Public data underlying the figures of Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2016

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Figure 1, Page 15: Evolution of DA electricity wholesale prices in different European power exchanges - 2011 - 2016 (euros/MWh)

Source: European Network of Transmission System Operators for Electricity (ENTSO-E) and Platts (2017)

Area	2011	2012	2013	2014	2015	2016
Germany (EPEX)	51	43	38	33	32	29
Nordic+Baltic Region (Nord Pool Spot)	46	34	40	34	25	29
The Netherlands	52	48	52	41	40	32
Belgium	49	47	47	41	45	37
France	49	47	43	35	38	37
Portugal	50	48	44	42	50	40
Spain	50	47	44	42	50	40
Italy	75	77	64	54	52	42
Great Bitain	55	55	59	52	56	49

Figure 2, Page 16: Frequency of price spikes in main wholesale DA markets in Europe - 2009-2016
(number of occurences per year)
Source: ENTSO-E, Platts (2017) and ACER calculations

Bidding Zone	2009	2010	2011	2012	2013	2014	2015	2016
BE	54	10	1	4	1	2	54	92
CH				26				8
CZ			1	1				4
DE	56			3				2
DK_E	161	200	2	15			3	40
DK_W	9			3	5	3		2
EE					12	22	10	57
ES	1							
FI	29	192		24	7	9	10	53
FR	79	21		17	1		1	46
GB	337	58	2	13		24	25	249
GR			13	28		43	20	11
HU			9	22	2	14	7	4
IT-BRI			31	26	1	10	16	17
IT-CENTNORD			53	58	1	16	18	39
IT-CENTSUD			58	52	1	18	18	36
IT-NORD			15	49		6	23	33
IT-SUD	776	60	34	26	1	16	16	17
LT				3	19	114	36	146
LV					19	114	36	126
NL	49		2	2				9
NO-1		123		7				21
NO-2				2				2
NO-3	24	235		10				17
NO-4	24	181		10				16
NO-5		1		5				2
PT		2						
RO	8							
SE	27	182						
SE-1				10				30
SE-2				10				30
SE-3				15			3	40
SE-4				15			3	40
SI			7	31		1	8	2
SK			22	4				4

Figure 5, Page 19: DA price convergence in Europe by region (ranked) – 2008–2016 (% of hours)

Source: ENTSO-E, Platts (2017) and ACER calculations

Region	Year	Full price convergence	Moderate price convergence	Low price convergence
Baltic	2011	13%	70%	17%
	2012	10%	57%	33%
	2013	40%	36%	24%
	2014	34%	20%	46%
	2015	37%	21%	42%
	2016	71%	18%	12%
CWE	2008	8%	55%	37%
	2009	12%	67%	20%
	2010	22%	59%	19%
	2011	68%	15%	16%
	2012	50%	23%	27%
	2014	21%	30%	49%
	2015	22%	24%	54%
	2016	39%	27%	34%
	2013	16%	19%	65%
SWE	2008	2%	29%	68%
	2009	7%	51%	42%
	2010	6%	38%	56%
	2011	8%	47%	45%
	2012	8%	52%	41%
	2013	5%	32%	63%
	2014	8%	24%	67%
	2015	14%	22%	64%
	2016	30%	35%	35%
Nordic	2008	14%	25%	61%
	2009	36%	39%	25%
	2010	27%	35%	38%
	2011	31%	27%	42%
	2012	30%	25%	46%
	2013	31%	41%	29%
	2014	17%	38%	46%
	2015	29%	24%	48%
	2016	16%	44%	40%
CEE	2010	3%	62%	35%
	2011	3%	59%	38%

	2012	6%	50%	44%
	2013	10%	48%	42%
	2014	5%	44%	51%
	2015	6%	43%	51%
	2016	5%	52%	43%
IU	2008	5%	36%	59%
	2009	7%	49%	44%
	2010	11%	48%	42%
	2011	9%	46%	45%
	2012	10%	38%	52%
	2013	4%	37%	59%
	2014	4%	41%	64%
	2015	4%	37%	59%
	2016	6%	41%	53%

Figure 6, Page 20: Monthly DA prices in Core (CWE) and the frequency of full price convergence - 2014 - 2016 (euros/MWh and % of hours)
Source: ENTSO-E, Platts (2017) and ACER calculations

Year/Month	Full price convergence	DA price in BE	DA price in DE	DA price in FR	DA price in NL
2014					
Jan	32%	40	36	39	45
Feb	28%	39	34	39	43
Mar	28%	37	31	36	40
Apr	19%	42	32	34	40
May	20%	39	31	30	39
Jun	34%	37	32	31	37
Jul	20%	34	32	25	34
Aug	6%	37	28	23	38
Sep	10%	46	35	37	44
Oct	16%	46	35	42	43
Nov	29%	45	36	39	44
Dec	15%	48	33	42	46
2015					
Jan	11%	43	29	41	41
Feb	12%	51	37	50	46
Mar	11%	47	31	44	42
Apr	6%	48	30	40	41
May	18%	38	25	26	37
Jun	30%	39	30	32	39
Jul	44%	43	35	38	42
Aug	22%	42	32	32	39
Sep	10%	53	32	37	40
Oct	30%	55	39	45	41
Nov	25%	43	32	42	38
Dec	33%	36	28	35	34
2016					
Jan	39%	33	29	34	32
Feb	42%	25	22	26	25
Mar	49%	27	24	27	26
Apr	64%	25	24	25	25
May	53%	25	23	24	27
Jun	44%	31	28	28	33
Jul	46%	31	27	30	33

Aug	62%	29	27	30	28
Sep	32%	38	30	37	33
Oct	15%	57	37	55	38
Nov	9%	62	38	65	43
Dec	8%	55	37	59	43

Figure 7, Page 24: NTC averages of both directions on cross-zonal borders, aggregated per CCR – 2010–2016 (MW)
Source: ENTSO-E, NRAs and Nord Pool Spot (2017)

Region	2010	2011	2012	2013	2014	2015	2016
Baltic	2502	2259	1989	1746	2314	2559	3195
Channel	1816	2153	2227	2517	2682	2796	2718
CWE	7614	8813	8782	11584	10715	10669	10406
GRIT	468	311	463	295	224	383	362
Hansa	822	1612	1677	1629	1514	1338	1509
Italy North	1950	1916	1872	1968	2369	2496	2554
IU	-	206	506	573	702	749	588
Nordic	-	4404	4149	3952	4230	4283	4394
Norwegian Borders	688	4898	4685	4244	4562	5067	4851
SEE	494	682	463	365	475	677	700
SWE	1969	2521	2804	2684	2978	3687	4340
Swiss borders	7847	7750	7639	7665	7683	8075	8118

Figure 8, Page 25: Changes in tradable capacity (NTC) in Europe from 2015 to 2016 (MW, %), excluding differences lower than 100 MW
Source: ENTSO-E, NRAs and Nord Pool Spot (2017)

Region	Border direction	Change in MW	Change in %
Baltic	LT->SE-4	476	new
	SE-4->LT	490	new
Core (excl. CWE)	AT->CZ	-119	-18%
	AT->SI	-120	-16%
	CZ->SK	173	10%
	DE->CZ	-586	-68%
Hansa	DE_TENNET->DK_W	441	51%
IU	IE->UK	-137	-28%
	UK->IE	-145	-28%
NO-borders	NO-1->SE-3	-410	-22%
Nordic	DK_W->SE-3	106	20%
SWE	ES->FR	810	72%
	ES->PT	-216	-10%
	FR->ES	1112	85%
	PT->ES	-399	-14%

Figure 9, Page 26: Monthly average size of the FB domain (volume) intersecting the economic directions in the Core (CWE) region in 2016 (MW^3)

Source: Data provided by the Core (CWE) region TSOs to ENTSO-E (2017) and ACER calculations

Month	Average of Directional volume
Jan	3.9872E+10
Feb	5.8147E+10
Mar	5.0313E+10
Apr	3.7643E+10
May	3.9903E+10
Jun	3.5055E+10
Jul	3.0019E+10
Aug	3.3876E+10
Sep	2.5966E+10
Oct	3.0564E+10
Nov	2.9269E+10
Dec	2.1066E+10

Figure 15, Page 37: The average percentage of RAM for cross-zonal exchange over Fmax in internal-to-bidding-zone CNEs, per TSO's control area in 2016 (%)
Source: Data provided by core (CWE) TSOs to ENTSO-E (2017) and ACER calculations

Row Labels	Percentage RAM	Percentage of capacity reduced to accommodate internal exchanges
DE-TenneT	0.05	0.95
DE-TransnetBW	0.09	0.91
FR	0.10	0.90
DE-Amprion	0.10	0.90
NL	0.16	0.84
BE	0.30	0.70

Figure 18, Page 43: Percentage of available capacity (NTC) used in the “right direction” in the presence of a significant (>1 euro) price differential on 37 European electricity interconnectors – 2010 (Q4) – 2016 (%)
Source: ENTSO-E, Vulcanus (2017) and ACER calculations

Year	Percentage of capacity used in the right direction	Percentage of capacity unused in the right direction
2010	61%	39%
2011	67%	33%
2012	75%	25%
2013	77%	23%
2014	85%	15%
2015	84%	16%
2016	86%	14%

Agency for the Cooperation of Energy Regulators

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Figure 19, Page 44: Estimated 'social welfare losses' in the abssence of market coupling, per border - 2015 - 2016 (million euros)

Source: ENTSO-E, NRAs, Vulcanus(2017) and ACER calculations

Border	2015	2016
IE-GB (EWIC)	67.83	58.77
NI-GB (MOYLE	29.76	45.78
CH-FR	42.32	29.63
CH-IT	17.43	28.93
CH-DE	35.68	14.25
AT-CZ	11.90	7.78
AT-CH	10.61	4.73
AT-HU	5.55	4.48
DE/LU-CZ (Ten	15.82	9.10

Figure 20, Page 46: Ratio between ID traded volumes and electricity demand in a selection of EU markets – 2011–2016 (%)

Source: Power exchanges, Eurostat, CEER National Indicators Database and ACER calculation (2017)

Market	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
ES	18.85%	19.58%	14.39%	13.71%	12.19%	12.01%
IT	7.26%	8.47%	8.12%	8.10%	8.67%	9.90%
PT	5.98%	11.34%	11.86%	8.16%	7.77%	8.71%
GB	6.56%	6.53%	6.75%	7.46%	7.87%	7.80%
DE/AT/LU	2.63%	2.38%	3.34%	4.55%	6.44%	7.09%
CH	0.00%	0.00%	0.73%	1.73%	2.33%	2.80%
Nordic + Baltic	0.00%	0.70%	0.82%	1.06%	1.16%	1.16%
FR	0.41%	0.50%	0.66%	0.80%	0.90%	0.96%
NL	0.13%	0.35%	0.42%	0.64%	0.62%	0.86%
BE	0.29%	0.36%	0.44%	0.54%	0.55%	0.74%

Figure 21, Page 48: Level of ID cross-zonal trade per year (absolute sum of net ID nominations for a selection of EU borders) - 2010 -2016 (GWh)

Source: ENTSO-E, NRAs, Vulcanus (2017) and ACER calculations

Year	Sum of Sum of ID (GWh)
2010	8406
2011	13464
2012	16189
2013	18493
2014	19263
2015	23990
2016	23745

Figure 24, Page 51: Overall costs of balancing (capacity and energy) and imbalance prices over national electricity demand in a selection of European markets - 2016 (euros/MWh)

Source: Data provided by NRAs through the EW template (2017) and ACER calculations

European market	Energy	Capacity (FCR)	Capacity (FRR+RR)	Imbalance charges
Markets with elements of price regulation				
SK	0.23	0.52	5.17	0.94
CZ	0.58	0.31	3.09	0.72
PL	0.26	0.01	0.58	0.26
FR	0.20	0.22	0.31	0.25
Markets with non-regulated prices				
RO	2.11	0.00	2.63	2.06
HU	1.19	0.64	2.59	1.25
SI	0.65	0.00	2.98	0.71
CH	0.28	0.15	2.30	0.46
PT	1.12	0.00	0.82	1.12
AT	0.92	0.14	0.20	0.57
ES	0.37	0.00	0.86	0.33
GB	0.29	0.35	0.42	0.46
Nordic area	0.15	0.33	0.41	-
NL	0.23	0.13	0.36	0.34
DE	0.17	0.16	0.25	0.19

Figure 26 page 53 : EU balancing energy activated abroad as a percentage of the amount of total balancing energy activated in national balancing markets - 2016 (%)

Source: Data provided by NRAs through the EW template (2017) and ACER calculations

Country	Sum of 2016 % imported
BE	0.08%
SI	0.30%
ES	0.42%
CZ	0.77%
PT	3.64%
DE	4.78%
FR	19.21%
AT	22.88%
LT	32.91%
EE	33.01%
LV	73.82%

Figure 27, Page 53: EU balancing capacity contracted abroad as a percenage of the system requirements of reserve capacity (upwards FCRs) - 2016 (%)

Source: Data provided by NRAs through the EW template (2017) and ACER calculations

Country	Sum of 2016 % imported FCR
DE	1.98%
AT	3.54%
CH	5.84%
SE	11.98%
DK	20.00%
SK	29.63%
BE	31.51%
NL	34.31%
FI	47.67%

Figure 28, Page 54: Imbalance netting as a percentage of the total need for balancing energy (activated plus avoided activation due to netting) from all types of reserves in national balancing markets - 2016 (%)

Source: Data provided by NRAs through the EW template (2017) and ACER calculations

National Market	Sum of 2016 % in total needs
SK	1.75%
FR	10.54%
HU	14.94%
HR	15.76%
LT	17.25%
SI	23.67%
BE	40.20%
CZ	41.12%
CH	42.01%
AT	47.06%
EE	48.44%
DE	56.64%
NL	57.20%
NO+SE+FI+DK	79.57%
LV	84.25%

Figure 30, Page 65: Percentage of hours with net DA nominations against price differentials per border (ranked) - 2015-2016(%)

Source: ENTSO-E, NRAs, Vulcanus (2017) and ACER calculations

Border	2015	2016
NI-GB (MOYLE)	40.73%	41.66%
IE-GB (EWIC)	45.71%	41.17%
CZ-DE	44.48%	39.65%
CH-FR	44.21%	32.41%
AT-CZ	44.55%	34.30%
PL-SK	26.09%	23.94%
CH-IT	15.20%	21.74%
GR-IT	25.46%	18.57%
AT-HU	21.22%	20.91%
AT-SI	25.32%	12.92%
AT-CH	20.79%	18.68%
CZ-PL	20.78%	17.48%
CH-DE	19.67%	17.28%
DE-PL	23.92%	16.07%
PL-SE	4.94%	7.56%

Figure 31 Page 65 : Level of ID cross-zonal trade (absolute sum of net ID nominations for a selection of EU borders) -2010-2016(GWh)
Source: ENTSO-E, NRAs, Vulcanus (2017) and ACER calculations

Border	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
AT-DE	1020	1413	1354	2000	2124	4304	4074
DE-FR	2077	2829	2762	2524	3057	2238	2733
CH-FR	1012	908	3620	4496	4695	4454	2732
ES-PT		1675	2044	2426	2274	2456	2243
CH-IT	61	51	179	250	256	1168	1629
ES-FR		823	1070	1023	838	744	1624
CH-DE	1676	1717	1383	1400	1506	1832	1578
CZ-DE	428	711	805	1008	1191	1430	1443
DE-PL	0	200	300	687	806	2356	1394
DE-NL	916	1195	728	396	629	550	1070
BE-FR	685	1089	1035	1065	658	662	966
AT-SI	308	396	327	433	418	530	673
BE-NL	167	283	363	464	558	456	659
FR-IT	24	37	42	102	58	563	583
CZ-SK	31	137	178	218	194	246	345

Figure 32, Page 66: Weighted average prices of balancing energy activated from aFRRs (upward and downward activation) in a selection of EU markets - 2016 (euros/MWh)

Source: Data provided by NRAs through the EW template (2017)

EU Market	Downward	Upward	Difference
France	26.23	26.93	-0.70
Poland	35.37	39.04	-3.67
Finland	39.44	43.43	-3.99
Norway (NO1-NO2-NO5)	27.75	33.05	-5.30
Sweden (SE1-SE2)	34.56	43.24	-8.68
Spain	32.39	43.03	-10.64
Switzerland	28.91	50.82	-21.90
Croatia	21.95	49.07	-27.12
Portugal	23.01	53.14	-30.13
Denmark (DK1)	10.76	42.06	-31.30
Slovenia	18.59	55.78	-37.19
Belgium	12.05	52.68	-40.63
Slovakia	60.00	120.00	-60.00
Romania	1.23	70.88	-69.65
Germany	-17.22	54.75	-71.96
Czech Republic	-0.04	86.97	-87.01
Netherlands	-4.32	110.21	-114.53
Hungary	-29.16	90.98	-120.14
Austria	-64.77	111.55	-176.32

Figure 33, Page 66: Average prices of balancing capacity (upward and downward capacity from aFRRs) in a selection of EU markets - 2016 (euros/MW/h)

Source: Data provided by NRAs through the EW template (2017)

EU Market	Upward	Downward
Austria	1.65	2.59
Germany	4.26	0.85
Netherlands	5.22	5.22
Norway	7.00	6.50
Denmark (DK1	7.20	7.20
Great Britain	10.70	4.80
France	9.18	9.18
Slovenia	10.44	10.44
Romania	10.78	10.78
Czech Republi	12.48	12.48
Hungary	13.95	11.33
Belgium	13.61	13.61
Sweden	18.00	10.00
Croatia	14.01	14.01
Spain	15.56	15.56
Portugal	16.50	16.50
Slovakia	16.69	16.69
Finland	22.00	15.70
Switzerland	19.05	19.05

Figure 34, Page 73: Absolute aggregate sum of UFs for three regions - 2014-2016 (TWh)
Source: Vulcanus (2017) and ACER calculations

Region	2014	2015	2016
Core (CEE)			
AT-CZ	10.28	12.87	11.64
AT-DE	11.73	14.89	13.86
AT-HU	1.84	1.97	1.85
AT-SI	2.14	1.58	2.04
CZ-DE_50HZT	6.40	7.51	6.97
CZ-DE_TENNET	2.66	3.93	2.71
CZ-PL	6.69	8.67	6.24
CZ-SK	1.91	2.08	1.99
DE-PL	9.96	13.18	10.30
HU-SK	2.49	2.72	2.55
PL-SK	3.70	5.30	4.38
Italy Nord & Swiss borders (former CSE)			
AT-CH	3.79	3.78	3.11
AT-IT	0.55	0.75	0.92
CH-DE	9.31	9.83	9.64
CH-FR	10.50	10.80	9.19
CH-IT	3.88	3.87	4.61
FR-IT	4.46	4.68	5.63
IT-SI	2.30	2.48	3.51
Core (CWE)			
BE-FR	7.33	8.24	5.86
BE-NL	7.25	8.10	5.80
DE-FR	19.91	20.27	15.68
DE-NL	7.20	7.98	5.71