ENTSO-E ITC TRANSIT LOSSES DATA REPORT 2017

BACKGROUND AND PURPOSE OF THIS DOCUMENT

The Inter Transmission System Operator Compensation (ITC) mechanism is governed by Article 13 of Regulation (EC) No 714/2009. The ITC mechanism is further specified by Commission Regulation (EU) No 838/2010 of 23 September 2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging.

According to Articles 4.2 and 4.3 of the Annex, Part A, of Commission Regulation (EU) No 838/2010, ENTSO-E is mandated to determine the amount of losses incurred on national transmission systems by calculating the difference between:

(1) the amount of losses actually incurred on the transmission system during the relevant period; and

(2) the estimated amount of losses on the transmission system which would have been incurred on the system during the relevant period if no transits of electricity had occurred.

ENTSO-E is also responsible for publishing this calculation and its method in an appropriate format. This document contains these publications.

METHOD

The losses caused by transits in each transmission system are determined by:

– recording the load flow situation for each party to the ITC mechanism (ITC Party) for 6 monthly snapshots τ (3rd Wednesday of a month and preceding Sunday at 03:30h, 11:30h and 19:30h CET/CEST):
  – with transit represented on the interconnected system;
  – with transit represented on the disconnected system;

– the losses caused by transit for the particular hour $\Delta P_{loss}(\tau, k)$ is then determined as the difference of the losses observed in the two situations;

– based on a mapping that attributes every hour of the month to one of the six snapshot timestamps τ, each snapshot timestamp is given a weight w_τ;

– the overall monthly amount of losses caused by transit for each ITC Party is derived by adding the weighted losses caused by transits of each snapshot timestamp.

Annex 1 contains further illustrations of this method.

CALCULATION

Annex 2 contains the calculation results for the year 2017.

European Network of Transmission System Operators for Electricity

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ANNEX 1: ILLUSTRATION OF THE METHODOLOGY

Monthly WWT Calculation: Introduction

– The losses caused by transit $\Delta P_{loss}(\tau, k)$ are determined for each ITC Party k for 6 monthly snapshots τ (3rd Wednesday of a month and preceding Sunday at 03:30 h, 11:30 h and 19:30 h CET/CEST).

– Based on a mapping that attributes every hour of the month to one of six snapshots timestamps τ, each snapshot timestamp is given a weight w_τ.

– ITC Party k's monthly WWT compensation is yielded by k's costs of losses $C_{losses}(k)$ multiplied by k's monthly losses caused by transit.
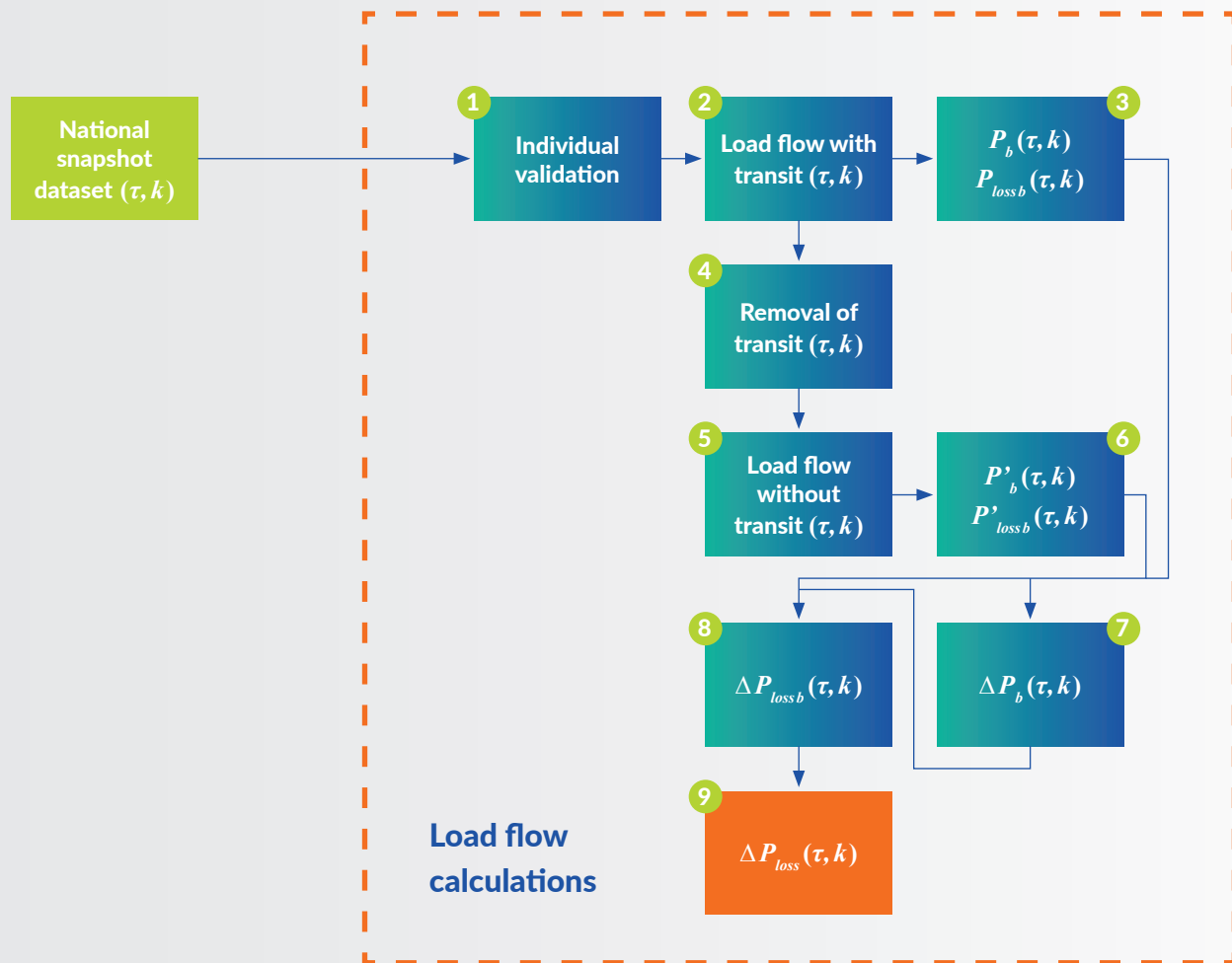
National snapshot dataset (τ, k)

1 Individual validation

2 Load flow with transit (τ, k)

3 $P_b(\tau, k)$ $P_{loss\,b}(\tau, k)$

4 Removal of transit (τ, k)

5 Load flow without transit (τ, k)

6 $P'_b(\tau, k)$ $P'_{loss\,b}(\tau, k)$

8 $\Delta P_{loss\,b}(\tau, k)$

7 $\Delta P_b(\tau, k)$

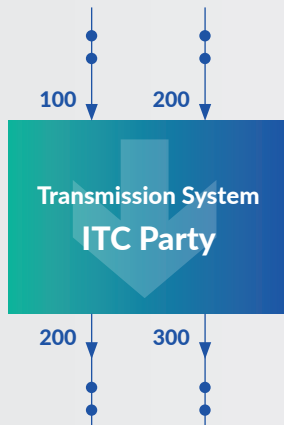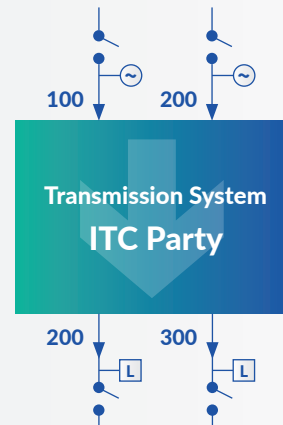**9** $\Delta P_{loss}(\tau, k)$

Load flow calculations

Figure 1: Monthly WWT Calculation

Load flow calculation (Module ②–③)

Recorded Situation with transit
represented on interconnected system (snapshots)
(measured load flow, result from State Estimation)

Recorded Situation with transit
represented on disconnected system
(measured load flow, result from State Estimation)

100   200

Transmission System
ITC Party

200   300

100   200

Transmission System
ITC Party

200 L   300 L

Transit = Minimum $\{\sum Pex_i, \sum Pim_j\}$
Pex_i = P of X node with positive active power
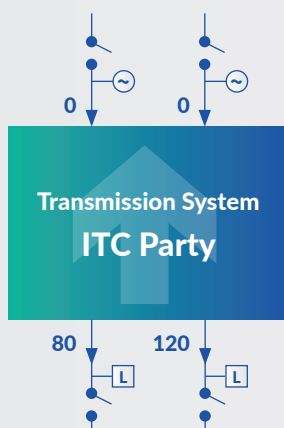Pim_j = $-$P of X node with negative active power

Example: $\sum$ Export = 500 MW, $\sum$ Import = 300 MW
Transit = Minimum $\{500\,\text{MW}, 300\,\text{MW}\} = 300\,\text{MW}$

Load flow without transits (Module ④–⑤–⑥–⑦)

Recorded Situation without transit
represented on disconnected system

0   0

Transmission System
ITC Party

80 L   120 L

Removal of transit by modifying the flows on tie-lines

If $(\sum_i Pex_i \geq \sum_j Pim_j)$ then $\quad Pex'_k = Pex_k \times \left(1 - \dfrac{\sum\limits_i Pim_i}{\sum\limits_j Pex_j}\right)$

$$Pim'_m = 0$$

If $(\sum_i Pex_i < \sum_j Pim_j)$ then $\quad Pim'_k = Pim_k \times \left(1 - \dfrac{\sum\limits_j Pex_j}{\sum\limits_i Pim_i}\right)$

$$Pex'_m = 0$$

Distribution of the overall modification in losses
observed on the slack node to all generators nodes

$$P_i' = P_i \times (1 + \frac{\Delta P_{loss}}{\sum\limits_n P_n})$$

$\Delta P_{loss}(\tau, k)$ – for each branch (Module ⑧)

In case the relative share of losses caused by transits exceeds the relative share of power flow caused by transits, it shall be delimited to this proportion.
(Interpretation of ERGEG Guideline)

$\Delta P_{loss\,b}(\tau, k) = P_{loss\,b}(\tau, k) - P'_{loss\,b}(\tau, k)$

$\Delta p_{loss\,b}(\tau, k) = \Delta P_{loss\,b}(\tau, k) \,/\, P_{loss\,b}(\tau, k)$

$\Delta p_b(\tau, k) = \Delta P_b(\tau, k) \,/\, P_b(\tau, k)$

If $\{\,\mathrm{sign}\,(\Delta p_{loss\,b}(\tau, k)) = \mathrm{sign}\,(\Delta p_b(\tau, k))$ and $|\Delta p_{loss\,b}(\tau, k)| > |\Delta p_b(\tau, k)|\,\}$

then

$\Delta P_{loss\,b}(\tau, k) = \Delta p_b(\tau, k) \times P_{loss\,b}(\tau, k)$

else

$\Delta P_{loss\,b}(\tau, k) = P_{loss\,b}(\tau, k) - P'_{loss\,b}(\tau, k)$

k	= ITC Party
b	= branch
τ	= snapshot timestamp
ΔP_{loss}	= relative increase in losses
ΔP	= relative increase in flows

$\Delta P_{loss}(\tau, k)$ – sum for ITC Party k (Module ⑨)

Sum of all branches within an ITC Party

$$\Delta P_{loss}(\tau, k) = \sum_b \Delta P_{loss\,b}(\tau, k)$$

The losses energy caused by transit is the scalar product of the $\Delta P_{loss}(\tau, k)$ vector times the w_τ vector that attributes each hour of the month to a snapshot

$$Compensation\_WWT(k, m) = C_{losses}(k) \sum_{t=1-6}^{b} \left[\Delta P_{loss}(\tau, k)\ w_\tau \right]$$

ANNEX 2: CALCULATION RESULTS 2017

	Monthly amount of losses caused by transits [MWh]											
Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Albania / AL	− 365,84	− 291,23	− 235,53	− 142,28	− 24,45	− 146,94	0,00	27,16	127,12	353,70	3,96	144,45
Austria / AT	17.376,57	14.962,36	21.219,04	20.538,70	30.690,75	26.858,59	20.131,56	11.920,13	8.946,72	19.610,58	15.619,31	22.449,56
Belgium / BE	12.933,53	23.862,91	6.306,11	1.317,31	6.149,46	4.113,02	3.187,34	6.339,88	2.076,18	5.631,20	8.920,61	15.001,63
Bosnia / BA	3.029,18	2.417,84	1.031,28	3.010,93	2.684,70	3.246,65	5.066,35	3.490,54	3.155,25	2.684,45	1.374,36	1.048,24
Bulgaria / BG	10.726,60	7.194,56	9.794,72	4.571,55	5.197,30	3.740,76	1.463,58	5.236,83	856,74	1.143,91	1.224,02	3.263,59
Croatia / HR	5.653,58	4.417,96	5.997,85	5.336,06	3.716,29	5.310,05	3.050,03	2.417,00	3.122,79	4.251,97	4.375,21	9.856,45
Czech Republic / CZ	40.913,66	28.160,10	18.467,25	14.414,52	18.593,47	48.219,04	38.981,75	5.636,96	9.082,17	12.769,78	5.933,33	8.534,38
Denmark / DK	22.345,12	42.359,67	26.969,68	31.373,30	15.228,83	45.537,79	21.296,78	11.254,38	1.545,47	28.124,25	28.844,32	59.278,68
Finland / FI	9.097,35	10.819,67	2.247,06	5.027,73	3.301,36	6.166,81	16.120,99	6.590,58	7.328,72	2.904,69	9.461,16	17.168,27
France / FR	39.463,48	55.573,78	19.386,22	14.417,40	5.326,54	51.494,67	31.610,42	28.669,92	18.412,50	27.380,42	68.303,27	96.426,25
Germany / DE	87.995,76	127.625,15	74.550,53	41.398,77	17.967,18	73.027,54	79.008,26	13.699,79	6.975,45	66.748,79	158.474,42	179.063,84
Great Britain / GB	11.239,86	3.183,36	2.312,15	11.153,47	− 236,22	− 667,72	− 2.606,52	− 2.968,22	− 4.432,70	− 1.512,41	8.463,96	− 4.746,60
Greece / GR	2.274,58	2.053,04	1.923,92	1.286,09	4.559,05	568,11	1.889,85	2.832,29	2.067,15	3.031,77	3.272,54	3.899,93
Hungary / HU	9.379,55	3.031,37	5.821,40	9.118,82	4.083,84	3.023,91	4.465,61	2.952,08	2.645,48	3.792,11	4.020,78	1.739,31
Ireland / IE	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Italy / IT	1.296,58	200,04	359,30	1.816,18	− 644,82	− 1.206,39	− 114,28	145,90	316,28	282,63	1.397,98	2.296,33
Estonia / EE	4.338,43	7.097,27	1.939,89	2.525,68	2.818,51	3.991,64	44.009,96	3.453,08	364,11	1.106,83	3.365,91	16.258,88
Kosovo* / KS*	2.057,70	1.208,85	1.372,17	875,07	672,46	1.252,91	2.749,34	2.781,78	671,39	1.615,59	1.412,47	519,14
Latvia / LV	9.318,13	7.345,88	1.963,58	1.934,02	4.381,21	3.958,49	7.204,37	2.839,35	2.088,33	4.338,03	6.740,11	9.776,95
Lithuania / LT	3.658,77	1.717,37	8.312,75	1.789,20	10.391,10	9.648,99	11.246,33	4.919,18	2.425,58	9.184,27	12.569,26	3.698,33
Luxembourg/LU	0,00	0,00	1,31	0,00	0,00	0,00	0,00	0,00	0,00	265,02	0,00	335,69
FYROM / MK	777,07	426,89	1.398,52	941,70	1.527,63	1.549,33	1.550,00	1.241,74	470,29	424,39	760,13	249,67
Montenegro / ME	274,06	110,22	397,36	537,55	482,40	− 132,74	1.089,06	1.515,72	1.524,80	431,26	862,76	475,20
Netherlands / NL	15.987,47	22.551,64	22.083,95	11.841,26	2.936,45	6.065,36	13.188,41	761,00	8.687,65	16.358,69	18.823,89	20.776,18
Northern Ireland / NI	93,33	192,64	76,92	494,70	60,77	105,84	121,02	110,00	46,19	175,35	638,51	105,67
Norway / NO	− 6.667,13	− 164,62	9.987,49	3.447,58	2.553,80	780,66	1.805,31	− 657,25	− 884,85	2.825,32	− 1.067,52	− 1.287,09
Poland / PL	24.045,90	18.015,71	40.390,40	23.721,70	9.770,49	14.905,86	13.040,97	4.324,96	4.703,87	9.314,06	10.137,44	5.896,81
Portugal / PT	6.728,85	391,84	41,97	1.174,52	860,01	4.135,34	7.018,46	56,50	− 722,96	1.193,41	− 726,22	6.746,95
Romania / RO	− 5.530,86	− 4.402,33	− 3.210,39	− 2.191,51	− 3.494,46	− 2.909,85	− 3.193,36	− 1.429,66	− 3.423,41	− 1.542,66	− 5.326,99	− 3.461,13
Serbia / RS	3.186,97	6.626,39	4.191,79	4.804,33	5.190,48	6.250,71	4.516,35	3.448,71	− 222,12	2.986,70	3.976,72	6.347,15
Slovakia / SK	11.281,92	11.593,36	7.225,85	12.072,86	9.147,30	4.950,55	7.902,40	6.392,02	8.465,82	9.787,05	4.949,84	2.456,32
Slovenia / SI	6.655,21	3.436,47	7.456,94	7.428,84	7.414,24	8.865,91	7.687,08	7.245,44	6.392,51	7.391,11	3.472,14	7.428,15
Spain / ES	21.094,63	25.158,06	24.799,99	34.697,55	6.170,62	12.107,45	31.448,83	33.358,88	10.542,28	16.868,54	26.709,18	17.213,72
Sweden / SE	40.949,83	34.332,77	17.401,84	26.220,90	35.843,14	30.512,66	33.718,99	34.386,79	31.266,14	20.941,68	43.078,37	70.903,89
Switzerland / CH	16.271,59	28.720,19	57.434,72	25.793,04	13.470,14	24.583,48	29.845,31	11.150,94	16.954,65	39.786,95	48.091,67	74.309,80
TOTAL	**427.881,428**	**489.929,212**	**399.418,010**	**322.747,538**	**226.789,562**	**399.908,460**	**438.500,544**	**214.144,364**	**151.575,591**	**320.649,397**	**498.156,892**	**654.174,591**

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ENTSO-E, the European Network of Transmission System Operators, represents 43 electricity transmission system operators (TSOs) from 36 countries across Europe. ENTSO-E was established and given legal mandates by the EU's Third Legislative Package for the Internal Energy Market in 2009.

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