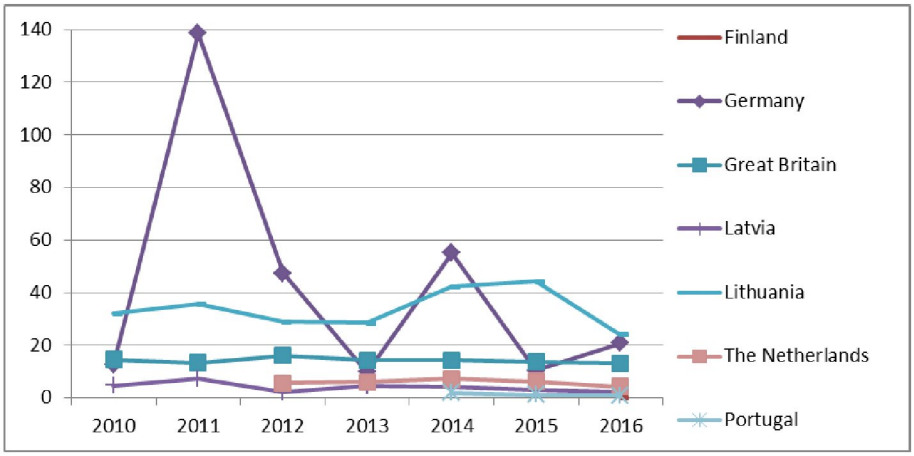


Figure 23 shows that unplanned SAIDI in most countries is below two minutes. In comparison with other countries, the unplanned SAIDI in Great Britain is about two to seven times higher than in other countries. Great Britain has derived both SAIDI and SAIFI measures specifically for the CEER questionnaire. Under usual circumstances, they use unweighted figures. This is also true for Luxembourg. Targets related to SAIDI and SAIFI are subject to change in the near future in Great Britain. Furthermore, their unplanned SAIDI figures do include major incidents. Excluding them would make their values significantly lower.

Regarding Germany, the obviously high peak in 2014 is due to an accident which, by definition, is not treated as *force majeure* or as an exceptional event. It is worth noting that the 2014 SAIDI value without this single interruption would have been 1,249 minutes per customer per year.

Figure 24 – Gas: planned and unplanned SAIDI (minutes per customer)



In the case of Latvia, its NRA (PUC) stated that data is collected for planned and unplanned SAIDI combined and is not available separately. This is the reason why Latvia is only included in Figure 24 and not in the two figures that precede it.

3.2 System Average Interruption Frequency Index – SAIFI

The following table illustrates what type of SAIFI indicators (planned, unplanned, total) are monitored in each country. Additionally, the table also shows how the indicator is defined in the respective country.

Country	Planned SAIFI monitored	Unplanned SAIFI monitored	Total SAIFI monitored	Definition
Austria	No	Yes	No	SAIFI = (total number of unplanned customer interruptions) / (total number of customers served); Not adjusted for cases of force majeure;
Bulgaria	Yes	Yes	Yes	SAIFI = Total number of interruptions / Total number of connected users
Croatia	No	No	No	
Czech Republic	No	No	No	
Denmark	No	No	No	
Estonia	No	No	No	
Finland	Yes	Yes	Yes	SAIFI = ∑(Ni) / Nt

France	No	No	No	
Germany	Yes	Yes	Yes	
Great Britain	Yes	Yes	Yes	Derived using the formula: total number of customer interruptions/total number of customers on the network
Greece	No	No	No	
Hungary	No	No	No	
Ireland	No	No	No	
Italy	Yes	Yes	Yes	The number of interruptions for the end customer (SAIFI) is defined by means of the following formula: Number of interruptions for customer = ΣCi / Ctot where the sum is extended to all n interruptions without notice occurred in the calendar year, and where: • Ci is the number of end users involved in the i-th interruption without notice considered; • Ctot is the total number of end customers served by the distribution company at the end of the calendar year.
Latvia	No	No	Yes	Planned + Unplanned, hours
Lithuania	Yes	Yes	Yes	It is average number of disruption for one customer, calculated as: sum of all customers for who encountered unplanned gas distribution disruption in the numerator and total number of customers in the denominator.
Luxembourg	No	No	No	
Malta	No	No	No	
The Netherlands	Yes	Yes	Yes	A planned interruption should be announced at least three working days in advance. The legal definition: SAIFI = ΣGA/TA In this formula ΣGA is the sum (over all interruptions) of the amount of the customers affected by the interruption. TA is the total amount of customers.
Norway	No	No	No	
Poland	No	No	No	
Portugal	Yes	Yes	Yes	Average number of interruptions per exit point: quotient of the total number of interruptions at the exit points over a specific period and the total number of exit points at the end of the period

				considered.
Romania	No	No	No	
Slovakia	No	Yes	No	SAIFI – unplanned -average number of interruptions in the distribution system calculated by the formula $\mathrm{SAIFI} = \frac{\sum_{i=1}^{n} N_i}{N}$ Ni – the number of the affected supply points in the interruption of gas distribution, N – the total number of supply points of the distribution system operator
Slovenia	No	No	No	
Spain	No	No	No	
Sweden	No	No	No	
Switzerland	No	No	No	

Table 4 – Gas: monitoring and definition of SAIFI across countries

As shown in Table 4, planned SAIFI is monitored in eight countries, unplanned SAIFI in ten and SAIFI total in nine countries. As is the case with SAIDI, these numbers are higher than the numbers of countries included in corresponding figures because there are countries that monitor SAIFI in gas but did not provide the values of the indicators. The method for calculating SAIFI indicators is quite similar in each country. Therefore, it is possible to compare and benchmark the given values as it is done in the following figures.

Figure 25 – Gas: planned SAIFI (interruptions per customer)

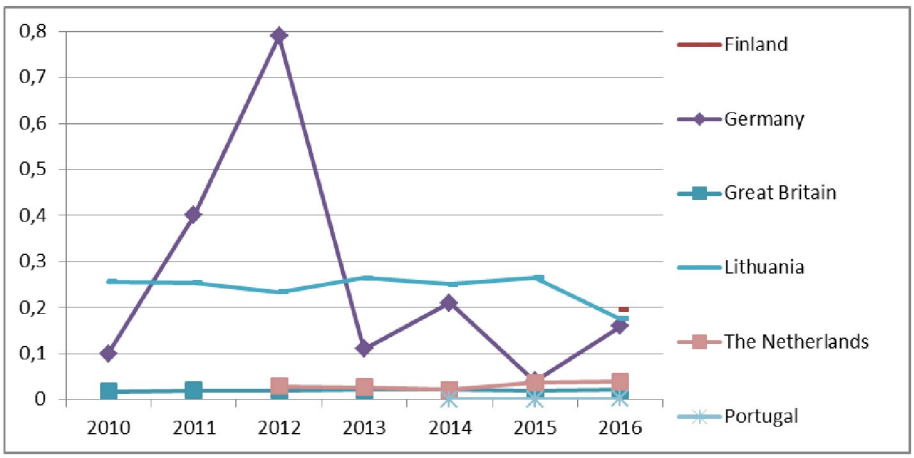


Figure 26 – Gas: unplanned SAIFI
(interruptions per customer)

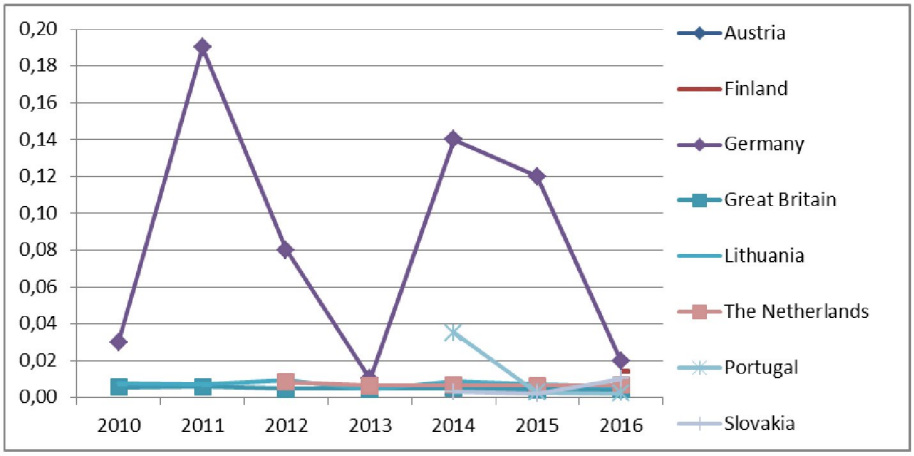
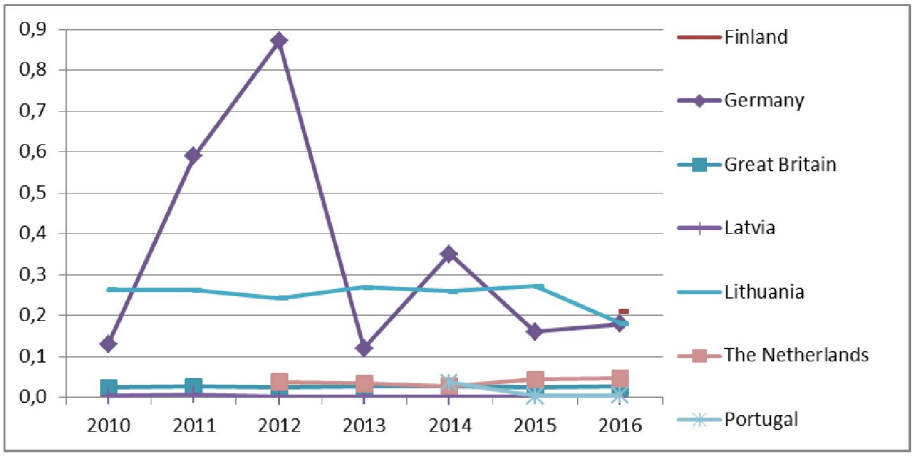


Figure 27 – Gas: planned and unplanned SAIFI
(interruptions per customer)



The figures show that SAIFI in Germany in all graphs is significantly higher than in other countries. At the same time Germany's SAIDI values are quite low. In other words, the average number of interruptions per supplied customer is high in Germany whereas the average duration of all interruptions per supplied customer is low. This could mean that German customers are facing many supply interruptions in a year, but the resumption of supply takes place in a relatively short period of time.

3.3 Customer Average Interruption Duration Index – CAIDI

The following table indicates which countries monitor CAIDI indicators (planned, unplanned, total) as well as how the indicator is defined in the respective country.

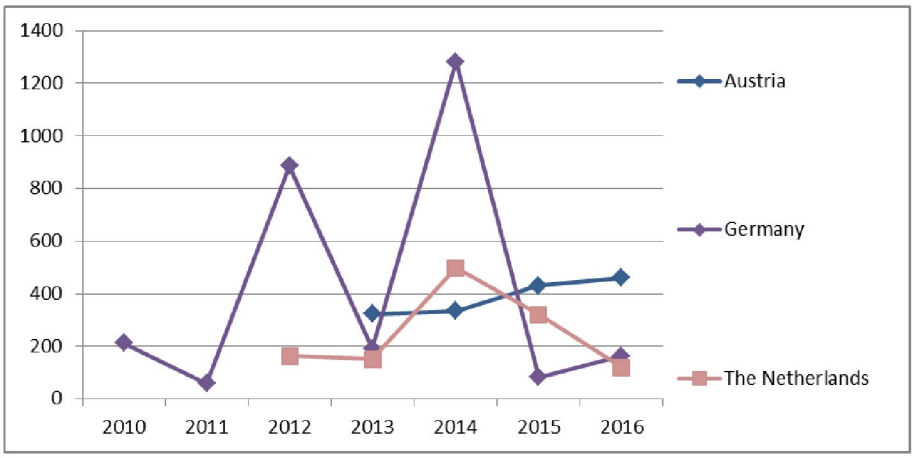
Country	Planned CAIDI monitored	Unplanned CAIDI monitored	Total CAIDI monitored	Definition
Austria	No	Yes	No	CAIDI = (sum of all unplanned customer interruption durations) / (total number of unplanned customer interruptions) = SAIDI / SAIFI; Not adjusted for cases of force majeure;
Bulgaria	Yes	Yes	Yes	CAIDI = Total duration of interruptions / Total interruptions
Croatia	No	No	No	
Czech Republic	No	No	No	
Denmark	No	No	No	
Estonia	No	No	No	
Finland	No	No	No	
France	No	No	No	
Germany	Yes	Yes	Yes	
Great Britain	No	No	No	
Greece	No	No	No	
Hungary	No	No	No	
Ireland	No	No	No	
Italy	No	No	No	
Latvia	No	No	Yes	Planned + Unplanned, hours
Lithuania	No	No	No	
Luxembourg	No	No	No	
Malta	No	No	No	
The Netherlands	Yes	Yes	Yes	A planned interruption should be announced at least three working days in advance. The legal definition: CAIDI = Σ(GA × T) / ΣGA In this formula Σ(GA × T) is the sum (over all interruptions) of the amount of the customers affected by the interruption multiplied by the duration of the interruption. ΣGA is the sum (over all interruptions) of the number of customers affected by

				an interruption.
Norway	No	No	No	
Poland	No	No	No	
Portugal	No	No	No	
Romania	No	No	No	
Slovakia	No	No	No	
Slovenia	No	No	No	
Spain	No	No	No	
Sweden	No	No	No	
Switzerland	No	No	No	

Table 5 – Gas: monitoring and definition of CAIDI across countries

The table shows that CAIDI is monitored only in a very few countries. Therefore, just one figure is given in this section to show the differences in values. The unit for CAIDI used in this figure is minutes.

Figure 28 – Gas: unplanned CAIDI
(minutes per interruption



)

Just as with SAIDI and SAIFI, Bulgaria stated they monitor CAIDI as an indicator. Unfortunately, reliable data was not available prior to publication. This is why Bulgaria is not included in the figure above.

3.4 Network length

Figure 29 – Gas: transmission network length in 2016 (km)

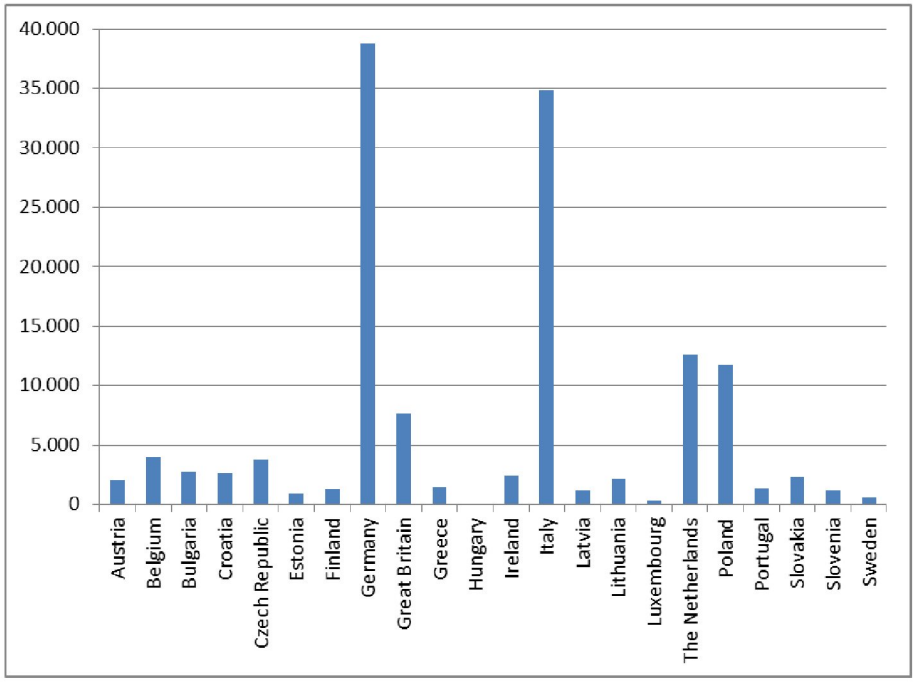
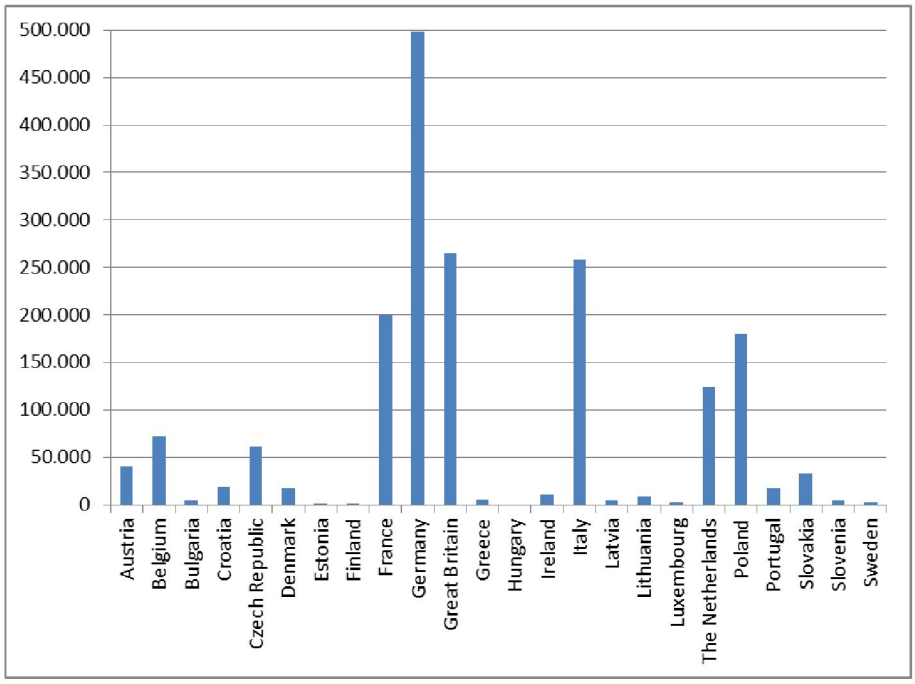


Figure 30 – Gas: distribution network length in 2016 (km)



Overall network length (consisting of transmission and distribution) shows a quite stable picture for almost all reporting countries as illustrated in Figure 31.

Figure 31 – Gas: transmission and distribution network length (km)

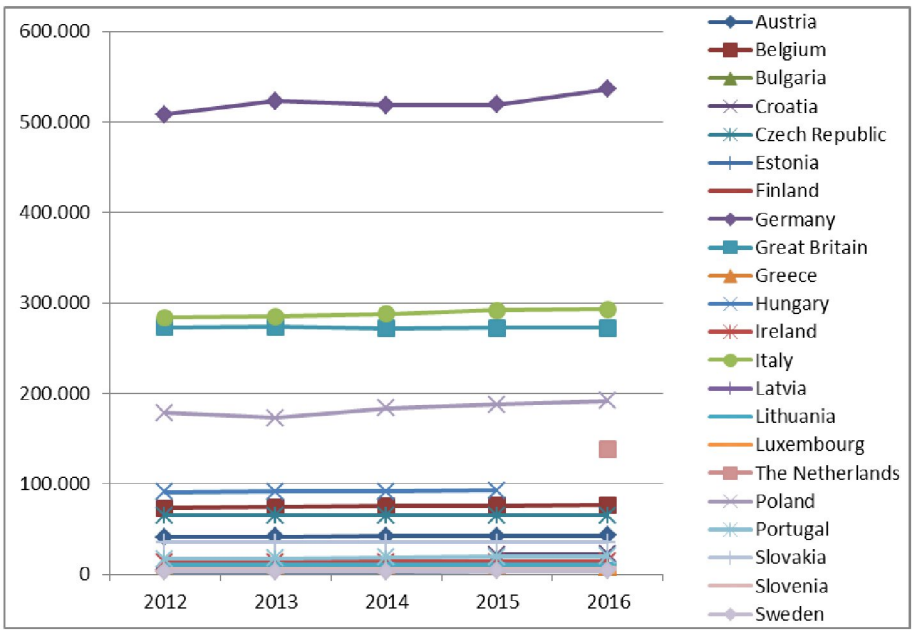
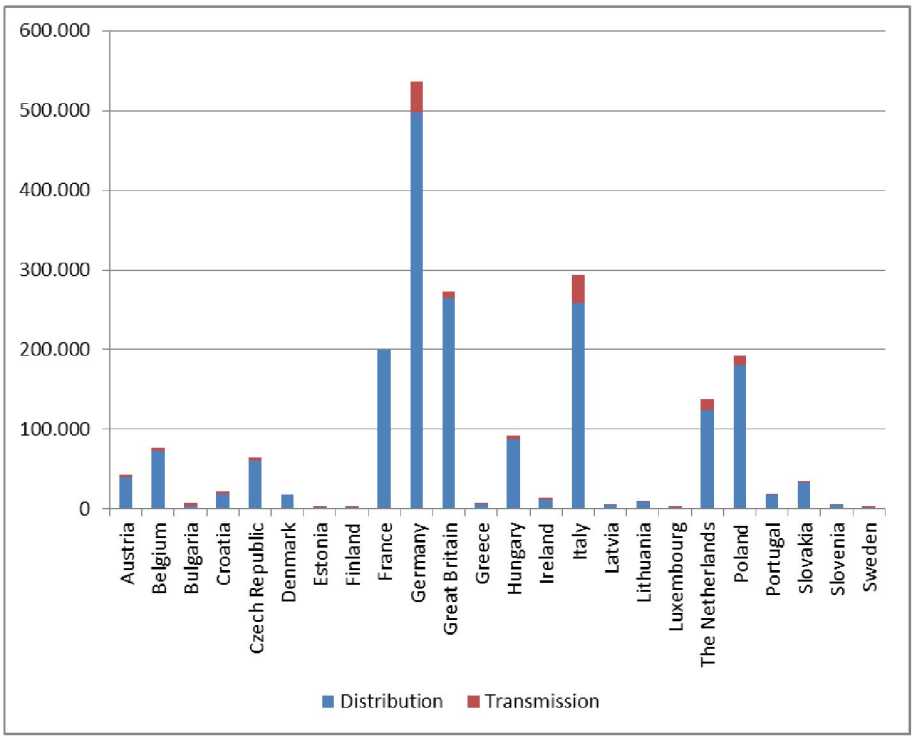


Figure 32 – Gas: combined transmission and distribution network length in 2016 (km)
** 2015 value for Hungary*



4 Conclusions

In electricity, all responding countries monitor the SAIDI indicator whereas the values of SAIFI were submitted by all but one responding country. However, some indicators are not always calculated the same way everywhere, potentially resulting in uncertainties in benchmarking.

In 2016, the most recent year included in this report, most countries had values that were at the bottom of their 7-year range, showing a decrease in SAIFI levels over time. The same applies to most countries in SAIDI, with the exception of planned SAIDI where the 2016 values in some countries were not at the bottom of their 7-year range. This temporary high level of planned interruptions could be a sign of a high level of investment in distribution networks, with the aim of reducing the number of unplanned interruptions in the future. More frequent planned interruptions can also be due to replacement and repair of components or a widespread replacement of energy meters.

Regarding SAIFI, indicators representing the number of interruptions are not always easily comparable among countries. The reason for this is that the aggregation rules for interruptions differ across Europe. In some countries, all interruptions occurring during a specific defined time period are considered as a single interruption.

The values of unplanned SAIDI and SAIFI seem to be stable or improving over time. In 2016, unplanned SAIDI, including exceptional events, had a range between nine and 371 minutes per customer while unplanned SAIDI without exceptional events was between nine and 290 minutes per customer. The former indicator includes all interruptions regardless of their cause and is possibly more reliable for benchmarking because of significant differences of exceptional events across Europe. The 2016 values of unplanned SAIFI including exceptional events were between 0,08 and 4,35 interruptions per customer while unplanned SAIFI excluding exceptional events ranged from 0,05 and 3,83 interruptions per customer.

The share of cable circuits has direct impact on the continuity of supply indicators. Countries that have a high percentage of underground cables (especially on medium voltage) generally have lower values of the corresponding interruption indicators. Moreover, benchmarking the values of indicators may be easier for groups of countries with similar network characteristics.

In gas, countries were asked to submit data for the same indicators as in the 6th BR, but this time for a longer period (from 2010 to 2016). The indicators in question are SAIDI, SAIFI and CAIDI. Even though these indicators are mainly borrowed from the electricity sector, they should not be interpreted the same way. Due to the possibility of storage in gas grids and very high technical requirements of these grids, continuity of supply is not the main factor influencing the decisions of network operators. Nevertheless, the typically used interruption indicators are good tools for international benchmarking of continuity of supply.

Unplanned SAIDI and unplanned SAIFI are monitored in ten countries in gas which is significantly less than in electricity. The indicator unplanned CAIDI is monitored in only four countries. These numbers are higher than the numbers of countries included in corresponding figures because there are countries that monitor an indicator but did not provide any values.

SAIDI values are generally much lower for gas than for electricity. This is due to underground gas pipelines which are not exposed to forces of nature in the same way as overhead power cables. In 2016, unplanned SAIDI ranged from 0,008 to 6,043 minutes per customer. The maximum value of this range comes from Great Britain as their unplanned interruptions include major incidents. Excluding these incidents would make the values significantly lower. In all other countries, unplanned SAIDI was significantly below 2. Planned SAIDI values in 2016 were between 0,026 and 23,389 minutes per customer. Similarly, values of planned SAIFI (between 0,0023 – 0,196) were greater than the values of unplanned SAIFI (0,0021 – 0,02 interruptions per customer).

Annex 1 – List of abbreviations

Term	Definition
AIT	Average Interruption Time
ASIDI	Average System Interruption Duration Index
ASIFI	Average System Interruption Frequency index
CAIDI	Customer Average Interruption Duration Index
CEER	Council of European Energy Regulators
CoS	Continuity of Supply
DSO	Distribution System Operator
EHV	Extra High Voltage
ENS	Energy Not Supplied
EQS WS	Energy Quality of Supply Work Stream
HV	High Voltage
LV	Low Voltage
MAIFI	Momentary Average Interruption Frequency Index
MV	Medium Voltage
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
TIEPI	Equivalent interruption time related to the installed capacity (used in Spain and Portugal)
TSO	Transmission System Operator

Annex 2 – List of country abbreviations

Abbreviation	Full country name
AT	Austria
BE	Belgium
BG	Bulgaria
HR	Croatia
CZ	Czech Republic
DK	Denmark
EE	Estonia
FI	Finland
FR	France
DE	Germany
GB	Great Britain (GB is used for Great Britain: England, Scotland and Wales)
EL	Greece
HU	Hungary
IE	Ireland
IT	Italy
LV	Latvia
LT	Lithuania
LU	Luxemburg
MT	Malta
NL	The Netherlands
NO	Norway
PL	Poland
PT	Portugal
RO	Romania
SK	Slovak Republic
SI	Slovenia
ES	Spain
SE	Sweden
CH	Switzerland

Annex 3 – Tables

Electricity

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											14,87	14,35	16,36	15,13	13,69
Bulgaria									286,10	280,50	274,90	264,00	199,00	208,80	177,50
Croatia											294,00	253,47	250,15	251,43	222,85
Czech Republic			148,29	166,19	144,70	150,23	165,82	140,65	159,40	154,74	147,59	159,68	162,33	171,18	159,91
Denmark									5,37	4,94	4,74	4,70	5,05	4,65	4,24
Estonia											84,93	86,84	65,76	69,32	73,75
Finland											14,21	15,47	12,90	11,51	12,64
France	6,00	5,30	6,60	8,00	7,90	10,80	19,40	23,20	24,00	18,90	15,60	15,90	15,80	16,20	17,90
Germany					15,10	13,85	13,17	11,53	9,66	10,12	11,83	7,23	7,56	7,03	10,29
Great Britain					4,06	4,96	5,70	6,48	6,72	6,69	6,70	5,68	5,72	5,02	3,91
Greece											149,00	156,00	136,00	105,00	112,00
Hungary														161,00	157,00
Ireland														77,30	64,80
Italy	77,97	80,67	62,62	58,77	53,79	46,16	49,35	43,58	55,71	61,85	65,97	55,28	59,60	66,62	78,85
Latvia						237,00	261,00	254,00	219,00	236,00	265,00	280,00	256,00	206,00	156,00
Lithuania				134,05	125,70	80,75	74,77	74,03	160,90	157,93	179,23	212,76	217,45	194,18	173,04
Luxembourg												12,03	6,62	5,96	5,23
Malta			69,28	105,63	94,74	78,88	72,73	75,10	72,60	69,00	80,40	61,04	207,00	54,69	62,80
The Netherlands											5,16	6,02	5,89	4,76	6,28
Norway											40,95	37,64	43,05	44,05	41,15
Poland						121,00	149,05	140,31	129,70	153,05	147,32	139,12	119,40	95,86	80,17
Portugal	52,21	62,39	49,16	39,16	18,70	7,31	2,07	2,00	1,57	2,05	1,68	1,46	2,59	2,44	1,91
Romania							386,00	323,00	324,00	333,00	246,00	270,00	230,00	211,00	184,00
Slovakia												187,14	164,99	176,03	178,24
Slovenia							137,73	130,86	105,55	126,33	116,61	115,09	119,28	128,61	120,10
Spain											10,62	9,18	10,68	13,44	12,24
Sweden											16,93	18,87	18,17	16,66	18,80
Switzerland									14,00	13,00	12,00	10,00	9,00	10,00	10,00

Table 6 – Electricity: planned SAIDI (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											35,55	39,29	51,95	47,63	41,17
Bulgaria									199,10	189,60	180,20	171,20	151,80	138,10	113,80
Croatia											370,00	305,99	411,57	264,89	189,39
Czech Republic							185,54	210,94	135,88	114,08	125,06	195,08	120,89	144,89	98,38
Denmark									15,05	17,04	14,75	15,86	11,59	15,86	15,14
Estonia											170,86	378,48	117,06	168,42	148,48
Finland											80,15	171,25	66,89	157,62	67,92
France	42,00	69,30	57,10	5,90	86,30	61,60	74,10	173,80	95,10	53,90	62,90	83,60	51,50	57,60	52,60
Germany					23,25	35,67	16,96	15,29	20,01	17,25	17,37	32,75	13,50	15,16	13,26
Great Britain	83,69	110,38	81,11	94,29	69,16	103,48	81,94	75,69	81,42	70,01	68,05	61,02	92,51	50,71	46,53
Greece											150,00	133,00	122,00	143,00	132,00
Hungary														67,00	59,00
Ireland														106,00	87,60
Italy	114,74	546,08	90,53	79,86	60,55	57,89	89,64	78,67	88,84	107,96	132,73	105,40	93,80	129,03	64,89
Latvia						269,00	236,00	424,00	1.073,0	708,00	371,00	341,00	210,00	144,00	130,00
Lithuania				146,21	164,59	245,61	156,73	182,60	260,74	302,57	288,10	153,93	144,04	106,53	172,92
Luxembourg												21,61	18,47	22,85	16,62
Malta			486,83	414,52	310,78	411,52	189,45	688,64	620,40	191,00	286,20	360,04	570,60	172,90	101,02
The Netherlands											26,34	23,40	20,00	32,90	21,00
Norway											65,81	143,77	118,07	128,77	87,68
Poland						410,00	440,64	378,35	386,18	325,76	263,19	281,82	205,41	267,46	191,83
Portugal	467,98	406,18	217,79	198,73	243,19	136,00	162,67	280,03	276,04	131,43	94,15	258,80	94,75	75,03	75,74
Romania												491,00	480,00	371,00	371,00
Slovakia											110,95	110,92	89,37	81,49	80,58
Slovenia							115,62	133,79	80,57	76,06	169,43	109,32	907,91	71,34	71,82
Spain											58,56	99,18	52,68	55,68	53,58
Sweden											88,18	151,94	83,73	118,15	75,62
Switzerland									14,00	16,00	22,00	15,00	13,00	11,00	9,00

Table 7 – Electricity: unplanned SAIDI, including exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											33,81	33,61	33,44	27,18	24,22
Croatia													166,34	152,99	102,40
Czech Republic			102,54	120,50	102,50	124,23	86,70	102,65	106,24	107,09	109,77	98,01	84,38	82,14	73,09
Denmark									15,00	16,10	14,70	11,20	11,60	14,90	15,10
France	40,00	51,00	50,70	52,20	71,50	57,70	62,60	67,20	62,90	52,60	60,10	68,10	50,20	51,70	48,70
Germany					21,53	19,25	16,89	14,63	14,90	15,31	15,91	15,32	12,28	12,70	12,80
Great Britain	81,66	81,28	76,59	68,64	65,55	78,03	74,22	73,43	70,02	67,94	55,43	54,71	53,22	44,86	38,39
Greece											101,00	96,00	92,00	94,00	96,00
Hungary														89,00	75,00
Ireland														81,40	80,10
Italy	108,88	96,83	76,52	65,74	53,84	52,47	53,10	49,45	47,77	43,59	45,45	42,27	41,32	45,40	37,11
Latvia											255,00	192,00	153,00	126,00	104,00
Lithuania				74,30	73,93	86,43	70,56	50,26	50,19	59,50	55,67	51,40	49,44	44,58	47,94
Luxembourg												21,61	18,47	22,85	16,50
Poland							354,51	316,46	316,26	309,10	254,00	254,85	191,77	244,18	180,19
Portugal	334,54	303,75	148,81	142,82	152,08	104,33	133,08	185,62	172,98	97,25	78,48	88,70	74,89	66,76	64,08
Romania							639,00	636,00	639,00	547,00	630,00	427,00	361,00	308,00	290,00
Slovenia										2,11	3,07	6,35	3,68	4,82	1,67
Spain											52,62	52,08	54,00	55,68	53,58
Sweden											83,77	82,19	74,49	83,59	69,10
Switzerland									14,00	16,00	22,00	15,00	13,00	11,00	9,00

Table 8 – Electricity: unplanned SAIDI, without exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											50,41	53,64	68,31	62,76	54,86
Bulgaria									485,20	470,10	455,10	435,20	350,80	346,90	291,30
Croatia											664,00	559,46	661,72	516,32	412,24
Czech Republic							351,36	351,59	295,28	268,82	272,65	354,76	283,22	316,07	258,29
Denmark									20,42	21,98	19,49	20,56	16,64	20,51	19,38
Estonia											255,79	465,32	182,82	237,74	222,23
Finland											94,36	186,72	79,79	169,13	80,56
France	48,00	74,60	63,70	13,90	94,20	72,40	93,50	197,00	119,10	72,80	78,50	99,50	67,30	73,80	70,50
Germany					38,35	49,52	30,13	26,82	29,67	27,37	29,20	39,98	21,06	22,19	23,55
Great Britain					73,22	108,44	87,64	82,17	88,14	76,70	74,75	66,70	98,23	55,74	50,43
Greece											299,00	289,00	258,00	248,00	244,00
Hungary														228,00	216,00
Ireland														183,30	152,40
Italy	192,71	626,75	153,15	138,63	114,34	104,05	138,99	122,25	144,55	169,81	198,70	160,68	153,40	195,65	143,74
Latvia						506,00	497,00	678,00	1.292,00	944,00	636,00	621,00	466,00	350,00	286,00
Lithuania				280,26	290,29	326,36	231,50	256,63	421,64	460,50	467,33	366,69	361,49	300,71	345,96
Luxembourg												33,64	25,09	28,81	21,84
Malta			556,11	520,15	405,52	490,40	262,18	763,74	693,00	260,00	366,60	421,08	777,60	227,59	163,82
The Netherlands											31,50	29,42	25,89	37,66	27,28
Norway											106,76	181,41	161,12	172,82	128,83
Poland						531,00	589,69	518,66	515,88	478,81	410,51	420,94	324,81	363,32	272,00
Portugal	520,19	468,57	266,95	237,89	261,89	143,31	164,74	282,03	277,61	133,48	95,83	260,26	97,34	77,47	77,65
Romania												761,00	710,00	582,00	555,00
Slovakia												298,06	254,36	257,52	258,82
Slovenia							253,35	264,65	186,12	202,39	286,04	224,41	1027,19	199,95	191,92
Spain											69,18	108,36	63,36	69,12	65,82
Sweden											105,11	170,81	101,89	134,81	94,42
Switzerland									28,00	29,00	34,00	25,00	22,00	21,00	19,00

Table 9 – Electricity: planned and unplanned SAIDI, including exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											48,67	47,96	49,79	42,31	37,91
Croatia													416,49	404,42	325,25
Czech Republic			250,83	286,69	247,20	274,46	252,52	243,30	265,64	261,83	257,36	257,69	246,71	253,32	233,00
Denmark									20,37	21,04	19,44	15,90	16,65	19,55	19,34
France	46,00	56,30	57,30	60,20	79,40	68,50	82,00	90,40	86,90	71,50	75,70	84,00	66,00	67,90	66,60
Germany					36,63	33,10	30,06	26,16	24,56	25,43	27,74	22,55	19,84	19,73	23,09
Great Britain					69,61	82,99	79,92	79,91	76,74	74,63	62,14	60,39	58,94	49,89	42,30
Greece											250,00	252,00	228,00	199,00	208,00
Hungary														250,00	232,00
Ireland														158,70	144,90
Italy	186,85	177,50	139,14	124,51	107,63	98,63	102,45	93,03	103,48	105,44	111,42	97,55	100,92	112,02	115,96
Latvia											520,00	472,00	409,00	332,00	260,00
Lithuania				208,35	199,63	167,18	145,33	124,29	211,09	217,43	234,90	264,16	266,89	238,76	220,98
Luxembourg												33,64	25,09	28,81	21,72
Poland							503,56	456,77	445,96	462,15	401,32	393,97	311,17	340,04	260,36
Portugal	386,75	366,14	197,97	181,98	170,78	111,64	135,15	187,62	174,55	99,30	80,16	90,16	77,48	69,20	65,99
Romania							1.025,0	959,00	963,00	880,00	876,00	697,00	591,00	519,00	474,00
Slovenia										128,44	119,68	121,44	122,96	133,43	121,77
Spain											63,24	61,26	64,68	69,12	65,82
Sweden											100,70	101,06	92,66	100,25	87,90
Switzerland									28,00	29,00	34,00	25,00	22,00	21,00	19,00

Table 10 – Electricity: planned and unplanned SAIDI, without exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							0,28	0,29	2,90	10,40	2,26	10,34	1,41	2,13	1,67
Denmark									2,17	1,86	1,41	0,70	0,62	1,89	1,10
Finland												2,39	8,25	2,23	2,94
France	1,90	2,20	1,50	6,70	7,50	2,10	6,10	5,60	1,50	1,10	2,00	2,00	1,80	6,80	2,40
Great Britain															18,45
Ireland														5,90	8,20
Italy	2,28	2,60	4,47	2,80	2,22	3,38	1,66	1,61	2,85	2,34	1,33	1,93	2,88	1,59	1,16
Lithuania				0,00	0,06	2,34	0,05	0,00	0,00	0,53	0,16	0,07	1,78	0,00	0,27
Luxembourg												0,15	0,61	3,53	0,27
The Netherlands												0,80	0,90	2,20	3,20
Norway											9,47	29,43	14,57	18,14	7,77
Portugal													18,18	12,83	13,71
Romania												5,98	8,60	1,79	96,94
Sweden											10,89	27,36	24,54	12,30	27,35
Switzerland									4,00	2,00	6,00	1,00	2,00	1,00	1,00

Table 11 – Unplanned SAIDI (HV), without exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							88,54	119,92	124,58	114,01	105,68	97,88	97,74	81,65	72,43
Denmark									12,49	12,15	11,27	8,79	9,12	10,84	12,01
France	31,00	40,00	40,60	36,80	54,80	47,10	47,40	50,50	51,00	42,60	47,10	54,70	39,40	36,30	36,90
Germany					18,67	16,50	14,32	12,00	12,10	12,68	13,35	12,85	10,09	10,45	10,70
Greece											96,00	91,00	88,00	89,00	92,00
Ireland														70,00	67,20
Italy	80,59	73,85	56,29	46,70	36,01	33,32	32,40	31,15	28,46	26,12	27,31	25,36	24,49	27,58	22,21
Latvia												138,00	113,00	86,00	78,00
Lithuania				55,80	49,86	58,89	49,55	38,40	38,11	45,51	43,44	40,71	37,75	35,79	37,96
Luxembourg												17,02	14,76	15,85	12,45
The Netherlands												15,90	12,80	12,60	11,70
Norway											94,11	229,25	98,31	103,44	75,98
Portugal	368,73	310,25	153,82	146,34	153,04	110,94	126,93	129,58	130,23	82,53	65,39	76,66	87,30	74,30	71,20
Romania												452,97	326,31	293,82	301,44
Slovenia							59,30	54,56	50,58	63,87	74,55	60,04	70,51	52,25	43,35
Sweden											54,10	63,72	55,41	62,38	59,37
Switzerland									7,00	12,00	14,00	12,00	10,00	8,00	6,00

Table 12 – Unplanned SAIDI (MV), without exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							82,80	102,58	106,17	107,06	109,80	98,02	84,33	82,15	73,10
Denmark									2,03	2,09	2,07	1,76	1,81	2,15	1,97
France	7,00	9,00	8,70	8,80	9,20	8,50	9,10	11,10	10,40	8,90	10,90	11,40	8,90	8,60	9,40
Germany					2,86	2,75	2,57	2,63	2,80	2,63	2,57	2,47	2,19	2,25	2,10
Great Britain															11,36
Greece											5,00	5,00	4,00	5,00	4,00
Ireland														5,50	4,70
Italy	26,01	20,38	15,76	16,24	15,61	15,76	19,04	16,69	16,15	14,86	16,26	14,51	13,59	15,14	13,55
Latvia												49,00	40,00	40,00	26,00
Lithuania				18,50	24,01	25,19	20,96	11,86	12,08	13,46	12,07	10,63	9,90	8,79	9,71
Luxembourg												4,44	3,09	3,46	3,17
The Netherlands												6,70	6,30	5,90	6,00
Norway													2,53	4,93	3,36
Portugal	334,54	303,75	148,81	142,82	152,08	104,33	133,08	185,62	172,98	97,25	78,48	88,70	74,89	66,76	64,08
Romania												427,74	367,44	310,41	289,91
Sweden											83,82	82,23	74,52	83,63	69,12
Switzerland									2,00	2,00	2,00	2,00	1,00	2,00	2,00

Table 13 – Unplanned SAIDI (LV), without exceptional events (minutes per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											0,13	0,13	0,14	0,13	0,13
Croatia											1,99	1,63	1,63	1,66	1,51
Czech Republic			0,57	0,57	0,55	0,56	0,62	0,54	0,59	0,54	0,50	0,52	0,51	0,54	0,50
Denmark									0,05	0,04	0,04	0,04	0,04	0,04	0,04
Estonia											0,53	0,57	0,48	0,47	0,47
Finland											0,17	0,19	0,15	0,14	0,15
France	0,04	0,04	0,05	0,06	0,06	0,11	0,21	0,24	0,21	0,13	0,11	0,13	0,13	0,13	0,14
Germany						0,13	0,10	0,10	0,09	0,10	0,12	0,08	0,08	0,08	0,08
Great Britain					0,02	0,02	0,02	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02
Greece											0,70	0,90	0,70	0,60	0,60
Hungary														0,53	0,53
Ireland														0,30	0,20
Italy	0,49	0,49	0,40	0,37	0,29	0,30	0,35	0,29	0,38	0,37	0,41	0,37	0,36	0,37	0,41
Latvia						0,83	0,94	0,90	0,85	0,85	0,94	0,96	0,99	0,83	0,68
Lithuania				0,46	0,43	0,27	0,26	0,29	0,58	0,48	0,53	0,54	0,56	0,65	0,58
Luxembourg												0,09	0,10	0,07	0,05
Malta											0,77	0,63	0,75	0,64	0,61
The Netherlands											0,03	0,03	0,03	0,03	0,03
Norway											0,27	0,26	0,29	0,30	0,30
Poland						0,40	0,74	0,76	0,68	0,82	0,70	0,62	0,56	0,50	0,46
Portugal	0,29	0,30	0,23	0,19	0,09	0,04	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,01
Romania							1,59	1,47	1,29	1,30	0,95	0,99	0,80	0,77	0,65
Slovakia												0,52	0,48	0,51	0,56
Slovenia							1,09	1,05	0,86	0,98	0,88	0,89	0,86	0,89	0,87
Spain											0,14	0,15	0,16	0,10	0,09
Sweden											0,14	0,15	0,16	0,14	0,16
Switzerland									0,12	0,12	0,11	0,09	0,08	0,09	0,10

Table 14 – Electricity: planned SAIFI
(interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											0,70	0,68	0,82	0,67	0,73
Croatia											3,10	2,69	2,71	2,49	2,00
Czech Republic							2,22	2,00	1,78	1,82	1,89	2,13	1,86	2,11	1,71
Denmark									0,39	0,40	0,40	0,37	0,31	0,38	0,38
Estonia											1,79	2,49	0,65	1,26	1,49
Finland											1,79	2,16	1,60	2,64	1,42
France	0,07	0,14	0,11	0,07	0,09	0,08	0,11	0,10	0,07	0,06	0,08	0,10	0,07	0,09	0,08
Germany					0,46	0,43	0,33	0,30	0,32	0,34	0,29	0,50	0,37	0,83	0,51
Great Britain	0,87	0,86	0,83	0,78	0,74	0,88	0,77	0,73	0,72	0,69	0,65	0,61	0,72	0,56	0,53
Greece											2,60	2,30	2,10	2,30	2,20
Hungary														1,01	0,90
Ireland														1,20	1,10
Italy	2,76	3,96	2,48	2,42	2,29	2,16	2,38	2,36	2,27	2,08	2,33	2,20	1,99	2,43	1,76
Latvia						2,18	2,01	0,90	4,15	4,74	3,84	3,52	2,78	2,35	2,45
Lithuania				1,11	1,30	2,17	1,63	1,60	1,87	2,19	1,83	1,43	1,29	1,07	1,25
Luxembourg												0,32	0,29	0,36	0,23
Malta											4,28	4,13	4,59	2,49	1,99
The Netherlands											0,29	0,30	0,28	0,44	0,29
Norway											1,36	1,96	2,15	1,87	1,59
Poland						3,10	4,14	3,84	3,77	4,22	3,44	3,32	2,96	3,61	3,00
Portugal	7,35	5,96	3,66	3,54	3,81	2,62	2,80	3,63	4,32	2,41	1,88	3,09	1,89	1,53	1,64
Romania												5,24	5,06	4,72	4,35
Slovakia											2,20	2,06	1,76	1,63	1,70
Slovenia							2,72	2,41	1,81	1,81	2,99	2,20	4,31	1,77	1,62
Spain											6,89	1,04	1,13	1,21	1,09
Sweden											1,33	1,33	1,30	1,22	1,17
Switzerland									0,28	0,28	0,34	0,28	0,22	0,23	0,20

Table 15 – Electricity: unplanned SAIFI, including exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											0,56	0,66	0,62	0,57	0,59
Croatia													1,83	1,94	1,44
Czech Republic			2,11	1,92	1,87	2,35	1,70	1,63	1,64	1,65	1,81	1,69	1,60	1,55	1,45
Denmark									0,39	0,40	0,40	0,32	0,31	0,37	0,38
France	0,07	0,14	0,11	0,07	0,09	0,08	0,11	0,07	0,06	0,06	0,08	0,10	0,07	0,09	0,08
Germany					0,46	0,33	0,32	0,29	0,26	0,31	0,28	0,47	0,34	0,80	0,51
Great Britain	0,87	0,79	0,81	0,72	0,72	0,78	0,73	0,71	0,69	0,68	0,60	0,59	0,60	0,54	0,48
Greece											1,73	1,60	1,70	1,50	1,47
Hungary														1,10	0,99
Ireland														1,01	1,10
Italy	2,74	2,68	2,42	2,33	2,23	2,10	1,92	1,95	1,80	1,67	1,74	1,63	1,65	1,75	1,50
Latvia											3,40	2,90	2,38	2,14	2,20
Lithuania				0,72	0,74	1,11	0,94	0,67	0,64	0,81	0,79	0,72	0,67	0,60	0,62
Luxembourg												0,32	0,29	0,36	0,23
Poland							4,08	3,70	3,74	4,14	3,42	3,02	2,95	3,60	2,99
Portugal	5,93	4,81	2,69	2,71	2,73	2,06	2,36	2,77	3,14	1,94	1,62	1,75	1,56	1,44	1,45
Romania							6,73	6,40	6,09	5,60	5,53	4,75	4,35	4,19	3,83
Slovenia										0,06	0,19	0,11	0,25	0,16	0,05
Spain											3,20	1,28	1,13	1,21	1,09
Sweden											1,33	1,29	1,30	1,20	1,17
Switzerland									0,28	0,28	0,34	0,28	0,22	0,23	0,20

Table 16 – Electricity: unplanned SAIFI, without exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											0,83	0,81	0,96	0,80	0,86
Croatia											5,09	4,32	4,34	4,15	3,51
Czech Republic							2,84	2,54	2,37	2,36	2,39	2,65	2,37	2,65	2,21
Denmark									0,44	0,44	0,44	0,41	0,35	0,42	0,42
Estonia											2,32	3,06	1,13	1,73	1,96
Finland											1,96	2,35	1,76	2,78	1,58
France	0,11	0,18	0,16	0,13	0,15	0,19	0,32	0,34	0,28	0,19	0,19	0,23	0,20	0,22	0,22
Germany						0,55	0,44	0,40	0,40	0,44	0,41	0,58	0,45	0,91	0,59
Great Britain					0,76	0,90	0,79	0,75	0,74	0,72	0,68	0,63	0,74	0,58	0,54
Greece											3,30	3,20	2,80	2,90	2,80
Hungary														1,55	1,43
Ireland														1,50	1,30
Italy	3,25	4,45	2,88	2,79	2,58	2,46	2,73	2,66	2,65	2,46	2,74	2,57	2,35	2,81	2,17
Latvia						3,01	2,95	1,80	5,00	5,59	4,78	4,48	3,77	3,18	3,13
Lithuania				1,57	1,73	2,44	1,89	1,89	2,45	2,67	2,36	1,97	1,85	1,72	1,83
Luxembourg												0,40	0,38	0,43	0,28
Malta											5,05	4,76	5,34	3,13	2,60
The Netherlands											0,33	0,33	0,31	0,47	0,32
Norway											1,63	2,22	2,44	2,17	1,89
Poland						3,50	4,88	4,60	4,45	5,04	4,14	3,94	3,52	4,11	3,46
Portugal	7,64	6,26	3,89	3,73	3,90	2,66	2,82	3,64	4,33	2,42	1,89	3,10	1,90	1,55	1,65
Romania												6,23	5,86	5,49	5,00
Slovakia												2,58	2,24	2,14	2,26
Slovenia							3,81	3,46	2,67	2,79	3,87	3,09	5,17	2,66	2,49
Spain											7,03	1,19	1,29	1,30	1,18
Sweden											1,47	1,48	1,46	1,36	1,34
Switzerland									0,40	0,40	0,45	0,37	0,30	0,32	0,30

Table 17 – Electricity: planned and unplanned SAIFI, including exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria											0,69	0,78	0,77	0,70	0,72
Croatia													3,46	3,60	2,95
Czech Republic			2,68	2,49	2,42	2,91	2,32	2,17	2,23	2,19	2,31	2,21	2,11	2,09	1,95
Denmark									0,44	0,44	0,44	0,36	0,35	0,41	0,42
France	0,11	0,18	0,16	0,13	0,15	0,19	0,32	0,31	0,27	0,19	0,19	0,23	0,20	0,22	0,22
Germany						0,45	0,43	0,39	0,35	0,41	0,39	0,55	0,42	0,88	0,59
Great Britain					0,73	0,80	0,76	0,74	0,72	0,70	0,63	0,61	0,62	0,56	0,50
Greece											2,43	2,50	2,40	2,10	2,07
Hungary														1,64	1,52
Ireland														1,31	1,30
Italy	3,23	3,17	2,82	2,71	2,52	2,40	2,27	2,24	2,19	2,04	2,15	2,00	2,00	2,12	1,91
Latvia											4,34	3,86	3,37	2,97	2,88
Lithuania				1,18	1,17	1,38	1,20	0,96	1,22	1,29	1,32	1,26	1,23	1,25	1,20
Luxembourg												0,40	0,38	0,43	0,28
Poland							4,82	4,46	4,42	4,96	4,12	3,64	3,51	4,10	3,45
Portugal	6,22	5,11	2,92	2,90	2,82	2,10	2,38	2,78	3,15	1,95	1,63	1,76	1,57	1,46	1,46
Romania							8,32	7,87	7,38	6,90	6,48	5,74	5,15	4,96	4,48
Slovenia										1,04	1,07	1,00	1,11	1,05	0,92
Spain											3,34	1,43	1,29	1,30	1,18
Sweden											1,47	1,44	1,46	1,34	1,33
Switzerland									0,40	0,40	0,45	0,37	0,30	0,32	0,30

Table 18 – Electricity: planned and unplanned SAIFI, without exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							0,06	0,03	0,18	0,09	0,15	0,21	0,11	0,14	0,20
Denmark									0,07	0,11	0,08	0,07	0,06	0,09	0,09
Finland												0,85	0,89	0,81	0,55
Great Britain															0,33
Ireland														0,10	0,20
Italy	0,17	0,16	0,20	0,22	0,19	0,22	0,14	0,13	0,12	0,09	0,11	0,12	0,16	0,12	0,09
Lithuania				0,00	0,00	0,04	0,01	0,00	0,00	0,01	0,00	0,00	0,02	0,00	0,01
Luxembourg												0,01	0,07	0,12	0,04
The Netherlands												0,05	0,04	0,09	0,07
Norway											0,25	0,49	0,44	0,32	0,25
Portugal													0,23	0,22	0,21
Romania												0,21	0,17	0,11	0,09
Sweden											0,24	0,41	0,55	0,39	0,51
Switzerland									0,08	0,07	0,10	0,08	0,06	0,05	0,05

Table 19 – Unplanned SAIFI – HV, without exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							1,45	1,82	1,95	1,93	1,87	1,78	1,78	1,57	1,50
Denmark									0,30	0,27	0,30	0,24	0,23	0,26	0,27
Germany					0,43	0,31	0,30	0,27	0,24	0,29	0,25	0,46	0,33	0,78	0,49
Greece											1,65	1,50	1,60	1,44	1,42
Ireland														0,90	0,80
Italy	2,41	2,35	2,05	1,95	1,87	1,71	1,58	1,61	1,47	1,37	1,38	1,28	1,27	1,41	1,20
Latvia												2,45	2,12	1,88	2,00
Lithuania				0,54	0,51	0,81	0,68	0,52	0,51	0,64	0,63	0,58	0,52	0,48	0,51
Luxembourg												0,27	0,22	0,22	0,15
The Netherlands												0,20	0,20	0,18	0,17
Norway											1,58	2,30	1,59	1,43	1,27
Portugal	5,77	4,70	2,64	2,63	2,66	1,98	2,28	2,68	3,02	1,88	1,57	1,70	1,84	1,64	1,68
Romania												6,29	4,80	5,16	6,10
Slovenia							1,80	1,50	1,40	1,63	2,16	1,59	1,89	1,45	1,21
Sweden											0,94	1,03	1,02	0,90	0,99
Switzerland									0,17	0,20	0,22	0,19	0,14	0,17	0,12

Table 20 – Unplanned SAIFI – MV, without exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Czech Republic							1,60	1,63	1,64	1,65	1,81	1,69	1,60	1,55	1,45
Denmark									0,02	0,02	0,02	0,01	0,02	0,02	0,02
Germany					0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Great Britain															0,07
Greece											0,08	0,10	0,10	0,06	0,05
Ireland															0,00
Italy	0,16	0,17	0,17	0,16	0,16	0,17	0,21	0,21	0,21	0,19	0,23	0,21	0,20	0,21	0,20
Latvia												0,29	0,26	0,26	0,20
Lithuania				0,18	0,23	0,26	0,25	0,14	0,13	0,17	0,16	0,13	0,12	0,12	0,10
Luxembourg												0,03	0,03	0,02	0,02
The Netherlands												0,04	0,04	0,04	0,04
Norway													0,02	0,02	0,02
Portugal	5,93	4,81	2,69	2,71	2,73	2,06	2,36	2,77	3,14	1,94	1,62	1,75	1,56	1,44	1,45
Romania												4,86	4,49	4,30	3,83
Sweden											1,33	1,29	1,30	1,20	1,17
Switzerland									0,02	0,02	0,02	0,02	0,01	0,01	0,02

Table 21 – Unplanned SAIFI – LV, without exceptional events (interruptions per customer)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	6.240	6.258	6.258	6.258	6.268	6.269	6.329	6.443	6.421	6.514	6.504	6.505	6.729	6.728	6.765
Belgium											1.759	1.758	1.761	1.855	1.862
Croatia											2.457	2.511	2.460	2.460	2.458
Czech Republic	5.279	5.279	5.279	5.279	5.279	5.347	5.390	5.390	5.390	5.390	5.419	5.419	5.419	5.526	5.633
Denmark											6.500	7.000	6.700		6.913
Estonia											1.693	1.693	1.855	1.909	1.909
Finland											7.165	7.376	7.378	7.245	6.977
France	48.304	48.371	48.418	48.392	48.470	48.478	48.692	48.883	48.929	48.973	49.070	49.454	49.687	49.770	49.862
Germany						35.147	35.391	35.129	34.749	34.797	35.270	34.979	34.737	35.970	35.970
Great Britain										53.588	53.676	52.730	53.051	53.796	54.133
Greece											4.561	4.699	4.699	4.699	4.921
Hungary														3.810	3.246
Ireland														6.805	6.711
Italy	21.885	21.596	21.539	21.915	21.872	22.031	21.986	22.044	21.997	20.581	21.960	21.895	21.931	22.080	22.254
Latvia											1.250	1.278	1.395	1.373	1.360
Luxembourg												257	257	257	298
Malta														99	99
The Netherlands											2.872	2.974	2.974	2.969	2.987
Norway											7.907	7.970	8.341	8.252	8.499
Poland									13.506	13.472	13.529	13.725	13.688	14.281	14.334
Portugal	6.195	6.439	6.490	6.657	7.018	7.426	7.513	7.569	8.049	8.371	8.534	8.733	8.629	8.805	8.863
Romania													8.717	8.735	8.794
Slovakia											0	0	0	0	0
Slovenia							836	836	836	836	836	997	997	997	997
Spain											62.418	63.021	63.920	64.190	64.714
Sweden											15.427	15.458	15.534	15.056	15.089
Switzerland										6.750	6.750	6.750	6.750	6.750	6.750

Table 22 – Total length of circuits – EHV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria	10.652	10.768	10.779	10.802	10.871	10.962	11.065	11.114	11.166	11.120	11.170	11.181	11.277	11.381	11.435
Belgium											9.537	9.550	9.604	9.604	9.605
Croatia											4.917	4.939	5.188	5.108	5.096
Czech Republic							13.935	13.995	14.186	14.079	14.085	14.137	14.185	14.207	14.229
Denmark								8.697	8.551	8.536	8.304	8.275	8.363	8.209	8.308
Estonia											3.484	3.484	3.506	3.592	3.592
Finland											15.791	16.024	16.171	16.268	16.495
France	51.035	51.030	51.040	51.150	51.206	51.156	51.252	51.254	55.111	55.171	55.182	55.103	55.221	55.253	55.384
Germany						76.398	76.900	76.899	95.154	95.022	95.425	96.308	96.373	96.658	96.749
Great Britain										324.947	326.224	325.900	326.702	327.972	328.872
Greece											12.834	12.834	12.733	13.209	13.369
Hungary														6.355	6.356
Ireland														7.225	7.225
Italy*	44.800	44.840	44.979	45.214	45.388	45.378	45.532	45.589	45.758	45.649	46.102	46.300	46.575	48.894	48.832
Latvia											4.081	4.081	3.964	3.964	3.965
Lithuania			6.659				6.679	6.679	6.679	6.687	6.687	6.704	6.792		7.251
Luxembourg												508	537	664	650
Malta												48	61	67	87
The Netherlands											6732	6667	6727	6857	6815
Norway											21.839	21.718	22.005	21.634	22.337
Poland									32.712	32.739	32.935	32.937	33.103	33.224	33.454
Portugal	7.454	7.628	7.812	8.052	8.310	8.500	8.840	8.913	8.981	9.114	9.140	9.303	9.375	9.427	9.516
Romania													22.271	22.254	22.206
Slovakia											1.870	1.951	1.953	1.953	2.138
Slovenia							2.630	2.540	2.589	2.614	2.723	2.802	2.798	2.732	2.770
Spain											30.380	30.336	31.441	31.393	31.129
Sweden											30.272	30.515	30.750	30.825	31.034
Switzerland										8.852	8.898	9.035	9.189	8.815	8.752

Table 23 – Total length of circuits – HV (km)

*Italy: until 2014, the HV network length did not include networks with voltages between 40 and 100 kV.

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		29.073				33.101	34.383	35.342	36.524	37.800	39.321	40.186	41.165	42.121	42.940
Belgium											67.865	69.026	70.000	70.214	70.625
Czech Republic							15.502	16.201	16.688	17.056	17.158	17.514	17.865	18.034	18.137
Denmark								68.508	59.824	60.666	61.576	62.023	62.450	62.112	62.228
Estonia											7.388	8.457	8.794	8.318	8.469
Finland											18.376	20.406	23.163	27.144	32.786
France	198.827	205.392	211.545	216.982	223.104	229.158	235.676	243.584	251.790	261.456	270.473	279.286	288.208	296.345	303.992
Germany														407.286	414.145
Greece											11.133	11.316	11.610	11.728	11.819
Hungary														13.615	13.747
Ireland														9.602	9.705
Italy						152.935	154.903	159.647	161.756	167.415	170.175	172.277	173.660	175.428	176.965
Latvia											5.823	6.133	6.456	6.831	7.186
Lithuania	8.003	8.291	8.542	8.714	9.014	9.309	9.664	9.896	10.304	10.654	11.011	11.319	12.516	12.295	12.828
Luxembourg												2.432	2.532	2.712	2.870
Malta												1.304	1.309	1.330	1.430
The Netherlands											106.288	107.279	107.855	108.358	108.971
Norway											38.205	37.902	39.949	41.114	44.091
Poland									63.848	65.530	67.626	69.671	71.491	73.165	74.577
Portugal	10.995	11.513	12.356	13.045	13.682	14.245	14.614	15.113	15.527	16.009	16.027	16.044	14.135	14.316	14.436
Romania													28.682	28.723	29.139
Slovenia							4.717	4.866	4.921	5.133	5.312	5.316	5.482	5.737	5.967
Spain											83.972	85.272	90.463	90.365	90.949
Sweden											108.283	112.128	116.319	121.376	123.233
Switzerland										31.370	32.174	32.833	33.544	33.870	34.034

Table 24 – Length of underground cables – MV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		34.746				32.547	31.769	31.135	30.582	29.881	28.747	28.151	27.528	26.785	26.122
Belgium											6.162	5.979	5.816	5.660	5.373
Czech Republic							60.821	60.226	59.394	59.417	59.029	58.990	58.950	58.920	58.885
Denmark								4.026	3.304	2.721	1.876	1.330	1.156	939	783
Estonia											22.292	22.406	22.530	20.818	20.660
Finland											120.637	119.807	118.126	115.967	113.033
France	381.114	377.097	373.933	371.403	369.110	366.942	363.594	360.602	356.264	351.667	347.169	342.901	338.628	335.070	331.622
Germany														103.878	106.181
Greece											97.613	98.370	99.140	99.411	99.740
Hungary														53.986	54.064
Ireland														83.018	83.152
Italy						215.862	216.108	215.688	215.609	215.661	215.487	215.453	215.102	214.908	214.629
Latvia											29.412	29.322	29.192	28.549	28.283
Lithuania						43.589	43.501	43.437	43.410	43.395	43.361	42.195	43.488	42.888	42.446
Luxembourg												1.093	1.082	1.066	1.046
Malta												96	85	82	81
The Netherlands											807	298	268	312	268
Norway											59.735	58.155	59.353	58.919	60.254
Poland									225.184	225.207	225.267	224.599	223.507	224.112	221.911
Portugal	51.460	52.742	53.905	55.240	56.121	56.965	57.700	58.261	57.945	58.133	58.152	58.195	58.184	58.433	58.606
Romania													90.335	90.379	90.167
Slovenia							12.738	12.674	12.595	12.438	12.384	12.106	11.943	11.863	11.831
Spain											111.178	109.440	116.983	118.638	117.406
Sweden											87.629	85.098	82.979	81.226	77.940
Switzerland										11.888	11.570	11.151	10.914	10.590	10.046

Table 25 – Length of overhead lines – MV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		63.819				65.648	66.152	66.477	67.106	67.682	68.068	68.337	68.693	68.906	69.062
Belgium											74.027	75.005	75.816	75.873	75.998
Croatia											41.467	40.478	40.599	40.971	41.253
Czech Republic							76.323	76.427	76.082	76.473	76.187	76.504	76.815	76.954	77.022
Denmark								72.534	63.128	63.387	63.452	63.353	63.606	63.051	63.011
Estonia											29.680	30.863	31.324	29.136	29.129
Finland											139.014	140.213	141.290	143.111	145.819
France	579.941	582.489	585.478	588.385	592.214	596.100	599.270	604.186	608.054	613.123	617.642	622.187	626.836	631.415	635.614
Germany						492.257	499.335	497.005	497.044	532.894	507.953	509.866	511.591	511.164	520.326
Greece											108.746	109.686	110.750	111.139	111.559
Hungary														67.601	67.811
Ireland														92.620	92.857
Italy						368.797	371.011	375.335	377.365	383.076	385.662	387.730	388.762	390.336	391.594
Latvia											35.235	35.455	35.648	35.380	35.468
Lithuania						52.898	53.165	53.333	53.714	54.049	54.372	53.514	56.004	55.183	55.274
Luxembourg												3.525	3.614	3.778	3.916
Malta												1.400	1.394	1.412	1.511
The Netherlands											107.095	107.577	108.122	108.670	109.238
Norway											97.940	96.057	99.302	100.033	104.345
Poland									289.032	290.737	292.893	294.270	294.998	297.277	296.488
Portugal	62.455	64.255	66.261	68.285	69.803	71.210	72.314	73.374	73.472	74.142	74.179	74.239	72.319	72.749	73.042
Romania													119.017	119.102	119.306
Slovakia											867	832	826	826	826
Slovenia							17.455	17.540	17.516	17.571	17.696	17.422	17.425	17.600	17.798
Spain											195.150	194.711	207.446	209.003	208.355
Sweden											195.912	197.226	199.298	202.602	201.173
Switzerland										43.258	43.744	43.984	44.458	44.460	44.080

Table 26 – Total length of circuits – MV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		101.263				116.897	119.717	123.399	125.587	127.518	130.325	133.057	135.192	137.528	139.753
Belgium											72.825	74.395	76.780	77.943	78.917
Czech Republic							69.735	74.102	79.376	81.335	82.466	83.375	85.071	85.935	86.328
Denmark								91.280	90.704	92.431	92.014	92.540	92.659	92.646	92.707
Estonia											8.838	10.156	10.530	10.004	10.222
Finland											92.340	92.843	97.807	102.746	107.978
France	193.673	203.606	212.658	221.437	230.224	239.296	248.529	258.109	266.353	276.870	286.005	294.422	302.556	309.450	316.201
Germany						1.075.183	1.110.057	1.122.663	1.123.898	1.241.361	1.149.973	1.156.785	1.164.311	1.053.014	1.065.691
Great Britain										329.189	331.376	327.574	328.829	330.509	331.350
Greece											13.893	14.162	14.430	14.638	14.791
Hungary														22.661	22.882
Ireland														12.471	12.611
Italy						274.351	290.706	289.992	296.249	302.386	309.119	316.993	320.578	323.628	326.462
Latvia											19.309	20.370	21.483	23.191	23.601
Lithuania	7.575	7.369	7.853	8.444	9.053	9.800	10.469	12.477	12.099	12.884	13.770	14.572	16.867	17.365	18.627
Luxembourg												5.679	5.724	6.023	6.123
Malta												799	951	1.036	1.346
The Netherlands											145.164	145.158	145.553	146.078	146.730
Norway											103.771	102.683	112.937	112.516	121.127
Poland									164.565	171.227	168.590	174.486	179.613	198.917	200.531
Portugal	23.973	24.627	27.571	28.610	29.408	30.133	30.453	31.714	32.113	32.627	32.899	33.127	33.243	33.389	33.543
Romania													49.910	50.023	50.359
Slovenia							18.878	19.547	20.171	20.959	21.556	22.228	22.169	22.740	23.290
Spain											165.796	188.582	189.736	193.003	194.531
Sweden											242.024	245.603	250.256	253.498	257.010
Switzerland										118.945	121.339	126.099	128.880	131.521	133.004

Table 27 – Length of underground cables – LV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		49.289				43.672	42.197	40.946	39.718	38.548	37.088	36.118	35.309	34.364	33.616
Belgium											52.011	51.704	48.744	48.213	48.009
Czech Republic							71.083	66.750	65.849	64.886	64.274	64.709	64.687	64.239	63.727
Denmark								4.282	3.848	3.366	2.842	1.592	823	298	198
Estonia											24.907	24.609	24.185	23.312	23.048
Finland											146.943	145.268	142.152	139.242	134.814
France	445.837	444.392	440.992	437.034	433.552	429.855	426.788	422.863	419.060	415.094	411.201	407.479	403.550	400.031	397.061
Germany														120.051	125.013
Great Britain										64.875	64.428	63.914	60.805	60.417	60.279
Greece											108.577	109.190	110.145	110.526	111.007
Hungary														64.532	64.585
Ireland														58.561	58.997
Italy						520.722	523.455	522.606	532.488	528.058	530.713	535.842	537.399	537.762	539.074
Latvia											40.157	38.880	37.478	35.549	34.744
Lithuania	59.719	59.575	59.291	58.566	58.211	56.482	56.050	55.026	39.738	56.848	56.488	53.612	54.211	53.280	51.751
Luxembourg												351	339	337	330
Malta												2.048	2.077	2.082	2.084
The Netherlands											88	56	57	60	57
Norway											95.376	90.009	93.959	91.843	96.101
Poland									258.161	257.087	253.047	249.841	244.927	272.669	264.107
Portugal	96.265	98.099	99.447	100.380	101.537	102.474	103.249	104.225	105.751	106.744	107.516	108.197	108.586	108.936	109.291
Romania													131.856	132.201	132.545
Slovenia							26.083	25.626	25.328	24.697	24.222	23.580	23.365	23.074	22.518
Spain											11.463	46.777	64.692	67.285	67.463
Sweden											68.597	66.535	64.759	62.681	60.294
Switzerland										11.117	10.835	10.227	9.719	10.653	9.073

Table 28 – Length of overhead lines – LV (km)

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Austria		150.552				160.568	161.915	164.345	165.306	166.066	167.412	169.175	170.501	171.892	173.369
Belgium											124.836	126.099	125.524	126.156	126.926
Croatia											95.271	95.420	95.173	95.837	100.092
Czech Republic							140.818	140.852	145.225	146.221	146.740	148.085	149.759	150.174	150.056
Denmark								95.562	94.552	95.797	94.856	94.132	93.482	92.944	92.905
Estonia											33.745	34.765	34.715	33.316	33.270
Finland											239.283	238.111	239.959	241.989	242.792
France	639.510	647.998	653.650	658.471	663.776	669.151	675.317	680.972	685.413	691.964	697.206	701.901	706.106	709.481	713.262
Germany														1.173.065	1.190.704
Great Britain										394.064	395.804	391.488	389.634	390.926	391.629
Greece											122.470	123.352	124.575	125.164	125.798
Hungary														87.193	87.467
Ireland														71.032	71.608
Italy						795.073	814.161	812.598	828.737	830.444	839.832	852.835	857.977	861.390	865.536
Latvia											59.466	59.250	58.961	58.740	58.345
Lithuania	67.294	66.944	67.144	67.010	67.264	66.282	66.519	67.503	51.837	69.732	70.258	68.184	71.078	70.645	70.368
Luxembourg												6.029	6.063	6.360	6.453
Malta												2.847	3.028	3.118	3.429
The Netherlands											145.251	145.214	145.611	146.137	146.787
Norway											199.147	192.692	206.896	204.359	217.228
Poland									422.726	428.314	421.637	424.327	424.540	471.586	464.638
Portugal	120.238	122.726	127.018	128.990	130.945	132.607	133.702	135.939	137.864	139.371	140.415	141.324	141.829	142.325	142.834
Romania													181.766	182.224	182.904
Slovakia											80	80	80	80	80
Slovenia							44.961	45.173	45.499	45.656	45.778	45.808	45.534	45.814	45.808
Spain											177.259	235.359	254.429	260.288	261.994
Sweden											310.621	312.138	315.015	316.179	317.304
Switzerland										130.062	132.174	136.326	138.599	142.174	142.077

Table 29 – Total length of circuits – LV (km)

Gas

Country	2010	2011	2012	2013	2014	2015	2016
Finland							0,026
Germany	11,358	136,68	45,25	9,1	38,2	8,52	19,7
Great Britain	8,82	9,075	11,438	9,602	9,407	8,022	7,069
Lithuania	31,132	34,85	27,43	26,97	40,223	43,285	23,389
The Netherlands			4,567	5,100	4,055	4,160	3,265
Portugal					0,219	0,193	0,369

Table 30 – Gas: planned SAIDI
(minutes per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Austria				1,830	1,680	1,800	1,590
Finland							0,014
Germany	1,256	1,9616	2,093	0,659	16,816	1,91	1,0705
Great Britain	5,6402	4,2693	4,589	4,736	4,995	5,700	6,043
Lithuania	0,942	0,6622	1,44	1,528	2,124	1,034	0,529
The Netherlands			1,029	1,008	3,249	2,155	0,985
Portugal					1,683	0,902	0,496
Slovakia					0,002	0,001	0,008

Table 31 – Gas: unplanned SAIDI
(minutes per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Finland							0,040
Germany	12,614	138,64	47,343	9,759	55,016	10,43	20,7705
Great Britain	14,458	13,344	16,027	14,338	14,402	13,722	13,112
Latvia	4,633	7,2125	2,107	4,54	4,297	3,152	2,294
Lithuania	32,074	35,5133	28,87	28,499	42,347	44,318	23,918
The Netherlands			5,596	6,108	7,304	6,315	4,250
Portugal					1,902	1,096	0,865

Table 32 – Gas: planned and unplanned SAIDI
(minutes per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Finland							0,1960
Germany	0,1	0,4	0,79	0,11	0,21	0,04	0,16
Great Britain	0,018	0,02	0,0206	0,0213	0,0214	0,0204	0,0217
Lithuania	0,2561	0,2543	0,234	0,2643	0,2507	0,265	0,17513
The Netherlands			0,0296	0,0271	0,0212	0,0372	0,0395
Portugal					0,0009	0,0013	0,0023

Table 33 – Gas: planned SAIFI (interruptions per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Austria				0,0057	0,0050	0,0042	0,0035
Finland							0,0140
Germany	0,03	0,19	0,08	0,01	0,14	0,12	0,02
Great Britain	0,005	0,0058	0,0047	0,0048	0,0050	0,0041	0,0043
Lithuania	0,00741	0,00705	0,0092	0,0045	0,00862	0,00708	0,00596
The Netherlands			0,0084	0,0064	0,0067	0,0065	0,0067
Portugal					0,0350	0,0027	0,0021
Slovakia					0,0031	0,0018	0,0101

Table 34 – Gas: unplanned SAIFI (interruptions per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Finland							0,2100
Germany	0,13	0,59	0,87	0,12	0,35	0,16	0,18
Great Britain	0,023	0,026	0,0253	0,0261	0,0263	0,0245	0,0260
Latvia	0,0032	0,006185	0,00065	0,00291	0,00109	0,00197	0,00057
Lithuania	0,26351	0,26135	0,2432	0,2688	0,25932	0,27208	0,18109
The Netherlands			0,0380	0,0335	0,0279	0,0437	0,0461
Portugal					0,0359	0,0040	0,0044

Table 35 – Gas: planned and unplanned SAIFI (interruptions per customer)

Country	2010	2011	2012	2013	2014	2015	2016
Austria				323,00	335,00	431,00	460,00
Germany	212,98	58,664	885,909	190,545	1.282,133	82,624	162,160
The Netherlands			163,83	150,42	497,30	320,95	119,50

Table 36 – Gas: unplanned CAIDI (minutes per interruption)

Country	2010	2011	2012	2013	2014	2015	2016
Austria	1.961	1.962	1.974	2.025	2.024	2.026	2.026
Belgium			4.060	4.056	4.023	4.024	3.973
Bulgaria							2.765
Croatia						2.694	2.693
Czech Republic		3.652	3.810	3.816	3.821	3.820	3.821
Estonia			878	885	885	885	885
Finland			1.315	1.287	1.287	1.287	1.294
Germany	46.428	39.496	37.695	37.880	37.580	37.809	38.759
Great Britain			7.600	7.600	7.600	7.600	7.600
Greece							1.459
Hungary			5.875	5.875	5.873	5.873	
Ireland			2.384	2.431	2.422	2.433	2.427
Italy	33.768	34.135	34.415	34.510	34.628	34.857	34.879
Latvia	1.240	1.240	1.240	1.240	1.240	1.191	1.191
Lithuania	1.865	1.865	1.904	2.007	2.007	2.113	2.113
Luxembourg			412	412	412	283	282
The Netherlands							12.601
Poland		10.538	10.718	10.762	11.008	11.681	11.674
Portugal	1.267	1.296	1.298	1.375	1.375	1.375	1.375
Slovakia			2.270	2.270	2.270	2.283	2.283
Slovenia			1.094	1.121	1.155	1.156	1.156
Sweden	601	601	601	601	601	601	601

Table 37 – Gas: transmission network length (km)

Country	2010	2011	2012	2013	2014	2015	2016
Austria	37.895	38.425	38.954	39.551	39.904	40.274	40.803
Belgium			69.124	70.094	71.220	71.956	72.514
Bulgaria							4.444
Croatia						18.987	19.153
Czech Republic		61.018	61.281	61.348	61.415	61.374	61.344
Denmark							18.224
Estonia			1.978	1.997	2.020	2.126	2.162
Finland			1.963	1.974	1.986	1.991	2.080
France							200.000
Germany	448.964	471.213	470.433	485.413	481.103	481.103	497.429
Great Britain	265.544	265.072	265.462	265.679	264.424	264.512	264.801
Greece							6.141
Hungary			85.182	85.364	85.587	86.494	
Ireland			11.113	11.221	11.266	11.339	11.527
Italy	250.041	248.648	249.363	250.661	253.233	256.954	258.148
Latvia	4.761	4.825	4.889	4.919	4.950	5.044	5.060
Lithuania	8.120	8.255	8.357	8.465	8.559	8.663	8.772
Luxembourg			2.623	2.797	2.878	2.932	2.977
The Netherlands			124.400	124.533	124.627	124.513	125.151
Poland			167.642	162.038	172.719	175.963	180.071
Portugal	14.840	15.433	15.878	16.291	17.374	17.759	18.245
Slovakia			33.079	33.182	33.257	33.301	33.270
Slovenia			4.328	4.449	4.531	4.633	4.671
Sweden	2.716	2.708	2.854	2.857	2.882	2.949	3.000

Table 38 – Gas: distribution network length (km)

Country	2010	2011	2012	2013	2014	2015	2016
Austria	39.856	40.387	40.928	41.576	41.928	42.300	42.829
Belgium			73.184	74.150	75.243	75.980	76.487
Bulgaria							7.209
Croatia						21.681	21.846
Czech Republic		64.670	65.091	65.164	65.236	65.194	65.165
Estonia			2.856	2.882	2.905	3.011	3.047
Finland			3.278	3.261	3.273	3.278	3.374
Germany	495.392	510.709	508.128	523.293	518.683	518.912	536.188
Great Britain			273.062	273.279	272.024	272.112	272.401
Greece							7.600
Hungary			91.057	91.239	91.460	92.367	
Ireland			13.497	13.652	13.688	13.772	13.954
Italy	283.809	282.783	283.778	285.171	287.861	291.811	293.027
Latvia	6.001	6.065	6.129	6.159	6.190	6.235	6.251
Lithuania	9.985	10.120	10.261	10.472	10.566	10.776	10.885
Luxembourg			3.035	3.209	3.290	3.215	3.259
The Netherlands							137.751
Poland			178.361	172.800	183.727	187.644	191.745
Portugal	16.107	16.729	17.176	17.666	18.749	19.134	19.620
Slovakia			35.349	35.452	35.527	35.584	35.553
Slovenia			5.422	5.570	5.686	5.789	5.827
Sweden	3.317	3.309	3.455	3.458	3.483	3.550	3.601

Table 39 – Gas: transmission and distribution network length (km)

Country	2010	2011	2012	2013	2014	2015	2016
Austria	1.351.888	1.350.842	1.350.310	1.350.423	1.348.867	1.346.339	1.346.537
Bulgaria							87.524
Croatia						656.337	659.914
Czech Republic	2.870.634	2.869.023	2.868.083	2.860.345	2.849.162	2.844.334	2.840.473
Denmark							413.597
Estonia			50.221	50.345	51.166	51.296	52.175
Finland			38.111	38.086	38.049	28.373	28.542
France							11.000.000
Germany	13.503.145	13.419.509	13.698.780	13.979.337	13.837.257	14.124.144	14.487.346
Great Britain	21.563.359	21.598.914	21.647.001	21.696.905	21.921.918	21.977.784	21.961.285
Greece							400.576
Hungary			3.598.676	3.489.772	3.447.485	3.442.542	3.456.792
Ireland			661.890	666.903	673.160	673.858	680.155
Italy	21.120.000	21.200.000	21.600.000	21.600.000	21.600.000	21.600.000	21.700.000
Latvia	434.783	434.595	433.998	433.640	433.557	433.174	432.501
Lithuania				561.561	565.114	569.300	573.004
Luxembourg							88.629
Poland			6.701.761	6.683.560	6.824.590	6.823.946	6.827.315
Portugal				1.320.052	1.355.122	1.395.741	1.424.259
Slovenia			131.652	132.881	133.364	133.379	133.439
Spain	7.180.323	7.298.923	7.394.113	7.470.265	7.553.501	7.615.864	7.708.548
Sweden	40.058	39.659	37.704	37.393	37.023	36.564	36.000

Table 40 – Gas: number of served customers

Annex 4 - About CEER

The Council of European Energy Regulators (CEER) is the voice of Europe's national regulators of electricity and gas at EU and international level. CEER's members and observers (from 36 European countries) are the statutory bodies responsible for energy regulation at national level.

One of CEER's key objectives is to facilitate the creation of a single, competitive, efficient and sustainable EU internal energy market that works in the public interest. CEER actively promotes an investment-friendly and harmonised regulatory environment, and consistent application of existing EU legislation. Moreover, CEER champions consumer issues in our belief that a competitive and secure EU single energy market is not a goal in itself, but should deliver benefits for energy consumers.

CEER, based in Brussels, deals with a broad range of energy issues including retail markets and consumers; distribution networks; smart grids; flexibility; sustainability; and international cooperation. European energy regulators are committed to a holistic approach to energy regulation in Europe. Through CEER, NRAs cooperate and develop common position papers, advice and forward-thinking recommendations to improve the electricity and gas markets for the benefit of consumers and businesses.

The work of CEER is structured according to a number of working groups and work streams, composed of staff members of the national energy regulatory authorities, and supported by the CEER Secretariat. This report was prepared by the Energy Quality of Supply Work Stream CEER's Distribution System Working Group.

CEER wishes to thank in particular the following regulatory experts for their work in preparing this report: Antonio Candela, Håvard Hansen, Sven Hilpert, Alexander Izmenyi, Jan Liska, Marko Poljak, Hugo Pousinho, Ognjen Radovic and Michael Westermann.

More information at www.ceer.eu.