ENTSO-E Overview of transmission tariffs in Europe: Synthesis 2012

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Background

- Transmission tariffs are one of the key elements of the International Electricity Market. There is no single “right solution” for recovering costs. Different methods will have to work side-by-side for the time being. Experience will then determine the possible degree of harmonization of the underlining principles for setting transmission charges to be achieved in the future.
- This report contains a comparative overview of 2012 transmission tariffs for 32 European countries in order to understand the components of the transmission tariffs and other regulatory charges recovered or invoiced by TSOs, but not directly related to TSOs’ activities.
- In order to be comparable, as far as possible, the tariffs taken into account cover all of the energy transmission charges, meaning that it include not only components related to TSO activities but also other regulatory charges not directly related to transmission costs which are covered through different mechanisms in each country. The components taken into account are:
    - infrastructure costs (operation and capital),
    - loss compensation costs,
    - internal congestion costs (but no costs of auctions or market splitting),
    - costs of supply of system services,
    - costs of system balancing,
    - other regulatory charges e.g. stranded costs, incentives for renewable,… if applied.
- It must be noted that only one aspect of the regulation (tariff) is covered (average charges are presented and compared) and this ENTSO-E overview does not take into account the differences between countries in areas such as quality of service, main technical characteristics and environment of the networks (e.g. consumption density, generation location,..) that influence level of such charges.

- Taking into account the «whole» of the tariff: adding, if necessary, both the invoices applied to the load (L) and to the generation (G), assuming they produce and consume the energy they had in their programs (without individual deviations).
- Voltage levels :
    - voltage levels of the transmission networks vary across Europe, in particular the lowest voltage level which is classified as transmission network varies largely (see Appendix 1: Voltage level operated by TSO)
    - to deal with this circumstance, two main cases are taken:
        - the producer and consumer are both connected to the EHV (Extra High Voltage) network (400 kV- 220 kV)
        - because in some countries transmission tariffs are applied to the HV (High Voltage) voltage range 150-50 kV or because no load is connected to EHV network, tariffs for these voltages have been compared for these countries too.
- For the comparison of transmission tariffs, the following **base case** is taken into account:
    - 5000 h utilization time that includes day hours of working days
    - the typical load considered is eligible and has a maximum power demand of 40 MW when it is connected at EHV and a maximum power demand of 10 MW when it is connected at HV
    - for countries with location signals, an average value has been taken.
- In addition to the base case, some examples are calculated in order to take into account the variation of tariffs according to:
    - the location of the generation and load (south or north of the country, same area / differentiated area)
    - the load's utilization time (the load is considered to first consume during day hours).

Main characteristics of the TSO tariffs in Europe

	Sharing of network operator charges		Price signal		Are losses included in the tariffs charged by TSO?	Are system services included in the tariffs charged by TSO?
	Generation	Load	Seasonal / time-of-day (1)	Location		
Austria	21%	79%	-	-	Yes	Through a specific component to generators
Belgium	9%	91%	xxx	-	Not included for grid >=150 kV	Tariff for ancillary services
Bosnia and Herzegovina	0%	100%	-	-	No	No
Bulgaria	0%	100%	-	-	Yes	Yes
Croatia	0%	100%	x	-	Yes	Yes
Czech Republic	0%	100%	-	-	Yes	Yes
Denmark	3%	97%	-	-	Yes	Yes
Estonia	0%	100%	x		Yes	Yes
Finland	13%	87%	x	-	Yes	Yes
France	2%	98%	-	-	Yes	Yes
Germany	0%	100%	-	-	Yes	Yes
Great Britain	27% TNUoS Tariff (2) 50% BSUoS Tariff (2)	73% TNUoS Tariff 50% BSUoS Tariff	xx	TNUoS - locational; BSUoS - non-locational	No, recovered in the energy market	Included in BSUoS Tariff
Greece	0 % Use of system 0 % Uplift charges	100 % Use of system 100 % Uplift charges	x	-	No, recovered in the energy market	Included in Uplift charges
Hungary	0%	100%	-	-	Yes	Tariff for ancillary services
Ireland	27%	73%	-	Generation only	No, recovered in the energy market	Yes
Italy	0%	100%	-	-	No	Yes
Latvia	0%	100%	-	-	Yes	Yes
Lithuania	0%	100%	-	-	Yes	Yes
Luxembourg	0%	100%	-	-	Yes	Yes
FYROM	0%	100%	-	-	Yes	Yes
Netherlands	0%	100%	-	-	Yes	Tariff for ancillary services
Northern Ireland	25%	75%	xxxx	Generation only	No	Tariff for ancillary services
Norway	33%	67%	xxx (via losses)	Location	Yes	Yes
Poland	0%	100%	-	-	Yes	Yes
Portugal	8%	92%	xx	-	No, included in energy price	No, included in energy price
Romania	17%	83%	-	Location (both G and L transmission tariffs vary by location; 6xG zones and 8xL zones) System services non-locational	Yes (included in the transmission tariff)	Tariff for ancillary services
Serbia	0%	100%	x	-	Yes	Yes
Slovak Rep.	0%	100%	-	-	Through a specific fee	Through a specific fee
Slovenia	0%	100%	xx	-	Yes	Tariff for ancillary services
Spain	0%	100%	xxx	-	No, included in energy price	No, included in energy price
Sweden	30%	70%	-	Location	Yes	Yes
Switzerland	0%	100%	-	-	By a separate tariff for losses	By separate tariffs for ancillary services

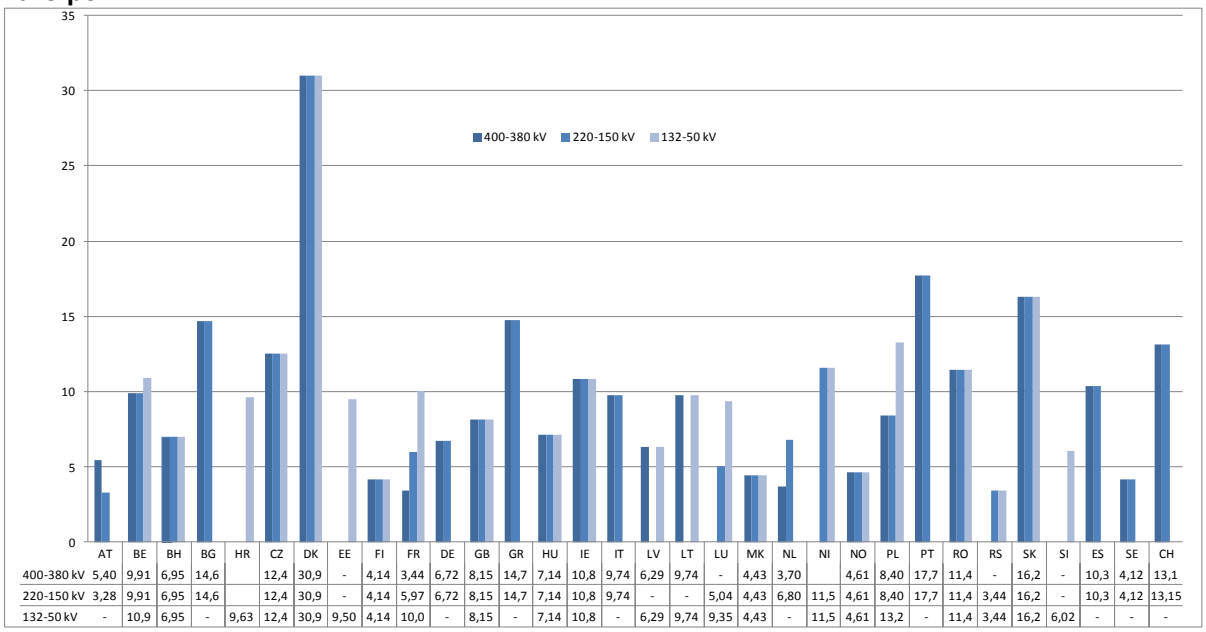
Remarks:

(1) The "X" indicates time differentiation. With one "X", there is only one time differentiation ("day-night", "summer-winter" or another one). With two "X" (or more), there are two (or more) time differentiations.

(2) TNUoS: Transmission Network Use of System; BSUoS=Balancing Services Use of System

Comparison of transmission tariffs: sum of generation and load fees

Euro per MWh



	AT	BE	BH	BG	HR	CZ	DK	EE	FI	FR	DE	GB	GR	HU	IE	IT	LV	LT	LU	MK	NL	NI	NO	PL	PT	RO	RS	SK	SI	ES	SE	CH
400-380 kV	5,40	9,91	6,95	14,6		12,4	30,9	-	4,14	3,44	6,72	8,15	14,7	7,14	10,8	9,74	6,29	9,74	-	4,43	3,70		4,61	8,40	17,7	11,4	-	16,2	-	10,3	4,12	13,1
220-150 kV	3,28	9,91	6,95	14,6		12,4	30,9	-	4,14	5,97	6,72	8,15	14,7	7,14	10,8	9,74	-	-	5,04	4,43	6,80	11,5	4,61	8,40	17,7	11,4	3,44	16,2	-	10,3	4,12	13,15
132-50 kV	-	10,9	6,95	-	9,63	12,4	30,9	9,50	4,14	10,0	-	8,15	-	7,14	10,8	-	6,29	9,74	9,35	4,43	-	11,5	4,61	13,2	-	11,4	3,44	16,2	6,02	-	-	-

Remarks:

- In this chart three voltage ranges are taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For those countries where more than one transmission tariff is applied for the different transmission voltage levels, one different bar for each tariff applied to the corresponding voltage level is represented.
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- The cost/benefits components taken into consideration for this comparison are presented in the table on page 9.
- Other regulatory charges are included.

Country remarks:

- **Austria:** L includes the usage of the grid. G however includes secondary control - these are quite different components which should be considered separately.
- **Belgium:** The cost of losses has been added, but is not included in the TSO-tariffs for users connected at EHV.
- **Bosnia and Herzegovina:** In Bosnia and Herzegovina there are two separate companies: NOS BiH (responsible for the system operation - ISO) and Elektroprenos BiH (owner of transmission grid - Transco). In this report synthetic tariff of TSO (just for comparison purpose) are sum of ISO and Transco tariff. System services and losses not purchased by the ISO and it is not included in synthetic TSO tariff. Costs for those services are part of end user price and suppliers pay it directly to the providers of ancillary services.
- **Bulgaria:** The Bulgarian TSO is not the owner of the grid and the transmission tariff is divided into two components: tariff 1 for “access to the grid” that has to be paid to ESO and tariff 2 for “transmission” that has to be paid to NEK in its capacity of Transmission Company and owner of the transmission assets. The service “Operation of the Transmission network” is performed by ESO on the basis of a service contract with NEK. The figures comprise both tariffs.

- **Germany:** weighted average of the TSOs operating in Germany, KWK-G surcharge (combined cycle co-generation) not included.
- **Great Britain**: cost of losses not included.
- **Greece:** The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).
- **France: Provisional figures, subject to annual re-evaluation.**
- **Ireland**: transmission losses are accounted for in the market however purely for comparison purposes an estimated charge has been included in these figures.
- **Italy:** This figure includes as “System services” the pass through component “Uplift” related to the charge for provision of dispatching services.
- **Latvia:** for 330kV transmission network (Latvia does not have 400kV networks).
- **Luxembourg:** charge corresponding to consumers other then users that use electricity for the chemical reduction and the electrolysis as well as in the metallurgical procedures.
- **Northern Ireland:** transmission losses are accounted for in the market however purely for comparison purposes an estimate is included
- **Norway:** The exchange rate used is the official rate of 31th of December 2012. Norwegian Main Grid tariffs are independent of voltage level and utilization time.
- **Portugal:** Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Spain:** According to the regulation the cost of renewable support are included in the main part of access tariffs. It must be noted that this cost is not included in the part of the access tariff dedicated to other costs (in the regulation this part is named “costs with specific allocation” see appendix 5). System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.
- **Switzerland:**
    - Example of a customer with a representative load profile with a peak power demand of 40 MW and one connection point; reactive energy within the tolerance range; including cost-covering feed-in remuneration fee

Costs included in the comparison transmission tariffs

	OPEX except system-services, losses and ITC	Losses cost	ITC cost/revenue	System-services								CAPEX		Other
				Primary reserve	Secondary reserve	Tertiary reserve	Internal Congestion management	Congestion management on interconnections	Black -Start	Voltage Control Reactive Power	System Balancing	Depreciation	Return on capital invested	
Austria	C	C	C/B	N	C	N	C	C/B	C	C	N	C	C	N
Belgium	C	C	C/B	C	C/B	C/B	C	C/B	C	C	N	C	C	C
Bosnia & Herzegovina	C	C	C/B	C	C	C	N	N	C	C	N	CAPEX	C	N
Bulgaria	C	C	C/B	C (capacity)	C (capacity)	C (capacity)	N	C	C	C	N	C	C	N
Croatia	C	C	N	N	C	C	C	C	C	C	C/B	C	C	C
Czech Rep.	C	C	C/B	C	C	C	C	C	C	C	C	C	C	C
Denmark	C	C	C/B	C	C	C	C/B	C/B	C	C	C/B	C	C	C/B
Estonia	C	C	C/B	N	N	C	C	C/B	C	C	N	C	C	N
Finland	C	C	C	N	N	C	C	C	C	C	N	C	C	C
France	C	C	C	C	C	N	C	N	C	C	N	CAPEX	C	C
Germany	C	C	C/B	C	C	C	C	C/B	C	C	N	C	C	C
Great Britain	C	C	N	C	C	C	C	C	C	C	C	C	C	C
Greece	C	C	N	C	C	N	N	?	N	N	N	C	C	C
Hungary	C	C	C/B	C	C	C	C	C/B	C	C	C/B	C	C	N
Ireland	C	N	N	C	C	C	N	N	C	C	N	C	C	N
Italy	C	C	N	C	C	C	C	C/B	C	C	C	C	C	N
Latvia	C	C	C	C	C	C	N	N	N	C	N	C	C	N
Lithuania	C/B	C	C/B	N	C	C	N	N	C	C/B	N	C	C	N
Luxembourg	C	C	C/B	C	C	C	C	C	C	C	C	C	C	C
FYROM	C	C/B	C	N	C	C	N	C	C	N	N	C	C	N
Netherlands	C	C	C/B	N	C/B	C/B	C/B	C/B	C	C	C	C	C	N
Northern Ireland	C	N	N	C	C	C	N	N	C	C	N	CAPEX	C	N
Norway	C	C	C	C	C	C	C	C	N	N	N	C	C	N
Poland	C	C	C	C	C	C	C	N	C	C	C	C	C	C
Portugal	C	C	C	N	C/B	N	N	C/B	N	N	N	C	C	Y
Romania	C	C	C/B	N	C	C	C	C/B	C	C	N	C	C	C
Serbia	C	C	C/B	C	C	C	C	C/B	C	C	C	C	C	C
Slovak Rep	C	C	C/B	C	C	C	C	N	C	C	N	C	C	N
Slovenia	C/B	C/B	C/B	N	C	C	C	C/B	C	C	N	C/B	C/B	C
Spain	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Sweden	C	C	C/B	C (2/5)	N	N	N	N	C	C	N	CAPEX	C	N
Switzerland	C	C/B	C	C/B	C/B	C/B	C/B	C/B	C/B	C/B	N	C	C	C

- Where:
  - C if costs are covered by the transmission invoice
  - C/B if costs less benefits are covered by the transmission invoice (C/B indicates whether certain costs covered by the tariff are also compensated by revenues. Intuitive examples are ITC, congestion costs and balancing. For instance if congestion rents are deducted from congestion costs, then the residual amount to be covered by tariffs is obtained. In this case the corresponding entry in the matrix would be C/B and not only C)
  - N if the costs are not included in the transmission invoice

Remarks:

- This table contains an indication of different costs covered by charges that have been included in the calculation of the price used for the comparison. Some of these charges may not be included in the TSO transmission tariff.

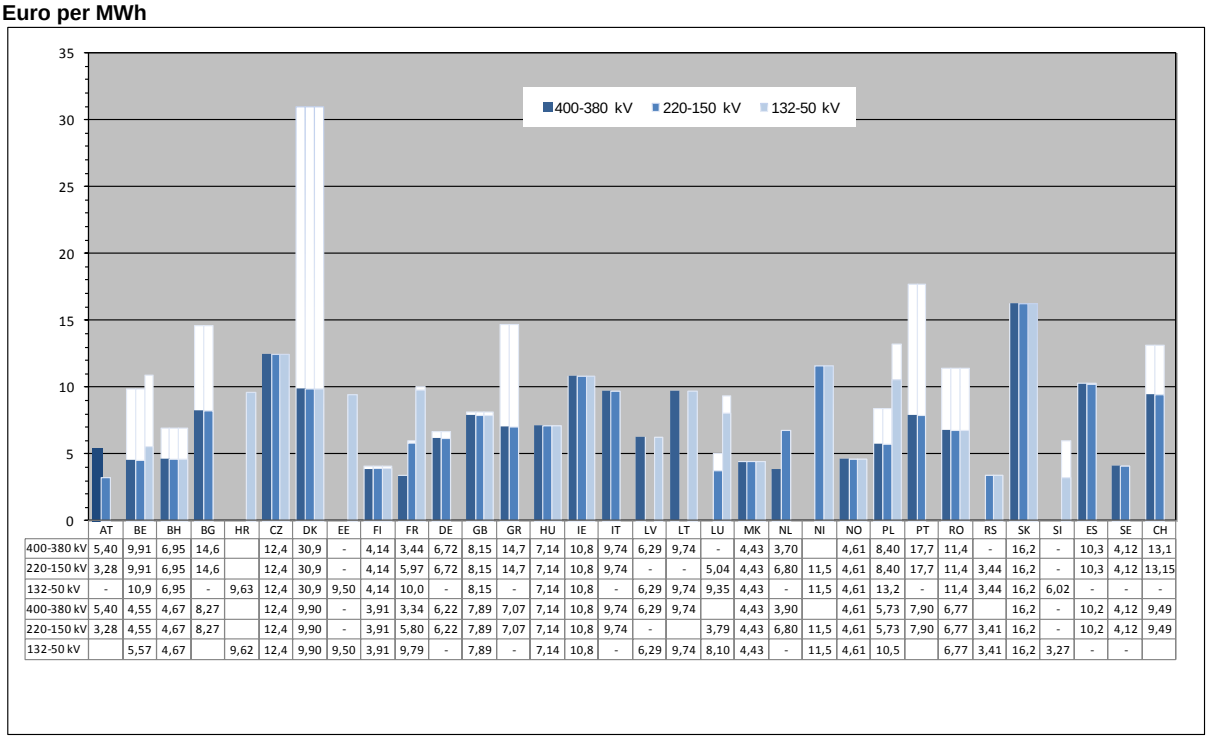
Country remarks:

- **Austria**:
  - Primary Reserve: According to the Austrian legal framework every generator with a max. capacity > 5 MW has to provide primary reserve.
  - System Balancing and Tertiary Reserve: The difference between the two expressions "tertiary reserve" and "balancing energy" is specific to the Austrian system. The TSO has nothing to do with the settlement of the system balancing.
- **Bosnia and Herzegovina**: The synthetic price for transmission system operation includes: Transco tariff (cost related to the maintenance of transmission grid), ISO tariff (cost related to the ISO operation), system service cost (the end users pay directly to the providers of ancillary services), cover of energy of losses (the end users pay directly to the providers of ancillary services
- **Bulgaria**: Primary, Secondary and Tertiary reserves only include cost for capacity.

- **Germany**: Secondary reserve and Tertiary reserve cover costs for capacity only.
- **Hungary**:
    - Total congestion rents on inter-connections are taken into account by regulatory authorities when approving the methodology for calculating network tariffs for the OPEX of system operation - not system-services - similar to ITC. This revenue always reduces the next year's tariff.
    - The difference between the realized and planned (at the tariff determination) profit of the system balancing reduces/increases the next second year's tariff for ancillary services.
- **Nordic countries:** "Secondary reserve" does not exist in the Nordic countries, with the exception of Denmark West, which is connected to the continental system
- **Poland**: Stranded costs i.e. cost resulting from compensations paid to energy producers for dissolving (early termination) long term energy sales contracts concluded in the past with a single buyer company. The long term contracts obliged energy producers to modernize their production units, adjusting them to environmental standards. Those costs are recovered by a transitory charge in the Tariff.
- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Spain**: System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.
- **Switzerland**: Other costs are cost- covering feed-in remuneration fee for renewable energy and water-adder.

Comparison of transmission tariffs: split between components related to TSO activities and other regulatory charges

Euro per MWh



	AT	BE	BH	BG	HR	CZ	DK	EE	FI	FR	DE	GB	GR	HU	IE	IT	LV	LT	LU	MK	NL	NI	NO	PL	PT	RO	RS	SK	SI	ES	SE	CH
400-380 kV	5,40	9,91	6,95	14,6		12,4	30,9	-	4,14	3,44	6,72	8,15	14,7	7,14	10,8	9,74	6,29	9,74	-	4,43	3,70		4,61	8,40	17,7	11,4	-	16,2	-	10,3	4,12	13,1
220-150 kV	3,28	9,91	6,95	14,6		12,4	30,9	-	4,14	5,97	6,72	8,15	14,7	7,14	10,8	9,74	-	-	5,04	4,43	6,80	11,5	4,61	8,40	17,7	11,4	3,44	16,2	-	10,3	4,12	13,15
132-50 kV	-	10,9	6,95	-	9,63	12,4	30,9	9,50	4,14	10,0	-	8,15	-	7,14	10,8	-	6,29	9,74	9,35	4,43	-	11,5	4,61	13,2	-	11,4	3,44	16,2	6,02	-	-	-
400-380 kV	5,40	4,55	4,67	8,27		12,4	9,90	-	3,91	3,34	6,22	7,89	7,07	7,14	10,8	9,74	6,29	9,74		4,43	3,90		4,61	5,73	7,90	6,77		16,2	-	10,2	4,12	9,49
220-150 kV	3,28	4,55	4,67	8,27		12,4	9,90	-	3,91	5,80	6,22	7,89	7,07	7,14	10,8	9,74	-		3,79	4,43	6,80	11,5	4,61	5,73	7,90	6,77	3,41	16,2	-	10,2	4,12	9,49
132-50 kV		5,57	4,67		9,62	12,4	9,90	9,50	3,91	9,79	-	7,89	-	7,14	10,8	-	6,29	9,74	8,10	4,43	-	11,5	4,61	10,5		6,77	3,41	16,2	3,27	-	-	

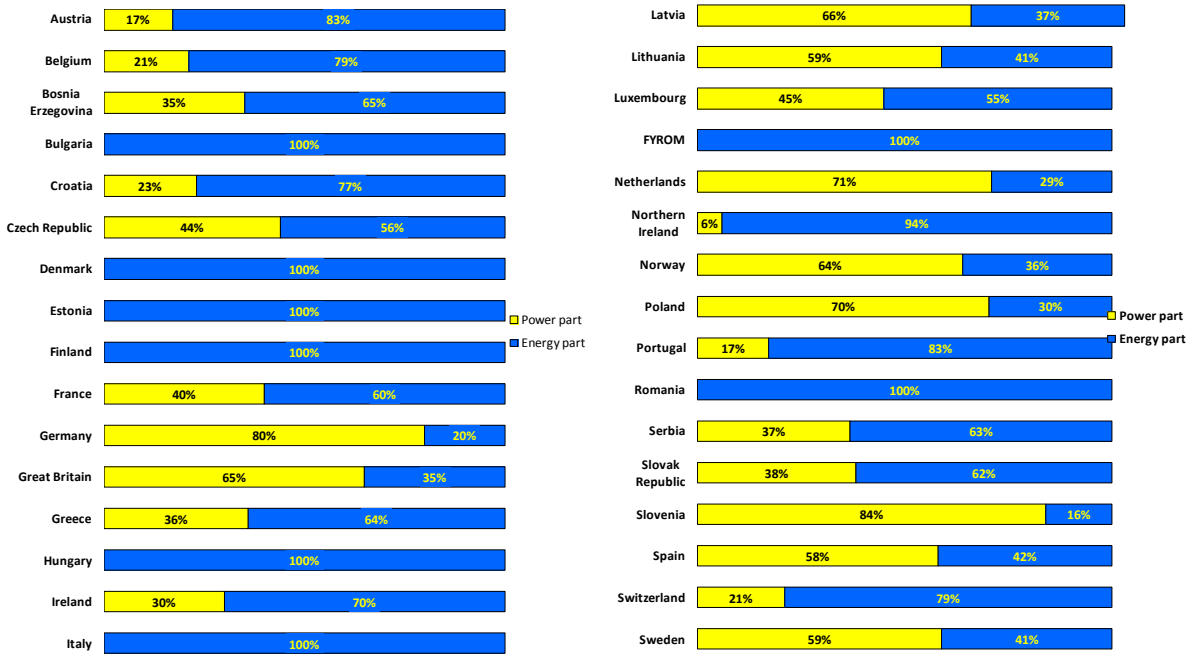
Costs related to TSO activities: infrastructure (capital and all operation charges), losses, system services, congestion.

Other regulatory charges not directly related to TSO activities: stranded costs, public interest contribution, renewable energy and other. Detailed in appendix 5.

Remarks:

- In this chart three voltage ranges are taken into consideration (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For those countries where more than one transmission tariff is applied for the different transmission voltage levels, it results in one different bar for each tariff applied to the corresponding voltage level.
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).

Energy-related components and power-related components in the transmission tariff



Remarks:

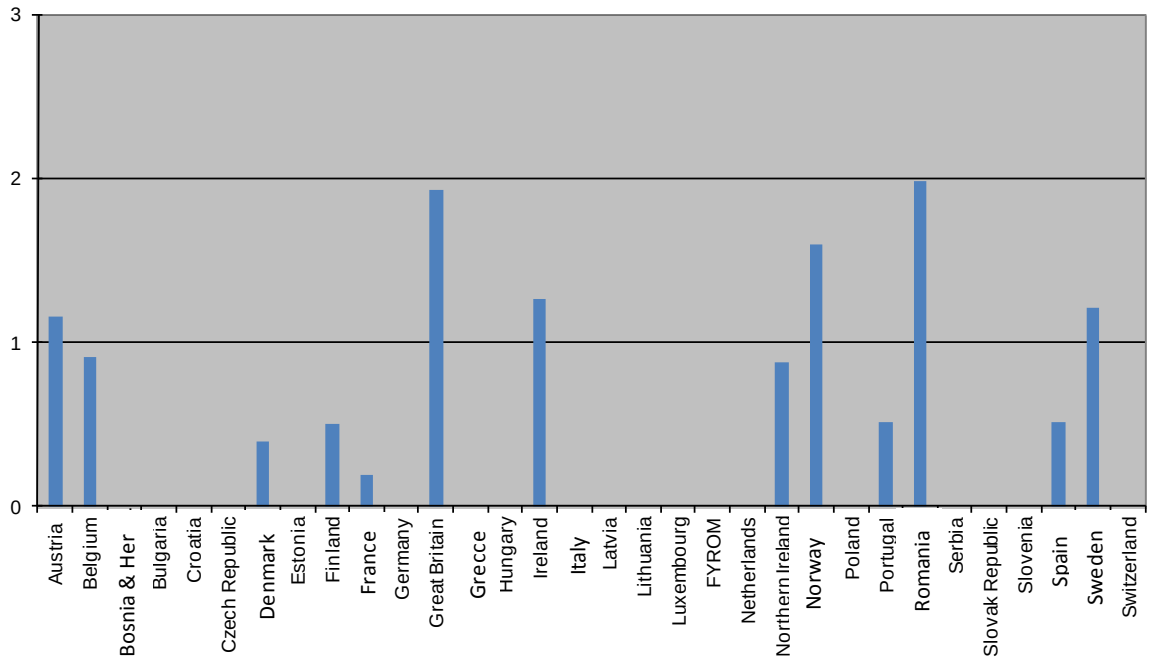
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For any transmission system user connected to the highest voltage level in each country.
- The values have been rounded.

Country remarks:

- **Bosnia and Herzegovina**: The above ratio apply only for Transco tariff (cost related to the maintenance of transmission grid)
- **Belgium**: the cost of losses has been added, but is not included in the TSO-tariffs for users connected at EHV.
- **Germany**: weighted average, KWK-G surcharge (combined cycle co-generation) not included.
- **Poland:** Values given include other burdens, i.e. not only TSO related costs. The share without other burdens would be respectively 56,6 % (power) and 43.4% (energy).
- **Spain**: percentages corresponding only to access tariffs without losses and system services.
- **Switzerland:** The fix part of the tariff for this example with one connection point represents 7%.

Range of G components paid in 2012 by producers across Europe

Euro per MWh



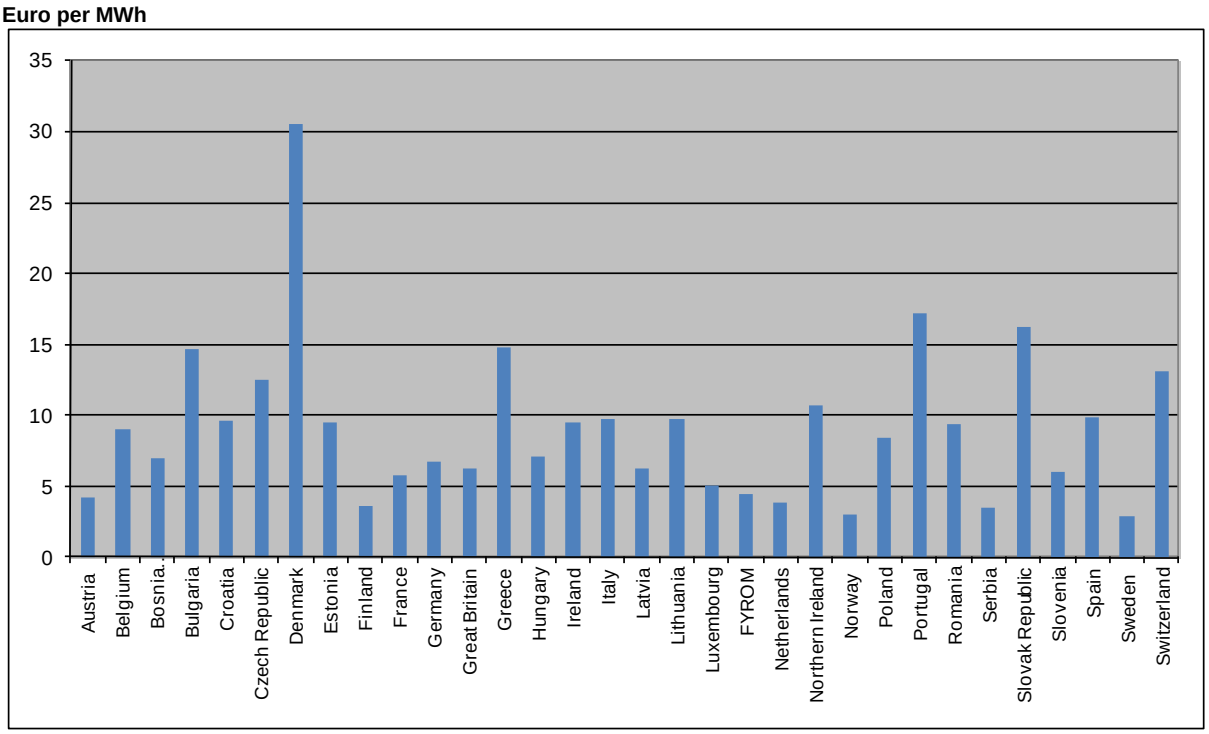
Remarks:

- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For any transmission system user connected to the highest voltage level in each country.

Country remarks:

- **Great Britain**: Generation tariffs range from 25.59 €/kW in West Scotland to -7.20 €/kW in Central London. The average weighted TNUoS generation tariff is around 4.56 €/kW. The contribution from BSUoS charges has not been included.
- **Spain:** actually there are two charges for generators:
    - The charge corresponding to the access tariff for generators established in 0,5 €/MWh.
    - Since 1st of June 2012 generators above 1 MW of capacity installed pay a fee which depends on their available capacity to finance system operator´s activities.

Range of L components paid in 2012 by load across Europe



Remarks:

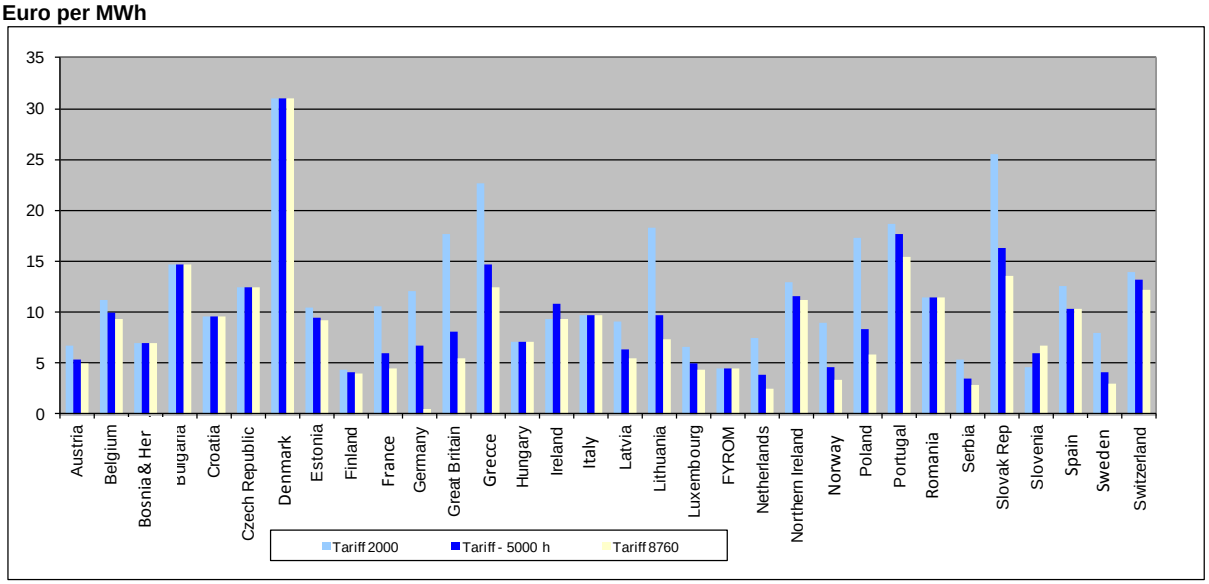
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For any transmission system user connected to the highest voltage level in each country.
- Other regulatory charges are included.

Country remarks:

- **Great Britain**: Demand tariffs range from 6.59 €/kW in the North Scotland to 30.05 €/kW in the Central London zone. The weighted average TNUoS demand tariff is around 23.50 €/kW. The contribution from BSUoS charges has not been included.
- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data).
- **Greece**: The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).
- **Italy**: This figure includes as “System services” the pass through component “Uplift” related to the charge for provision of dispatching services.
- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Spain**: According to the regulation the cost of renewable support are included in the main part of access tariffs. It must be noted that this cost is not included in the part of the access tariff dedicated to other cost (in the regulation this part is named “costs with specific allocation” see appendix 5). System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market.

Comparison of transmission tariffs G+ L: impact of utilisation time

Euro per MWh



Remarks:

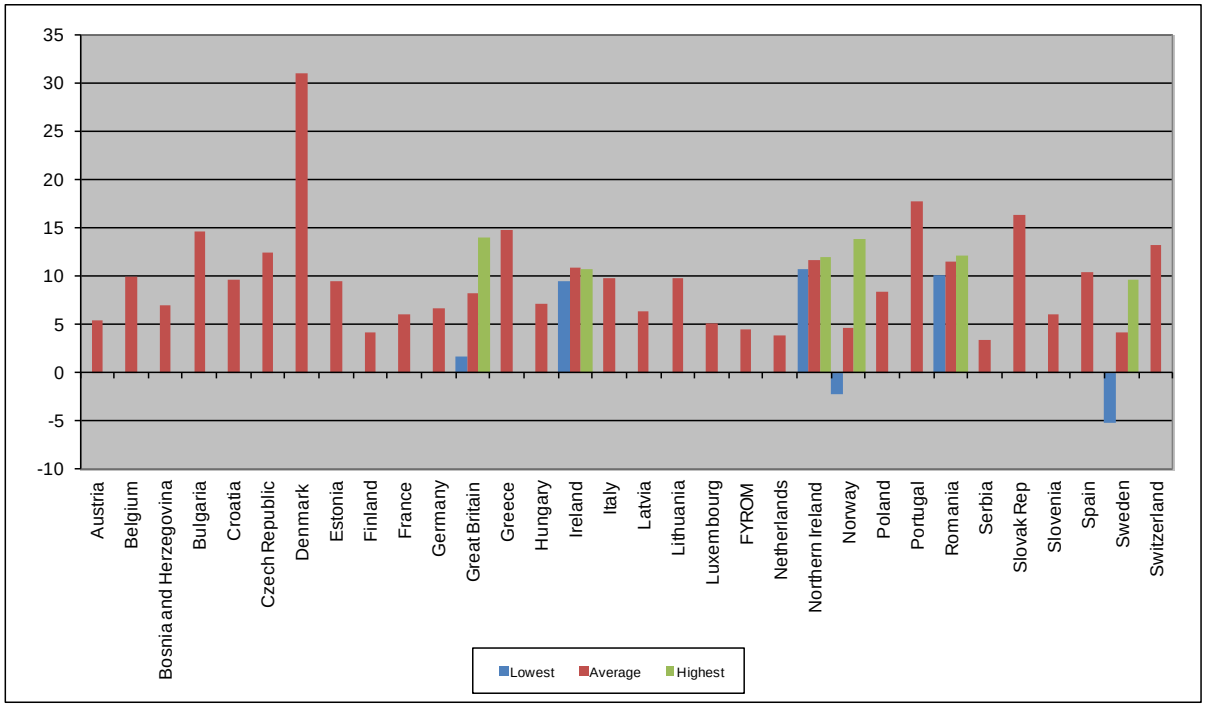
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5) but taking into account the effect of the utilization time.
- For any transmission system user connected to the highest voltage level in each country.
- Other regulatory charges are included.
- For most TSOs a typical customer is a DSO with a seasonal load profile. Neither full annual utilization time of 8760h nor low utilization time 2000h are cases that occur in the grid. Results for these utilization times are presented for hypothetical, comparison purposes only, to present how fixed components of the tariffs impact the average transmission charges.

Country Remarks:

- **Estonia**: Seasonal tariff only for 110 kV
- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data).
- **Greece:** The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).
- **Italy**: This figure includes as “System services” the pass through component “Uplift” related to the charge for provision of dispatching services
- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Spain:** System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.

Comparison of transmission tariffs G+ L: impact of location

Euro per MWh



Remarks:

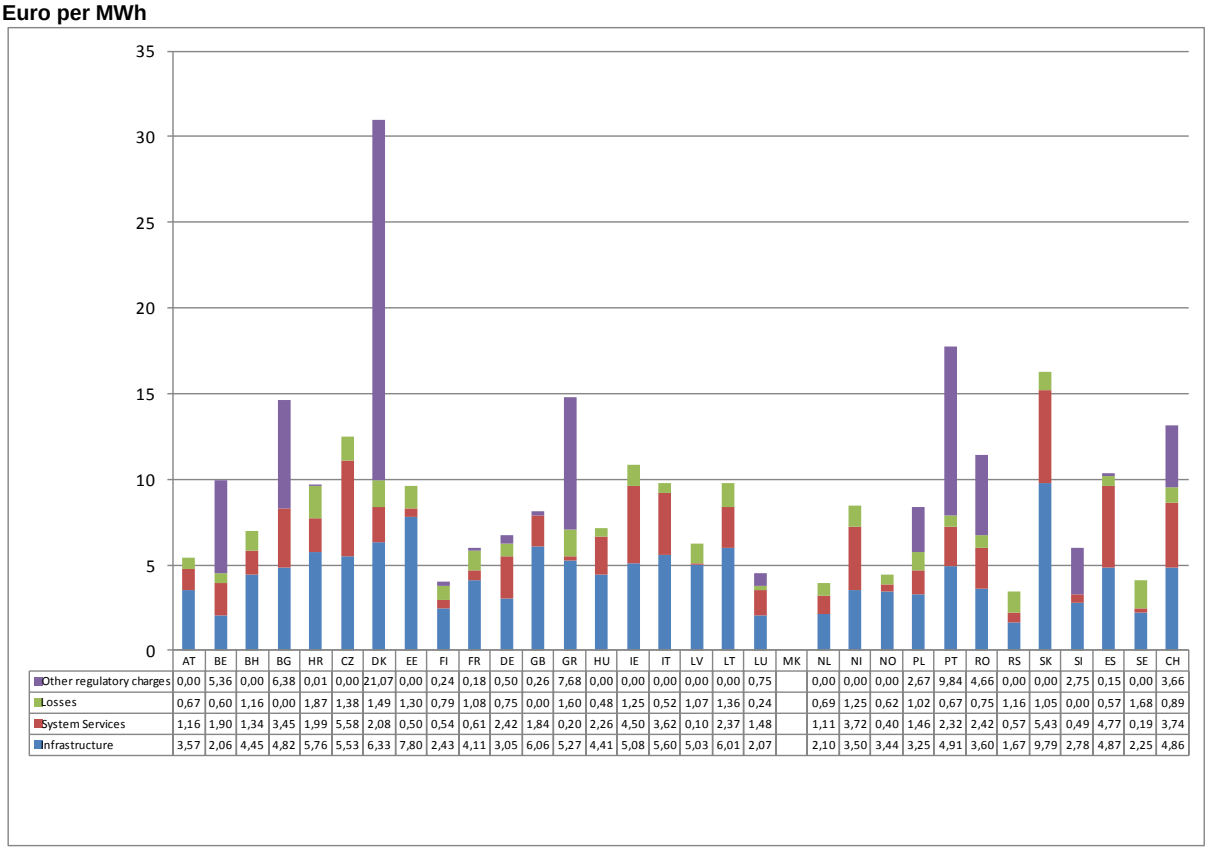
- The example taken for this comparison is the base case (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- For any transmission system user connected to the highest voltage level in each country.
- Other regulatory charges are included
- See also Appendix 4. Definition of the tariff areas in countries with generation/consumption geographic zonal differentiation.

Country Remarks:

- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data).
- **Greece**: The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).
- **Italy**: This figure includes as “System services” the pass through component “Uplift” related to the charge for provision of dispatching.

Components of transmission tariffs

Euro per MWh



	AT	BE	BH	BG	HR	CZ	DK	EE	FI	FR	DE	GB	GR	HU	IE	IT	LV	LT	LU	MK	NL	NI	NO	PL	PT	RO	RS	SK	SI	ES	SE	CH
Other regulatory charges	0,00	5,36	0,00	6,38	0,01	0,00	21,07	0,00	0,24	0,18	0,50	0,26	7,68	0,00	0,00	0,00	0,00	0,00	0,75		0,00	0,00	0,00	2,67	9,84	4,66	0,00	0,00	2,75	0,15	0,00	3,66
Losses	0,67	0,60	1,16	0,00	1,87	1,38	1,49	1,30	0,79	1,08	0,75	0,00	1,60	0,48	1,25	0,52	1,07	1,36	0,24		0,69	1,25	0,62	1,02	0,67	0,75	1,16	1,05	0,00	0,57	1,68	0,89
System Services	1,16	1,90	1,34	3,45	1,99	5,58	2,08	0,50	0,54	0,61	2,42	1,84	0,20	2,26	4,50	3,62	0,10	2,37	1,48		1,11	3,72	0,40	1,46	2,32	2,42	0,57	5,43	0,49	4,77	0,19	3,74
Infrastructure	3,57	2,06	4,45	4,82	5,76	5,53	6,33	7,80	2,43	4,11	3,05	6,06	5,27	4,41	5,08	5,60	5,03	6,01	2,07		2,10	3,50	3,44	3,25	4,91	3,60	1,67	9,79	2,78	4,87	2,25	4,86

Remarks:

- The figures in the chart are estimates of the value of each final price component.
- The base case is taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- System services include system balancing where it applies.
- For any transmission system user connected to the highest voltage level in each country.

Country remarks:

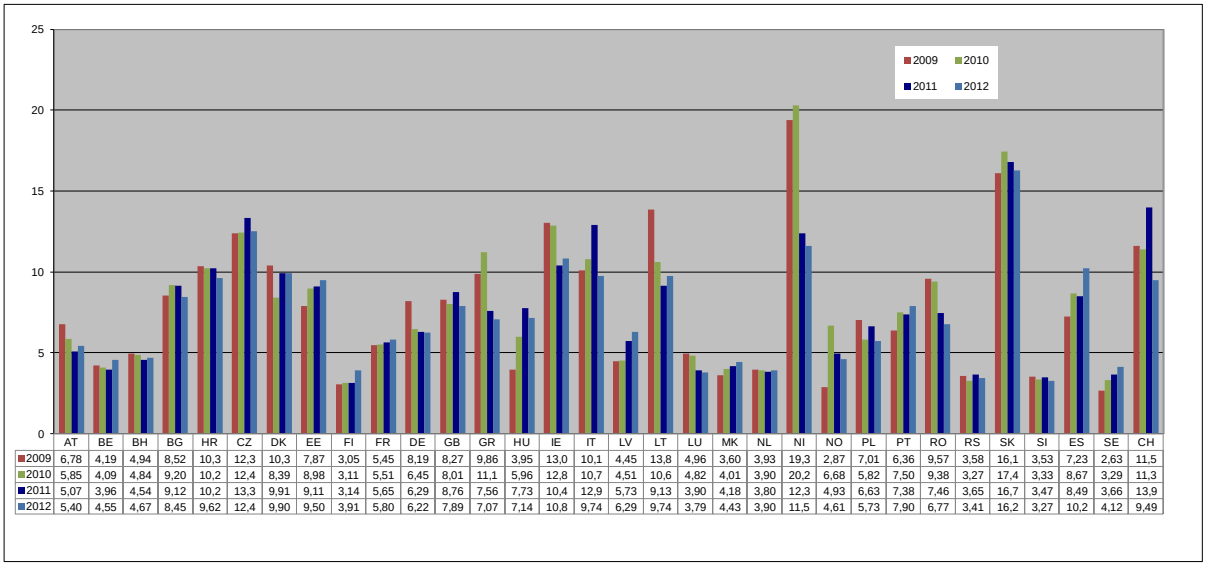
- **Bosnia and Herzegovina**: Infrastructure cost (Transco tariff), System services (ISO tariff and cost of system services), Losses (cost of losses)
- **Netherlands**: the price of losses is not public so the value taken is an average within the range in which it is included (see Appendix 2: Comparison of network losses)
- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data). There is no specific allocation of system services or losses cost to any specific tariff, the values here are purely indicative.
- **Great Britain**: data for losses are not available.
- **Greece**: The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).
- **Hungary**: Losses are part of transmission system operation tariff. It is set in the justified cost of losses by the Regulator in the yearly tariff.
- **Netherlands**: the cost of losses is part of the transmission tariff so the value of the chart is only estimation.

- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Ireland**: transmission losses are accounted for in the market however an estimated cost has been included here purely for comparison purposes.
- **Italy**:
    A. The tariff component “System Services” includes the pass-through component “Uplift” related to charge for provision of dispatching service.
- **FYROM**: the splitting of the total invoice is not available.
- **Spain**: According to the regulation the cost of renewable support are included in the main part of access tariffs. It must be noted that this cost is not included in the part of the access tariff dedicated to other cost (in the regulation this part is named “costs with specific allocation” see appendix 5). System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market.
- **Slovenia**: losses included in the transmission fee, no splitting available
- **Switzerland**:
    - System services: cover general ancillary services and part (without loss compensation) of individual ancillary services
    - Other costs: Cost-covering feed-in remuneration fee and water-adder

Transmission tariffs evolution only TSO costs

Constant Euros of 2012

Euro per MWh



	AT	BE	BH	BG	HR	CZ	DK	EE	FI	FR	DE	GB	GR	HU	IE	IT	LV	LT	LU	MK	NL	NI	NO	PL	PT	RO	RS	SK	SI	ES	SE	CH
2009	6,78	4,19	4,94	8,52	10,3	12,3	10,3	7,87	3,05	5,45	8,19	8,27	9,86	3,95	13,0	10,1	4,45	13,8	4,96	3,60	3,93	19,3	2,87	7,01	6,36	9,57	3,58	16,1	3,53	7,23	2,63	11,5
2010	5,85	4,09	4,84	9,20	10,2	12,4	8,39	8,98	3,11	5,51	6,45	8,01	11,1	5,96	12,8	10,7	4,51	10,6	4,82	4,01	3,90	20,2	6,68	5,82	7,50	9,38	3,27	17,4	3,33	8,67	3,29	11,3
2011	5,07	3,96	4,54	9,12	10,2	13,3	9,91	9,11	3,14	5,65	6,29	8,76	7,56	7,73	10,4	12,9	5,73	9,13	3,90	4,18	3,80	12,3	4,93	6,63	7,38	7,46	3,65	16,7	3,47	8,49	3,66	13,9
2012	5,40	4,55	4,67	8,45	9,62	12,4	9,90	9,50	3,91	5,80	6,22	7,89	7,07	7,14	10,8	9,74	6,29	9,74	3,79	4,43	3,90	11,5	4,61	5,73	7,90	6,77	3,41	16,2	3,27	10,2	4,12	9,49

Remarks:

- The base case is taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- Prices updated to € 2012 (31st December).
- CPI used for each country is the published in Eurostat.
- For countries not in the Euro zone the exchange rate to € in December 31st 2012 is used.
- For any transmission system user connected to the highest voltage level in each country.

Country remarks:

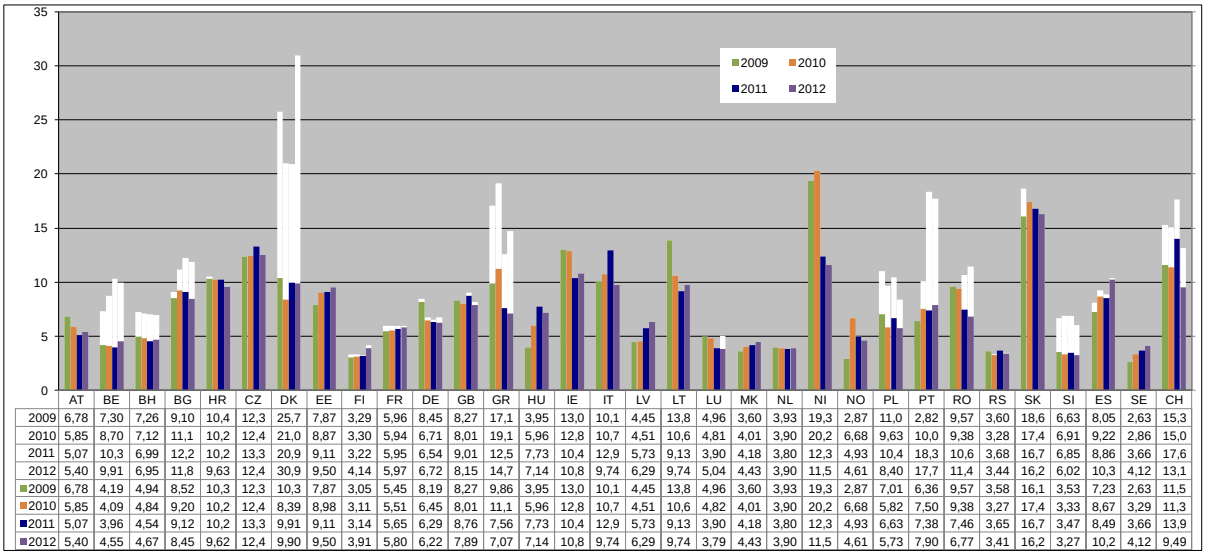
- **Belgium**:
  - Inflation effect because of fixed tariffs over 4 years (new tariff period as from 2012)
  - Rising investment costs due to energy policy (offshore grid)
  - Rising costs for ancillary services due to intermittent generation
  - Less congestion revenues due to market coupling
  - Decrease in offtake of the Elia-grid due to local generation
  - Higher levies following political decisions

- **Denmark**:
  - Danish transmission tariffs are based on estimated (budget) costs and revenues.
  - As Energinet.dk's economy is based on a break.even principle, under- or overabsorption due to differences between estimated costs and realized costs in earlier years, are to be calculated into the tariffs. In 2011 an underabsorption of 1,2 £/MWh was calculated into tariffs. In 2012 an underabsorption of 1,5 €/MWh is calculated into tariffs.
- **Estonia**: increases mainly caused by the investments in regulated assets
- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data).
- **Greece**: The 2012 tariffs have been estimated because the System Services part has components (for example the ancillary services) that are calculated ex post. The estimation of these values was based on 2011 values. Transmission losses are paid by those who inject energy in the transmission system (generators and importers).

- **Italy:** The tariff value 2012, does not longer include some pass trough components of “system services” not strictly related to this activity.
- **Latvia**: Change regulatory period.
- **Lithuania**: Correction of differentiated tariff miscalculation in 2011.
- **Norway**: 2010 price was extraordinary high due to a change in regulatory conditions, higher infrastructure costs from investments, higher power costs (losses) and underestimated tariffs earlier year.
- **Spain**: According to the regulation the cost of renewable support are included in the main part of access tariffs. It must be noted that this cost is not included in the part of the access tariff dedicated to other cost (in the regulation this part is named “costs with specific allocation” see appendix 5). System services and losses are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.
- **Switzerland**: Most tariff components in Switzerland decreased quite significantly in 2012 compared to 2011. This decrease yields almost 10% for the power part and for the fix part of the grid usage tariff.

Transmission tariffs evolution including non TSO costs

Constant Euros of 2012



	AT	BE	BH	BG	HR	CZ	DK	EE	FI	FR	DE	GB	GR	HU	IE	IT	LV	LT	LU	MK	NL	NI	NO	PL	PT	RO	RS	SK	SI	ES	SE	CH
2009	6,78	7,30	7,26	9,10	10,4	12,3	25,7	7,87	3,29	5,96	8,45	8,27	17,1	3,95	13,0	10,1	4,45	13,8	4,96	3,60	3,93	19,3	2,87	11,0	2,82	9,57	3,60	18,6	6,63	8,05	2,63	15,3
2010	5,85	8,70	7,12	11,1	10,2	12,4	21,0	8,87	3,30	5,94	6,71	8,01	19,1	5,96	12,8	10,7	4,51	10,6	4,81	4,01	3,90	20,2	6,68	9,63	10,0	9,38	3,28	17,4	6,91	9,22	2,86	15,0
2011	5,07	10,3	6,99	12,2	10,2	13,3	20,9	9,11	3,22	5,95	6,54	9,01	12,5	7,73	10,4	12,9	5,73	9,13	3,90	4,18	3,80	12,3	4,93	10,4	18,3	10,6	3,68	16,7	6,85	8,86	3,66	17,6
2012	5,40	9,91	6,95	11,8	9,63	12,4	30,9	9,50	4,14	5,97	6,72	8,15	14,7	7,14	10,8	9,74	6,29	9,74	5,04	4,43	3,90	11,5	4,61	8,40	17,7	11,4	3,44	16,2	6,02	10,3	4,12	13,1
2009	6,78	4,19	4,94	8,52	10,3	12,3	10,3	7,87	3,05	5,45	8,19	8,27	9,86	3,95	13,0	10,1	4,45	13,8	4,96	3,60	3,93	19,3	2,87	7,01	6,36	9,57	3,58	16,1	3,53	7,23	2,63	11,5
2010	5,85	4,09	4,84	9,20	10,2	12,4	8,39	8,98	3,11	5,51	6,45	8,01	11,1	5,96	12,8	10,7	4,51	10,6	4,82	4,01	3,90	20,2	6,68	5,82	7,50	9,38	3,27	17,4	3,33	8,67	3,29	11,3
2011	5,07	3,96	4,54	9,12	10,2	13,3	9,91	9,11	3,14	5,65	6,29	8,76	7,56	7,73	10,4	12,9	5,73	9,13	3,90	4,18	3,80	12,3	4,93	6,63	7,38	7,46	3,65	16,7	3,47	8,49	3,66	13,9
2012	5,40	4,55	4,67	8,45	9,62	12,4	9,90	9,50	3,91	5,80	6,22	7,89	7,07	7,14	10,8	9,74	6,29	9,74	3,79	4,43	3,90	11,5	4,61	5,73	7,90	6,77	3,41	16,2	3,27	10,2	4,12	9,49

Costs related to TSO activities: infrastructure (capital and all operation charges), losses, system services, congestion.

Other regulatory charges not directly related to TSO activities: stranded costs, public interest contribution, renewable energy and other. Detailed in appendix 5.

Remarks:

- The base case is taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- Prices updated to € 2012 (31st December).
- CPI used for each country is the published in Eurostat.
- For countries not being in the Euro zone the exchange rate to € in December 31st 2012 is used.
- For any transmission system user connected to the highest voltage level in each country.

Country remarks:

- **France**: Charges corresponding to the "220-150" voltage level (highest voltage level with statistically representative data).
- **Greece**: The increase of costs not directly related to TSO activities is mainly due to a sharp increase of tariff for costs related to the compensation of RES Units and due to a higher tariff for public services.

Appendixes

1. Voltage level operated by TSO
2. Comparison of network losses: sum of producer and consumer fees connected at EHV, for a utilisation time of 5,000 h
3. Comparison of system services: sum of producer and consumer fees connected at EHV, for a utilisation time of 5,000 h
4. Definition of the tariff areas in countries with generation/consumption geographic zonal differentiation
5. Other regulatory charges not directly related to TSO activities
6. First connection charges
7. Special Tariffs
8. Treatment Final Customers vs Distribution System Operators
9. Reactive Energy

Appendix 1: Voltage level operated by TSO

% km	400-380 kV	220 -150 kV	132-50 kV
Austria (Verbund)	32%	48%	20%
Belgium (Elia)	15%	47%	38%
Bosnia and Herzegovina	15%	26%	59%
Bulgaria (NEK)	16%	19%	64%
Croatia	17%	17%	66%
Czech Republic (CEPS)	68%	31%	1%
Denmark (Energinet.dk)	28%	48%	24%
Estonia (Elering)	30%	4%	67%
Finland (Fingrid)	30%	18%	52%
France (RTE)	20%	26%	53%
FYROM	27%	6%	67%
Germany	58%	42%	0%
Great Britain (NGT)	52%	27%	22%
Greece (ADMIE)	28%	72%	0%
Hungary (Mavir)	59% (+6% 750kV)	30%	5%
Ireland (EirGrid)	6%	28%	64%
Italy (Terna)	19%	81%	0%
Latvia Augstsprieguma Tikls)	24% (330 kV)		76%
Lithuania (Litgrid)	25%	0%	75%
Luxembourg	0%	100%	0%
Netherlands (TenneT)	33%	67%	0%
Northern Ireland (SONI)	0%	38%	62%
Norway (Statnett)	74%	0%	26%
Poland (PSE Operator)	39% (+1% 750 kV)	59%	1%
Portugal (REN)	27%	73%	0%
Romania (Transelectrica)	55%	45%	0%
Serbia (EMS)	17%	21%	62%
Slovak Republic (SEPS)	67%	31%	2%
Slovenia (Eles)	20%	13%	67%
Spain (REE)	52%	48%	0%
Sweden (Svenska K.)	69%	26%	5%
Switzerland	27%	73%	0%

Remarks:

- Percentages calculated as the ratio between the kilometers of circuits for each voltage level and the total kilometers of circuits operated by each TSO.
- Values have been rounded.
- Denmark: About 6% of the total circuits under the operation of Energinet.dk are within the range 380-220kV.
- Latvia. Highest voltage level operated in Latvian TSO is 330kV.
- Sweden: the figure of the last column corresponds to HVDC not at 132-50 kV.

Appendix 2: Comparison of network losses

Losses (€/MWh)	COUNTRY
below 0.7	**Austria**
	Belgium
	Bulgaria
	Hungary
	Italy
	Luxembourg
	Netherlands
	Portugal
	Spain
0.7<…<1	**Finland**
	Germany
	Norway
	Romania
	Switzerland
above 1	**Bosnia and Herzegovina**
	Croatia
	Czech Republic
	Denmark
	Estonia
	France
	Greece
	Ireland
	Latvia
	Lithuania
	Northern Ireland
	Poland
	Serbia
	Slovak Rep
	Sweden

Remarks:

- The base case is taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).

Country remarks:

- **Bosnia and Herzegovina**: End users (through Balance responsible parties) pay to the providers of ancillary services energy for cover of network losses.
- **France**: there is no specific allocation of system services nor losses costs to any specific tariff, the values here are purely indicative.
- **Greece**: Transmission losses are paid by those who inject energy in the transmission system (generators and importers), however an estimated cost has been included here for comparison purposes.
- **Ireland**: transmission losses are accounted for in the market however an estimated cost has been included here purely for comparison purposes.
- **Italy**: In Italy, cost of network losses is recovered through the energy price. However an estimated cost has been included here purely for comparison purposes.
- **Netherlands**: Losses are part of transmission tariff; the value given is only estimation.
- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.
- **Spain**: Losses are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.

Appendix 3: Comparison of system services

System Services (€/MWh)	COUNTRY
below 0.5	**Greece**
	Latvia
	Norway
	Slovenia
	Sweden
0,5<---<1	**Estonia**
	Finland
	France
	Serbia
1<---<3	**Austria**
	Belgium
	Bosnia and Herzegovina
	Croatia
	Denmark
	Germany
	Great Britain
	Hungary
	Ireland
	Lithuania
	Luxembourg
	Netherlands
	Poland
	Portugal
	Romania
above 3	**Bulgaria**
	Czech Republic
	Italy
	Northern Ireland
	Slovak Rep
	Spain
	Switzerland

Remarks:

- The base case is taken (see Methods and hypotheses chosen for ENTSO-E overview on page 5).
- These figures cover the system services listed on the table Costs included in the comparison of transmission tariffs on page 9.

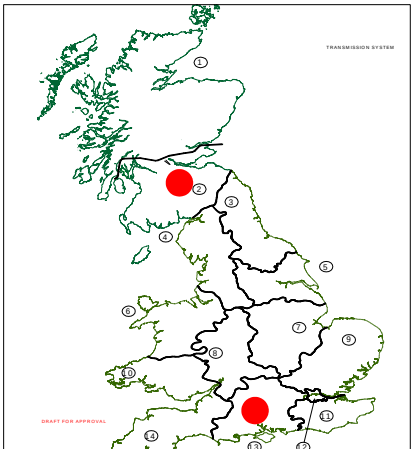
Country remarks:

- **Bosnia and Herzegovina**: End users pay system services directly to the provider of ancillary services. System balancing is not included in the system services.
- **France**: there is no specific allocation of system services or losses cost to any specific tariff, the values here are purely indicative.
- **Portugal**: Losses costs and system-services costs are not recovered by a regulated tariff they are recovered in the energy price. They have been included only for comparison purposes.

- **Spain**: System services are not included in the transmission tariff as they are recovered in the energy price in the market. They have been included only for comparison purposes.

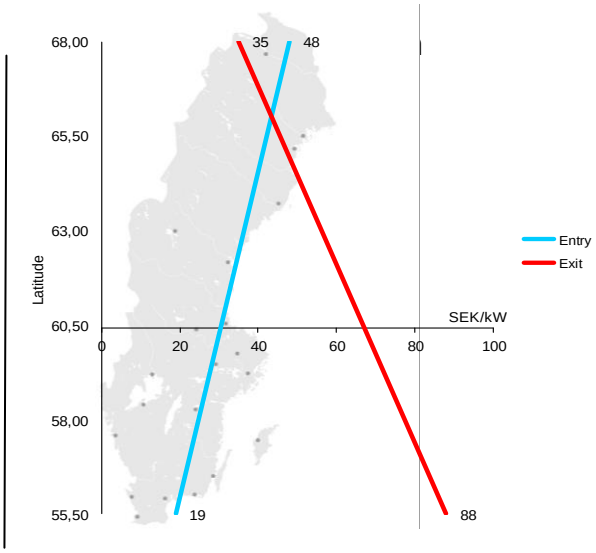
Appendix 4: Definition of the tariff areas in countries with generation/consumption geographic zonal differentiation (i)

England and Wales



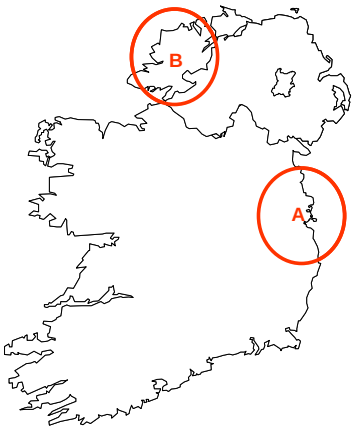
North area: Northern Scotland
South area: South of England

SWEDEN



The annual entry fees decreases linearly with the latitude to SEK 19/kW in the south. For the exit fees the reversed principle applies.

Ireland



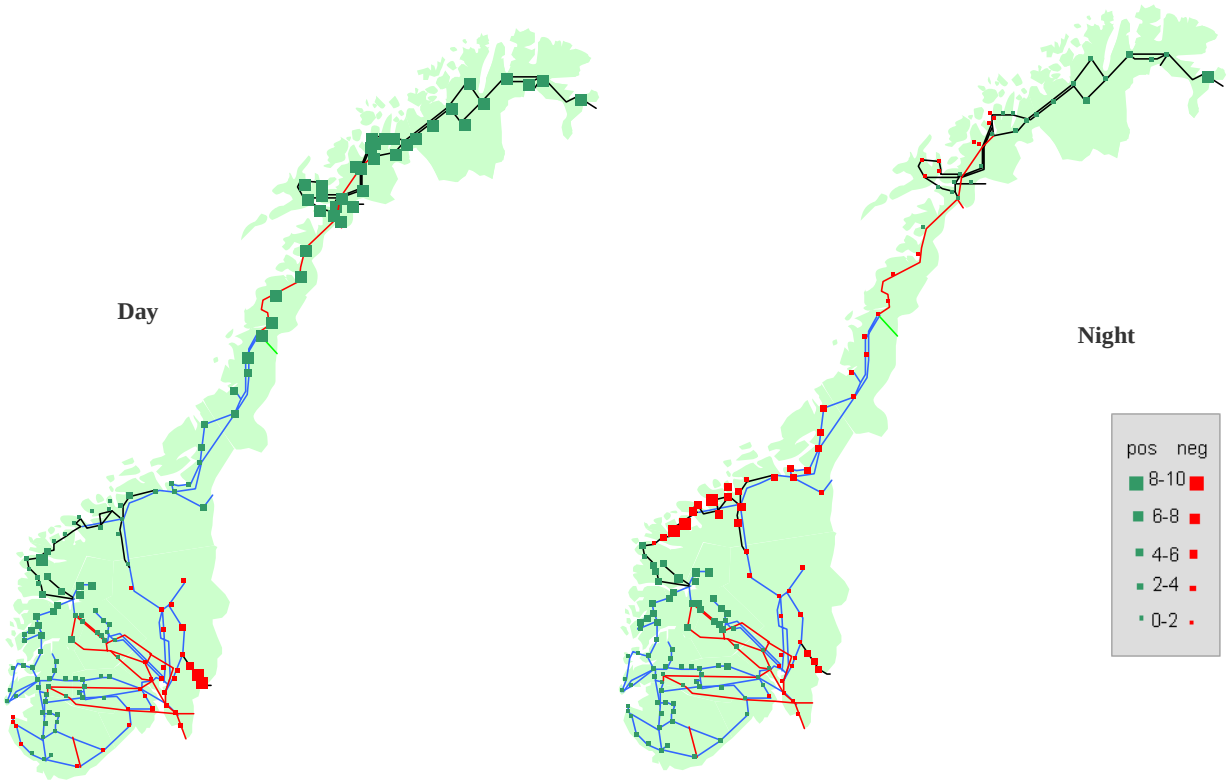
Highest case (A): G located in Dublin (surplus area)
Lowest case (B): G located in Donegal (shortage area)

Norway

(Marginal loss factors (MLF) week 7- 2007)

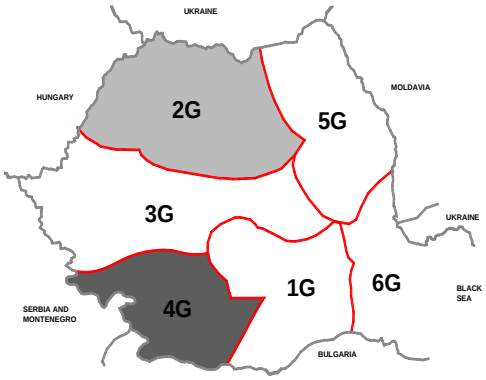
MLFs are symmetrical, i.e. MLF*input* = - MLF*output*

The MLFs below represent MLF*input*

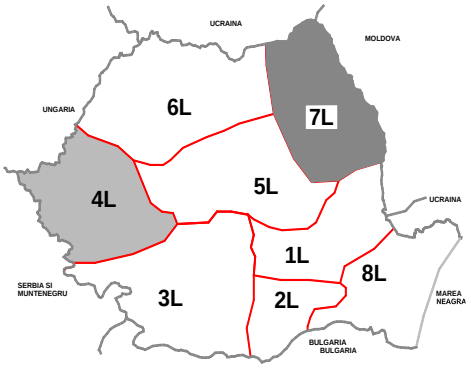


*The energy element (€/MWh) = Marginal loss factors (%) * market price (€)*

Romania



6 Generation zones highlighting the generation surplus area (4G) and generation deficit area (2G)
4G – highest G value
2G – lowest G value



8 Load zones highlighting the load deficit area (4L) and load surplus area (7L)
4L – lowest L value
7L – highest L value

Appendix 5: Other regulatory charges not directly related to TSO activities

Belgium:

5,3636 €/MWh related to:

- Levy for federal contribution,
- Levy for financing connection of offshore wind turbine parks
- Levy for financing green certificates

Bosnia and Herzegovina:

Currently NOS BiH (Independent System Operator) and Elektroprenos BiH (Transco) are not responsible for the purchase of losses, secondary reserves, tertiary reserves... Respective costs are included in the price which consumers pay directly to service providers, but those cost are included in syntehtic values of „TSO tariffs“ in this report.

All licence holders (including Transco and ISO) are obliged to pay yearly fixed amounts to Regulatory Authorities which issued license to cover their administrations costs.

Bulgaria:

3.8 €/MWh - the charge for green energy was introduced in 2009 and covers the difference between the feed in tariffs for RES and the base price determined by the Regulator.

1.71 €/MWh - the charge for cogeneration was introduced in 2011 and covers the difference between the feed in tariffs for CHP and the base price determined by the Regulator

0.87 €/MWh - the charge for stranded cost was introduced in 2012 and covers the difference between the prices in Long Term Purchase Agreements and the base price determined by the Regulator

Croatia:

Regulator’s activities: 0,0066 EUR/MWh (percentage of revenues of the previous year)

Czech Republic:

16,511 €/MWh related to:

- Support of Renewable energy sources and Combined generation of electricity and heating (16,25 €/MWh):
- Market Operator + Energy Regulatory Office (0,261 €/MWh)

Denmark:

- The PSO (Public Service Obligation) tariff was 20,62 €/MWh on average in 2012:
    - Direct subsidies to producers of environmentally friendly energy (91%).
    - Indirect subsidies (3%)
    - Research & development into environmentally friendly energy (4%).
    - Different public charges and other expenses (2%)

- Administration costs regarding the PSO are due to Danish legislation allocated to the System tariff (0.26 €/MWh).

- Payment to the Danish Energy Regulatory Authority and to the Danish Energy Agency to cover their administrations costs (0.18 €/MWh)

Finland:

Peak load capacity fee for consumption 0,23 €/MWh. (data estimated)

France:

For the case base this is 0.18 €/MWh. In 2005, the pensions system of people working in the gas and electricity industry was globally reformed. For the transmission tariff, it implied the creation of what is called in French, CTA, Contribution Tarifaire Additionnelle (Additional Tariff Contribution). It is calculated on the fixed part of the tariff (power part of the transmission tariff). All the customers pay the “CTA” which does not cover any RTE cost

Germany:

Extra charge for extra costs according to the German law “Gesetz für die Erhaltung, die Modernisierung und den Ausbau der Kraft-Wärme-Kopplung” **(KWK-G**), Modified Law for Combined Heat and Power Production Promotion. The level of this charge here is at least **0.25 Euro /MWh** applied to all utilisation times and voltage levels.

Extra charge for extra costs according **§ 19 sec. 2** for fee exemptions and individual tariffs of the German Grid Tariff Regulation Ordinance “Stromnetzentgeltverordnung” (StromNEV), The level of this charge here is at least **0.25 Euro /MWh** applied to all utilisation times and voltage levels.

Great Britain:

The non-TSO costs of 0.26 €/MWh comprises of High Electricity Distribution Costs Energy Consumption Tariff (this recovers an assistance amount, which is passed to the Relevant Distributor in certain areas with high distribution costs) and Licence Fees.

Greece:

Total average charge is 7.75 €/MWh. It is a sum of Public Service Obligations (4.14 €/MWh) and costs related to the compensation of RES Units and the cost for the coverage of the Use of System charge for RES units. For the year 2012 the tariff related to RES units is 3.54 €/MWh. The cost related to the Regulatory Authority is 0.07 €/MWh.

Luxembourg:

The tax " Fonds de compensation " (0,75 €/MWh for consumers ≥ 65kV) serves for encouraging and for subsidizing the projects of production of national electrical energy on base of renewable sources of energy or the cogeneration.

The tax "Taxe Electricité" is used to the financing of the “Assurance dépendance”.

0,50 €/MWh (consumers cat. B)*
0,10 €/MWh (consumers cat. C)*

* cat. B: consumers > 25 MWh, except those belonging to cat. C
cat. C: consumers > 25 MWh, electricity mainly used for the chemical reduction and the electrolysis as well as in the metallurgical procedures.

Poland:

Stranded costs i.e. cost resulting from compensations paid to energy producers for dissolving (early termination) long term energy sales contracts concluded in the past with a single buyer company. The long term contracts obliged energy producers to modernize their production units, adjusting them to environmental standards. Those costs are recovered by a transitory charge in the Tariff. The average value for the base case is 2,67 €/MWh.

Portugal:

9.84 €/MWh related to:

- Hydropower station land, 0.46 €/MWh
- Surplus costs for the remaining Power Purchase Agreements (PPAs) 2.60 €/MWh
- Island’s tariff convergence costos, 4.01 €/MWh
- Regulator costs, 0.11 €/MWh
- Interruptibility 0.64 €/MWh
- Capacity payments, 1.80 €/MWh
- Incentives related with consumption efficiency, 0.22 €/MWh

Romania :

The Contribution for promotion of cogeneration based on useful heat demand in the internal market (4,3 €/MWh) was introduced beginning with 1st of April 2011.

Serbia:

Payment for Regulator's activities: 0.0263 EUR/MWh

Slovenia:

2,755 €/MWh regarding:

- Power Market Operator's activities (0.13 €/MWh),
- Regulator's activities (0.17 €/MWh)
- Renewable energy (2,073 €/MWh)
- Domestic resources (0,382 €/MWh)

Spain:

During 2012 two Ministerial Orders setting access tariffs were published for different periods in the year. These costs are included as a percentage of the access tariffs. For the base case the weighted charge is 0.15 €/MWh being these costs the following:

- Permanent costs = 0.01 €/MWh.
- Diversification and security of supply cost = 0.14 €/MWh.

Switzerland:

Surcharge on the transmission costs to cover the costs arising from cost-covering feed-in remuneration is equal 2.84 €/MWh.

A water-adder (for hydrological accompanying measures) is equal 0.81 €/MWh.

Appendix 6: First connection charges

First connection charges can be:
- Shallow: only for the connection line and other equipments belonging to the connection
- Deep: connection line and other equipments belonging to the connection plus the investment costs in the grid due to the connection that has to be borne by the TSO

First connection charges have an impact on the tariff for use of the system since in case of a “deep” approach the concerned costs in the grid are not to be socialized in the tariff.

Country	First connection charges are “Shallow” or “Deep”?
Austria	**Deep**. Grid user builds own connection line. If grid reinforcements are necessary the user has to pay for this
Belgium	**Shallow**
Bosnia and Herzegovina	**Shallow**
Bulgaria	**Shallow**
Croatia	**Deep** First connection costs can be charged just for the connection line and other equipments belonging to the connection (“Shallow”) or including the investment costs the TSO has in the grid due to the connection (“Deep”). There is an impact on the tariff for use of the system since in case of a “Deep” approach the concerned costs in the grid are not to be socialized in the tariff, so the tariff will be lower.
Czech Republic	**Shallow.** Customer pays connection lines up to connecting point of TSO. New generation pay a lump sum connection fee of 19.952€/installed MW, New consumption pay a lump sum connection fee of 7.981€/installed MW
Denmark	**Shallow** to partially **Shallow** (in some cases charges are calculated to a fictitious point that can be closer than the physical connection point)
Estonia	**Deep.** All the equipment, belonging to the connection + all reinforcements, needed prior to the connection are included in the connection fee.
Finland	**Shallow** in most cases, but a possibility to **Deep** in exceptional cases.
France	**Shallow**. The first connection is made to the nearest substation where the appropriate voltage level is available and where this connection is technically possible. No locational differentiation, charges based on actual costs. Generators pay 100 % of the cost, consumers pay 70 % of the cost of their main connection.
Germany	**Deep** (customers) **shallow** (power plants)
Great Britain	**Shallow**
Greece	**Shallow**
Hungary	**Partially Deep** Establishing a new connection for a generator incurs a maximum 100% of investment costs charged, same for a single customer is a maximum 70% or 1 million HUF/MVA (3214EUR/MVA, exchange rate: 311,13 HUF/EUR), whichever larger. Multiple generators and/or customers on the new connection are charged proportionally. If the generator declares it used at least 70 % of renewable energy for its production per year, it pays only 70 % of the investment costs, and if this value is at least 90 %, it pays only 50 % of the investment costs.
Ireland	**Shallow to Partially Deep**. The connection charge is based on the Least Cost Chargeable shallow connection method. However the Least Cost Chargeable shallow connection method depends on the availability of appropriate transmission infrastructure in the area e.g. voltage level etc. Charges can also include station common costs or station extension costs (if higher). Demand customers pay only 50% of the charge, generators 100%.
Italy	**Shallow**. Grid user bears the cost of his own connection line. Enhancements of the grid are socialized in tariff.
Latvia	**Deep.** Grid users builds own connection line. All connection equipment and reinforcement are included in the connection fee.
Lithuania	**Deep** (100% of investment costs for customers and 100% for Generators. Exceptions are for connection of renewable generators)
Luxembourg	**Shallow** Grid user has to pay for his own connection line and substation. General

	reinforcements of the grid are socialized in tariff
FYROM	**Shallow** Grid user has to pay for the connection line other equipments belonging to the connection. General reinforcements of the grid are socialized in tariff.
Netherlands	**Shallow**
Northern Ireland	**Shallow**
Norway	**Shallow**
Poland	**Shallow.** The enterprise which is going to be connected pay for all the expenditures to build the connection site which contains extension or rebuilding costs for the substation (if necessary). The reinforcement and development of existing network is performed by TSO. Connection charges are: • Final customers (load) pay 25% of investment expenditures. • RES units of installed capacity <=5MW pay 50% of investment expenditures. • Co-generation units of installed capacity <=1MW pay 50% of investment expenditures Other generators and distribution companies pay 100% of investment expenditures.
Portugal	**Shallow**
Romania	**Deep**
Serbia	**Shallow:** Generators and distributors pay for connection lines aimed at meeting security criteria (the most frequent case is the building of 'in-out' connection toward an existing line) and for substation. **Deep**: Industrial customers, in addition to payment for connection lines and substations, have to pay connection fees aimed at supporting further network development. Connection fees are 43 000 € per approved power in MW. **Note**: Generally, in 110 kV network, grid users keep ownership over 110/x kV substations
Slovak Republic	**Partially Deep**. Distribution companies pay 40% charge, TSO pay 60 % charge. Direct customers connected on the TSO pay 100% charge.
Slovenia	**Deep**
Spain	**Shallow**. The generator builds own connection line. Enhancements of the grid that affect the rest of system are socialized in the tariff.
Sweden	**Deep**
Switzerland	The cornerstones for the first connection charges for consumers and power plants have to be clarified by the NRA.

Appendix 7: Special tariffs

Special tariffs conditions can exist in some countries e.g:

- Special tariff conditions for low utilization (auto production or own production units behind the connection site, second connection used for emergency situations, pumping stations,…)
- Special tariff conditions for high consumption (for instance over 100 GWh per year)
- Special tariff conditions for users fulfilling defined technical criteria of its production/connection site
- Special tariff conditions for any group of users (eg. any public utilities, army
- etc

Country	Special Tariff Conditions
Austria	Special tariffs for 150-220 kV; special tariffs for hydro pump / storage energy producers
Belgium	Grid users with a local production unit (offtake and injection at the same access point) can introduce a special yearly subscription for maximum 75 MW that gives them 30% reduction on the price. This subscription will only be applied for maximum 1.000 hours a year. For the mobile charges of the railway company, the price for subscribed power is reduced with 7%.
Bosnia and Herzegovina	None
Bulgaria	None
Croatia	None at the moment
Czech Republic	None
Denmark	1) For grid companies with autoproducers with net settlement, an adjusted settlement basis is applied that takes into account that the autoproducers shall not pay a grid tariff or a system tariff for the part of their consumption that they cover by their own production. 2) Customers with their own 132 kV transformers with settlement on the 132 kV side pay a reduced grid tariff. 3) A reduced PSO tariff is used for autoproducers for the part of their consumption that they cover by their own production. The reduction corresponds to the costs relating to subsidies for renewable energy and local CHP units. 4) For customers with consumption of more than 100 GWh/year per place of consumption, a reduced PSO tariff is used for the part of their consumption that exceeds 100 GWh/year per place of consumption. The reduction corresponds to the costs relating to subsidies and balancing costs relating to renewable energy.
Estonia	None
Finland	None
France	- Specific tariff for a second connection used for emergency situations. - Specific tariff for multi-locations customers .This tariff considers a unique virtual site, summing all load of the concerned sites, and calculating an annual fee proportional of the necessary length of network to connect these sites - A DSO directly connected to the lowest voltage level of a transformer that belongs to the TSO can use the tariff of the highest voltage level of this transformer. - A DSO owning lines of the same voltage level as the lines of the TSO it is connected to benefits from a discount. - When the actual temperatures are very low compared to average temperatures, DSOs may benefit from a discount on their capacity overrun. - Occasional planned overrun of contracted capacity: during summer, a customer can benefit from a discount on its tariff during 2 weeks, provided it informs the TSO in advance
Germany	- **Monthly power price:** For final customers with a temporary high power consumption and an obvious lower or no power consumption in the remaining time, a monthly price instead of a yearly price for the power component is offered. - **Individual tariff:** For final customers with a peak load occurring at a different time period than the maximal power in the grid, an individual tariff is offered. The individual tariff must not be lower than 20 % of the published regular tariff. **- Grid fee exemption:** For Energy intensive customers (typically heavy industry customers) with energy consumption that exceeds 7 000 hours per year and 10 GWh there is fee exemption. The agreement on both for individual tariffs and grid fee exemption requires the approval of the regulator.

Great Britain	- Small Generators' Discount: €0.154224/kW discount to generation tariff and €0.215172/MWh discount to energy charge for generators below 100MW - The Assistance for areas with high electricity distribution costs special tariff recovers an assistance amount, which is passed to the Relevant Distributor in certain areas with high distribution costs: €0.194749/MWh. (estimated from 2011 figures - based on conversion of £1 : € 1.195 at 30/12/2011)
Greece	None
Hungary	None
Ireland	Autoproducers pay capacity based TUoS charges on the greater of either their contracted Maximum Import Capacity or contracted Maximum Export Capacity, not both
Italy	None
Latvia	None
Lithuania	None
Luxembourg	Distribution companies don't have the binominal tariff but a tariff respecting their simultaneity factor related to the power peak of the grid
FYROM	Only one user pays a special tariff – company of public interest i.e. FYROMn Public Railway Company.
Netherlands	A reduced tariff is used for a spare connection with a utilization time of less than 600 hours/year.
Northern Ireland	None
Norway	Interruptible load Special tariffs is offered for interrupt load according to agreements. The tariffs are from 5% to 75 % of the regular L-tariff level depending on the kind of agreement. Power intensive industry Load of 15 MW+ and utilization time of 7000+ hours receive a reduced load tariff. The reduction is about 50% compared to regular load. The special tariff is based on the so called k-factor model described in the Excel sheet. More information on: www.statnett.no/en/.
Poland	A final consumer is entitled to pay 10% of the quality charge if in the preceding year he fulfilled the following technical and economic conditions: – yearly consumption was not less than 400 GWh, – utilization of the connection power was not less than 50%, – overall costs related to electric energy (purchase and transportation) constitute not less than 15% of the total production costs A final consumer is entitled to pay 27% of the transitory charge (covering stranded costs) if in the preceding year he fulfilled the following technical and economic conditions: – yearly consumption was not less than 400 GWh, – utilization of the contractual capacity was not less than 60%, - overall costs related to electric energy (purchase and transportation) constitute not less than 15% of the total value of their production.
Portugal	Social tariff for vulnerable costumers (domestic consumers with a contracted power less than 4,6 kVA, who benefit from social insertion income, invalidity and old age social pension). For 2012, the discount is 0.24€/kVA at the fixed term of the access tariffs.
Romania	None
Serbia	All network users are charged for active energy, reactive energy and active power except the following special categories of network users: - auxiliary power for power plants are charged only for active energy, - pump plants are charged only for active and reactive energy, - reversible pumped storage power plants are not charged.
Slovak Republic	Consumers connected directly to transmission network pay in 2012 tariff for system services discounted by 90% if their utilization of maximum contractual capacity in 2010 were higher than 6800 hours (average utilization of the contractual capacity was not less than 77,63%) and perpetual deviation of the subject of settlement was lower than 0,025
Slovenia	Special tariffs for Public Lighting and alarming systems
Spain	None
Sweden	None
Switzerland	None

Appendix 8: Treatment Final Customers vs Distribution System Operators

There might be different tariffs, charges calculation procedures or settlement rules for final customers and distribution system operators. Different treatment might be a result of the size of a load of a given network user, number of connection points to the transmission grid (simultaneous off take), network configuration conditions and co-operation of distribution network with transmission network (often DSOs' network is plays a role of sub transmission grid) …

Country	Different treatment between final customer and distributor	Difference with the total charge applied to the case base (%)
Austria	No	
Belgium	No tariffs for DSOs for the studied voltage levels	
Bosnia and Herzegovina	No	
Bulgaria	No	
Croatia	TSO charges only transmission fees for eligible customers directly on TSO network. For customers that are not directly connected to TSO network transmission fee is colected by DSO and transferred to the TSO.	
Czech Republic	No	
Denmark	The TSO does not charge the costumer directly. It is the DSO that charge the costumers.	N/A
Estonia	No	
Finland	No	
France	- A DSO directly connected to the lowest voltage level of a transformer that belongs to the TSO can use the tariff of the highest voltage level of this transformer. - A DSO owning lines of the same voltage level as the lines of the TSO it is connected to benefits from a discount. - When the actual temperatures are very low compared to average temperatures, DSOs may benefit from a discount on their capacity overrun.	N/A
Germany	No differentiation between final customers and distributors. Tariffs just for load, not for generation.	
Great Britain	No	
Greece	Presently ADMIE does not charge final customers but distributors and producers. It is the distributor who charges final customers connected to the transmission network. In the case that a final customer will be charged by ADMIE, the current legislation doesn't provide for different treatment.	
Hungary	The transmission system operation tariff is regulated by the type of costumers. Distributors pay a higher tariff to MAVIR. The TSO's income of the additional part is repaid in another sum – which is calculated with a predetermined percentage by "price degree" - for the distributors.	71.9 % on transmission system operation tariff, on both tariff elements 49.2 % before rebate

	Thus: Transmission system operation charge for eligible costumer: 4.88 €/MWh Transmission system operation charge for distributor: 8.39 €/MWh Income of the positive difference of Transmission system operation charge for distributors is paid back for the distributors in percentage as **a rebate** since 2010. Calculation: [(injection /kWh/ * 351.0 c €) * (n_1+n_2+n_3+… %)], where Σ n = 100 % Charge for ancillary services is the same for every company.	
Ireland	Yes, final customers connected to the transmission system and customers connected to the distribution system[1] are treated in a slightly different manner. The Demand Network Capacity Charge (DNCC) charged to transmission connected customers is greater than the DNCC charged to distribution connected customers	The DNCC charged to customers connected to the distribution system is approx 15% less than that charged to final customers connected to the transmission system. The actual difference in a TUoS bill would depend on the magnitude of other elements of the TUoS bill which are determined by energy consumption
Italy	Yes, in Italy distributors invoice to the final consumers the transmission component TRAS, differentiated according to the voltage level of the grid to take into account losses, and pay back to Terna theCTR for withdrawal of energy from NTG	
Latvia	No	
Lithuania	No	
Luxembourg	Distribution companies have a tariff respecting their simultaneity factor related to the power peak of the grid	
FYROM	No	
Netherlands	No	
Northern Ireland	No	
Norway	No	
Poland	There is no differentiation between final consumers and distributors but between kinds of points of delivery (PoD). There are two different rates for access to the transmission network: one called “final” PoD (where end consumption is connected) and other called “network” PoD (which are PoD of DSOs having more than two PoDs, and these PoDs are nodes of meshed distribution network 110 kV).	The total charge (without stranded costs) for users connected in “final PoDs” amounts to 65% of the charge paid by DSO in “network PoDs”.
Portugal	The TSO charges distribution by all the energy delivered and is the distributor who charge customers connected to the transmission network.	
Romania	No	
Serbia	There is no difference in treatment of distributors and final customers. The only difference is in the billing procedure. Eligible customers and distributors are charged directly by	

[1] The Distribution System Operator is not charged TUoS, customers connected to the distribution system are charged TUoS via their supplier

	TSO, while tariff (captive) customers are charged by distributors as public retail suppliers.	
Slovak Republic	No	
Slovenia	No	
Spain	In Spain the TSO does not charge directly to the customers.	
Sweden	No	
Switzerland	No	

Appendix 9: Reactive Energy

In some countries, a tariff is applicable on the measured reactive energy (based on MVarh) or a penalty is applicable for the part exceeding predefined conditions (also based on MVarh). These charges/penalties are not included in the tariff overview of this document.

<table>
<tr><th>Country</th><th>Reactive Tariff (Y/N)</th><th>Penalty (Y/N)</th><th>Quantity/Conditions of application</th></tr>
<tr><td>Austria</td><td>N</td><td>N</td><td></td></tr>
<tr><td>Belgium</td><td>N</td><td>Y</td><td>• Elia System Operator makes quarter-hourly deliveries of reactive power that exceed tg □=0,329 per offtake point. This leads to a term for supplementary deliveries of reactive energy, according to the article 209 §4 and §5 of the Technical Code. This term is function of the time of the day and the reactive regime of the customer.
• In case the offtaken active energy does not exceed, on a quarterly basis, 10% of the valid subscriptions at any given point, the additional delivery of reactive energy will be defined as the excess in respect of 32,9% of the 10% of the valid subscriptions at that point.
• In case the capacitive reactive power of the customer being in offtake regime doesn't exceed the following limit values, penalty for supplementary deliveries of reactive energy equals 0€/MVarh.
<table>
<tr><th>Voltage level (kV)</th><th>Limit values capacitive reactive power (MVar)</th></tr>
<tr><td>400- 380</td><td>9</td></tr>
<tr><td>220-150</td><td>9</td></tr>
<tr><td>132-50</td><td>2,5</td></tr>
</table></td></tr>
<tr><td>Bosnia and Herzegovina</td><td>Y</td><td>N</td><td>The tariff for excessive take-on of reactive power shall be paid by eligible customers connected to the transmission network. The tariff set on 5.56 EUR/Mvarh.
Excessive take-on of reactive power shall be a positive difference between the measured reactive power and reactive power which corresponds to the power factor cos φ=0, 95 inductivity, i.e. it is the reactive power exceeding 33% of active power which is taken over.</td></tr>
<tr><td>Bulgaria</td><td>N</td><td>Y</td><td>Penalty is imposed to users with connection capacity ≥ 100 kW
The calculation of the quantity of reactive power for which the penalty is imposed is according to formula:
$Erp = Erconsumed - 0.49Eaconsumed$

Where,
Erp – Q-ty of reactive power for which penalty is imposed
$Erconsumed$ - Q-ty of consumed reactive power by the user
0.49 – coefficient, corresponding to cos □□□□□□□
$Eaconsumed$ - Q-ty of consumed active</td></tr>
</table>

			power by the user The penalty for consumed reactive energy is 10% of the market wholesale price of the active energy The penalty for injected reactive energy is 100% of the market wholesale price of the active energy
Croatia	Y	N	Reactive energy is paid monthly according to metered consumption. Tariff for reactive energy is 0,0199 EUR/kvarh.
Czech Republic	No for EHV	No for EHV	There is a penalty charged to customers connected to DSO. The penalty is charged by DSO.
Denmark	N	N	n/a
Estonia	Y	N	Charge is based on both consumed and generated MVarh
Finland	N	Y	Agreed limits on use of reactive energy are monitored within geographical areas. If the limits are exceeded, the penalties are charged per connection point. • 3000 €/Mvar for excess reactive power 10 €/Mvarh for excess reactive energy
France	N	Y	If reactive energy/active energy >0.4 for each connection point from 01/11 to 31/03 (on working days and 6h-22h): *1.3 c€/kvarh is invoiced for 400-380 kV customers *1.39 c€/kvarh is invoiced for 220-150 kV customers * 1.55 c€/kvarh is invoiced for 132-50 kV customers
Germany	Y, partly	Y, partly	In particular circumstances customers are charged for reactive power usage (charge up to 8,70 €/Mvarh). Power Plants are reimbursed for the provision of reactive power.
Great Britain	N	N	
Greece	N	N	
Hungary	N	N	
Ireland	N	N	
Italy	N	Y	A charge in c€/Kvarh is applied to the distributors/Terna for reactive energy withdrawn from the transmission grid/distribution grid exceeding a certain threshold of active energy. The charges are: -Reactive energy between 50% and 75% of active energy: 0,86 c€/Kvarh. - Reactive energy over than 75% of active energy: 1,1 c€/Kvarh. The difference paid/received by Terna increases/decreases the amount of the ancillary services. There is also a charge issued by the distributors and paid by the final consumer for reactive energy withdrawn from the distribution grid exceeding a certain threshold of active energy.
Latvia	Y	N	Reactive power tariffication between TSO and DSO not applied in Latvia. Reactive power tariff exist only for consumers, in cases where phase factor tgφ is above 0,4: reactive power tariff for consuming is 4,27€/MVArh (if tgφ≥0,4). Tariff for reactive power generation to the transmission

			network is 12,81€/MVArh.
Lithuania	Y	N	Tariff is paid by consumers above ≥30kV except households. Tariff is 0.516 €/MVarh for consumed 1 MVarh and 1.03 €/MVarh for generated 1 MVarh..
Luxembourg	N	Y	A penalty of 11.16 €/MVarh is applied in case the average cos φ per ¼ hour is below 0.9
FYROM	N	Y	Reactive energy penalties are applied for every excessive consumption of reactive energy when it exceeded 33% of the active power. Penalties are not paid when the value of reactive power doesn't exceed 33% of Active power.
Netherlands	N	N	According to the network code, cos fi has to be between 0.85 and 1.0.
Northern Ireland	N	N	Currently no direct charge for reactive energy
Norway	Y	N	Reactive tariffs are applied in connection points where reactive load creates a problem on the system. Tariff rate is 30 NOK (=3,8 €) /kVAr (rounded off to the nearest 20 MVAr)
Poland	N	Y	PSE Operator S.A. applies additional fees for excess reactive power. The charge is calculated for each MVahr of passive energy taken-off the HV and EHV network when phase factor tgφ is above 0,4 and for each MVahr of passive energy fed into the transmission network regardless the value of phase factor. The charge for excess take-off passive energy (above tgφ =0,4) is calculated according to the following formula: $O_b = k \times C_{rk} \times \left(\sqrt{\frac{1+\mathrm{tg}^2\,\varphi}{1+\mathrm{tg}^2\,\varphi_0}} - 1 \right) \times A$ where: k – coefficient equal 0.5, C_{rk} – unit price of active energy, as defined in transmission tariff, tgφ – real phase factor, measured value in a period used for settlement of the charges for excess take-off of passive energy, $tg\varphi_o$ – value of phase factor = 0,4 determined in a Agreement between PSE Operator S.A. and final consumer, A – amount of active energy taken-off the transmission network by final customer in a settlement period. The charge for passive energy fed into transmission network (capacity reactive energy) is calculated as a product of the amount of passive energy, the price of active energy C_{rk} and coefficient k=0.5.
Portugal	Y	Y	***Penalty:*** The Inductive reactive energy supplied by the transmission network outside the off-peak hours, is charged as follows: 6,7 €/MVArh, if 0,3<= tgφ <0,4 20,4 €/MVArh, if 0,4<= tgφ <0,5 61,4 €/MVArh, if tgφ >=0,5 ***Tariff:*** The reactive energy received by the transmission network in the off-peak hours, is charged to 15,2 €/MVArh
Romania	Y	N	The difference of the quantity between cosφ=0.92 and cosφ=0.65

Serbia	Y	Y	All consumers of energy on HV grid except auxiliary power for power plants are charged for reactive energy. If consumed reactive energy exceeds level of cosφ=0.95 the charge for the exceeding reactive energy is double. The base reactive energy tariff is 1,12EUR/MVArh The reactive energy tariff for cosφ<0.95 is 2,24EUR/MVArh
Slovak Republic	N	N	
Slovenia	Y	Y	If Cos fi < 0,95 a penalty is charged in amount of 6,26 €/MVarh
Spain	N	Y	A charge in €/MVArh is applied to the reactive energy consumption exceeding the 33% of active energy consumption. The charges are the following: 41, 554 €/MVArh 0.80 < cosφ<0,95 62.332 €/MVArh cosφ<0,80
Sweden	N	N	
Switzerland	Y	N	The following tariffs resp. remuneration rates are applied: Individual ancillary services tariff for reactive energy for active participants: 0.75 Rp./kvarh Individual ancillary services tariff for reactive energy for passive participants: 0.75 Rp./kvarh Remuneration rate for active participants for reactive energy supplied according to requirements: 0.30 Rp./kvarh

Glossary of terms

Black-Start

The ability of a generating unit to go from a shutdown condition to an operating condition and start delivering power without assistance from the electric system.

CAPEX

Capital cost.

Cross-border congestion

Congestion produced in the transmission network between countries or TSO control areas.

Energy-related components

Components of charges that are allocated according to the energy consumed, offtaken or injected (consumption and offtaken energy can be different in case that generation is connected to the same transmission access point).

First Connection charges

Charge for the party (producer or consumer) that wants to be connected to the transmission network.

G component

Transmission tariff component applied to generation (producers).

Internal congestion

Congestion produced in transmission network within a country or TSO control area.

ITC

Inter TSO Compensation, costs or revenues for Transmission System Operators (TSOs) as a result of inducing or hosting cross-border flows of electricity.

L component

Transmission tariff component applied to load (consumers).

Locational signals

Economic signals for efficient location of generation and consumption.

Losses

In this document the term losses refers to transmission losses which are the energy losses that occur in the transmission system as a result of the system operating conditions (MW and MVAr flows, Voltage levels, system topology…). Measured losses can be different, higher or lower than the real losses due to measurement errors and even accounting mistakes.

OPEX

Operational costs.

Other Regulatory Charges

Charges resulting from provisions imposed by national law regulations, recovered or invoiced by TSOs, but not directly related to TSOs' activities. Examples of costs recovered through such charges are: stranded costs, costs of supporting renewable or cogeneration energy production, regulatory levies, costs of diversification and security of supply ….

Power-related components

Components of charges that are allocated according to contracted power and/or peak power which is consumed, offtaken or injected.

Primary Reserve

Power available in the generators which is reserved to respond to frequency changes and which have a very fast response time. Keeping these reserves creates costs that are charged to the users one way or another.

Public Service Obligation

Public Service Obligations (PSOs) are compulsory services the Regulators apply to companies in the public interest.

The transmission system operator and grid owners are subject to a number of PSOs. Examples include:

- supply security;
- payment of subsidies for environmentally-friendly electricity; and
- research and development of environmentally-friendly production technology.

Stranded costs

Stranded costs have to do with the transition from a regulated to a more competitive market.

Seasonal/Time-of-day differentiation

Tariff rate differentiation related to season of year or time-of-day or type of day (working day/holiday).

Secondary reserve

Power available in the generators which is reserved to respond to frequency changes and which have a higher time of response than primary reserves. Keeping these reserves creates costs that are charged to the users one way or another.

System balancing

This system service which involves activating secondary and tertiary reserves, is used for correcting in real time, energy deviations from the values specified in contractual schedules of market participants.

System Services or Ancillary Services

Interconnected Operations Services identified as necessary to effect a transfer of electricity between purchasing and selling entities and which a provider of transmission services must include in an open access transmission tariff.

Tertiary reserve

Power available from generators which is reserved to respond to frequency changes which are manually activated. Keeping these reserves creates costs that are charged to the users one way or another.

Voltage Control and Reactive Power

The purpose of this system service is to maintain voltage in the power system within the allowed limits and to control flows of reactive power in the network. Voltage and reactive power control is carried out by producing reactive energy in power plants, by using compensation devices and by changing transformer transmission ratios.

Voltage levels

Voltage levels of the transmission networks vary across the Member States, in particular the lowest voltage level which is classified as transmission network varies largely. However, in all Member States the voltage levels of 220 kV and above are included as transmission network.