



Brussels, **XXX**
[...](2018) **XXX** draft

ANNEX

ANNEX

to the

Commission Regulation (EU) .../... of XXX

amending Regulation EU No 548/2014 of 21 May 2014 on implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to small, medium and large power transformers

ANNEX

The Annexes to Regulation (EU) No 548/2014 are amended as follows:

(1) Annex I is amended as follows:

(a) point 1 is amended as follows:

(i) the following paragraphs are added:

"As of the date of application of Tier 2 requirements (July 2021), when the one-to-one replacement of an existing medium power transformer entails disproportionate costs associated with their installation, the replacement transformer is, exceptionally, only required to meet Tier 1 requirements for the given rated power.

In this respect, it can be considered that installation costs are disproportionate if these costs (e.g. the replacement of the complete substation housing the transformer and/or the acquisition or rental of additional floor space) are higher than the net present value of the additional avoided electricity losses (tariffs, taxes and levies excluded) of a Tier 2 compliant replacement transformer over its normal expected service life. This net present value should be calculated based on capitalised loss values using widely accepted social discount rates.

In those cases where the replacement transformer is only capable of meeting Tier 1 requirements instead of Tier 2, the manufacturer or importer must state in the technical documentation of the transformer the following information obtained from the commissioner of the unit:

- Address and contact details of the commissioner of the unit
- The station where the replacement unit is to be installed. This can be either a specific location or an specific installation type (e.g., station or cabin model)
- The justification to install a unit that is only Tier 1 compliant. If the unit(s) were commissioned by a tendering process, this shall include all the necessary information regarding the analysis of bids and the award decision, but not information that may be commercially sensitive for bidders."

(ii) Table I.3 is replaced by Tables I.3a and I.3b as follows:

"Table I.3a: Correction factors to be applied to the load and no load losses indicated in Tables I.1, I.2 and I.6 for medium power transformers with special combinations of winding voltages (for rated power ≤ 3150 kVA)

Special combination of voltages in one winding		Load losses (P_k)	No load losses (P_o)
For both liquid immersed (Table I.1) and dry type (Table I.2)		No correction	No correction
Primary highest voltage for equipment $U_m \leq 24$ kV	Secondary highest voltage for equipment $U_m > 3.6$ kV		
For liquid immersed (Table I.1)		10%	15%
Primary highest voltage for equipment $U_m = 36$ kV	Secondary highest voltage for equipment $U_m \leq 3.6$ kV		

Primary highest voltage for equipment $U_m = 36\text{kV}$	Secondary highest voltage for equipment $U_m > 3.6\text{kV}$	10%	15%
For dry type (Table I.2)		10%	15%
Primary highest voltage for equipment $U_m = 36\text{kV}$	Secondary highest voltage for equipment $U_m \leq 3.6\text{kV}$		
Primary highest voltage for equipment $U_m = 36\text{kV}$	Secondary highest voltage for equipment $U_m > 3.6\text{kV}$	15%	20%

Table I.3b: Correction factors to be applied to the load and no load losses indicated in Tables I.1, I.2 and I.6 for medium power transformers with dual voltage in one or both windings differing more than 10% and rated power ≤ 3150 kVA.

Type of dual voltage	Reference voltage for the application of correction factors	Load losses (Pk)(*)	No load losses (Po)(*)
Dual voltage on one winding with reduced power output on the lower low-voltage winding AND maximum available power on the lower voltage of the low-voltage winding limited to 0,85 of the rated power assigned to the low-voltage winding at its higher voltage.	losses shall be calculated based on the higher voltage of the low-voltage winding	No correction	No correction
Dual voltage on one winding with reduced power output on the lower high-voltage winding AND maximum available power on the lower voltage of the high-voltage winding limited to 0,85 of the rated power assigned to the high-voltage winding at its higher voltage.	losses shall be calculated based on the higher voltage of the high-voltage winding	No correction	No correction
Dual voltage on one winding AND full rated power available on both windings, i.e., the full nominal power is available regardless of the combination of voltages.	The losses shall be calculated based on the higher voltage of the dual voltage winding	10%	15%
Dual voltage on both windings AND	the losses shall be calculated based on	20%	20%

rated power available on all combinations of windings, i.e., both voltages on one winding are fully rated in combination with one of the voltages on the other winding	the higher voltages of both dual voltage windings		
--	---	--	--

(*) The losses shall be calculated on the base of the voltage of the winding specified in the second column and can be increased with the correction factors given in the last 2 columns. In any case, whatever the combinations of winding voltages, the losses cannot exceed the values given in Tables I.1, I.2 and I.6 corrected by the factors in this table.",

(b) in point 1.4, the first paragraph is replaced as follows:

"1.4. For the one-to-one replacement of existing medium power pole-mounted transformers, the applicable maximum levels of load and no-load losses are not the ones in Tables I.1 and I.2, but those in Table I.6 below. The correction factors for special combinations of winding voltages indicated in Tables I.3a and I.3b are also applicable." ,

(c) point 2 is replaced by the following:

"2. Minimum energy efficiency requirements for large power transformers

Minimum efficiency requirements for three-phase large power transformers are set out in Tables I.7, I.8 and I.9.

As of the date of application of Tier 2 requirements (July 2021), when the one-to-one replacement of an existing large power transformers or the installation of a new large power transformer in an existing site entails disproportionate costs associated to its transportation and/or installation, or is technically infeasible, the replacement transformer is, exceptionally, only required to meet Tier 1 requirements for the given rated power.

Furthermore, if the cost involved in meeting Tier 1 requirements also proves to be disproportionate, or where it is demonstrated in the technical documentation that no technically feasible solutions exist, no minimum requirements would be applicable for the one-to-one replacement of a large power transformer in an existing site.

As of the date of application of Tier 2 requirements (July 2021), when the installation of a new large power transformer in a new site entails disproportionate costs associated to their transportation and/or installation, or is technically infeasible, the new transformer is, exceptionally, only required to meet Tier 1 requirements for the given rated power.

Furthermore, if the cost involved in meeting Tier 1 requirements also proves to be disproportionate, or where it is demonstrated in the technical documentation that no technically feasible solutions exist, no minimum requirements would be applicable for new large power transformers installed in new sites.

In those cases where a replacement or a new large power transformer is not capable of meeting Tier 2 requirements, or not even Tier 1 ones, the manufacturer or importer responsible for placing on the market or putting into service the transformer must state in the technical documentation the following information obtained from the commissioner of the unit:

- Address and contact details of the commissioner of the unit
- The station where the replacement unit is to be installed. This can be either a specific location or an specific installation type (e.g., station or cabin model)

- The technical and/or economic justification to install a unit that is only Tier 1 compliant (or not even able to meet Tier 1 requirements for new transformers). If the unit(s) were commissioned by a tendering process, this shall include all the necessary information regarding the analysis of bids and the award decision, but not information that may be commercially sensitive for bidders.

In all the above cases, the complete technical documentation must systematically be submitted to the competent national market surveillance authorities every time that a non-compliant transformer is placed on the market or put into service.

Table I.7 Minimum Peak Efficiency Index requirements for liquid immersed large power transformers

Rated Power (MVA)	Tier 1 (01.07.2015)	Tier 2 (01.07.2021)
	Minimum Peak Efficiency Index (%)	
≤ 0.025	97.742	98.251
0.05	98.584	98.891
0.1	98.867	99.093
0.16	99.012	99.191
0.25	99.112	99.283
0.315	99.154	99.32
0.4	99.209	99.369
0.5	99.247	99.398
0.63	99.295	99.437
0.8	99.343	99.473
1	99.360	99.484
1.25	99.418	99.487
1.6	99.424	99.494
2	99.426	99.502
2.5	99.441	99.514
3.15	99.444	99.518
4	99.465	99.532
5	99.483	99.548
6.3	99.51	99.571
8	99.535	99.593
10	99.56	99.615
12.5	99.588	99.64
16	99.615	99.663
20	99.639	99.684
25	99.657	99.7
31.5	99.671	99.712
40	99.684	99.724

50	99.696	99.734
63	99.709	99.745
80	99.723	99.758
100	99.737	99.77
125	99.737	99.78
160	99.737	99.79
200	99.737	99.797

Minimum PEI values for kVA ratings that fall in between the ratings given in Table I.7 shall be calculated by linear interpolation

Table I.8 Minimum Peak Efficiency Index requirements for dry-type large power transformers with $U_m \leq 36kV$

Rated Power (MVA)	Tier 1 (01.07.2015)	Tier 2 (01.07.2021)
	Minimum Peak Efficiency Index (%)	
$3,15 < S_r \leq 4$	99.348	99.382
5	99.354	99.387
6,3	99.356	99.389
8	99.357	99.390
≥ 10	99.357	99.390

Minimum PEI values for kVA ratings that fall in between the ratings given in Table I.8 shall be calculated by linear interpolation",

Table I.9 Minimum Peak Efficiency Index requirements for dry-type large power transformers with $U_m > 36kV$

Rated Power (MVA)	Tier 1 (01.07.2015)	Tier 2 (01.07.2021)
	Minimum Peak Efficiency Index (%)	
≤ 0.05	96.174	96.59
0.1	97.514	97.79
0.16	97.792	98.016
0.25	98.155	98.345
0.4	98.334	98,57
0.63	98.494	98.619
0.8	98.677	98.745
1	98.775	98.837
1.25	98.832	98.892
1.6	98.903	98.96
2	98.942	98.996
2.5	98.933	99.045

3.15	99.048	99.097
4	99.158	99.225
5	99.2	99.265
6.3	99.242	99.303
8	99.298	99.356
10	99.33	99.385
12.5	99.37	99.422
16	99.416	99.464
20	99.468	99.513
25	99.521	99.564
31.5	99.551	99.592
40	99.567	99.607
50	99.585	99.623
≥ 63	99.59	99.626

Minimum PEI values for kVA ratings that fall in between the ratings given in Table I.9 shall be calculated by linear interpolation",

(d) in point 3, a new point (f) is added as follows:

"(f) the noise levels of medium and large power transformers, measured at least as a type test and the last subparagraph is replaced by:

For medium and large power transformers only, the information under a); c) and d) shall also be included on the rating plate of the transformer. ";

(e) point 5 is added as follows:

"5. Repair operations

Existing medium and large power transformers shall be considered as new products if they are subject to upgrade or retrofit activities, regardless of when they were first placed on the market. This is without prejudice to the legal obligations under other Union's harmonisation legislation that these products could be subject to.

Existing medium and large power transformers on which only routine repair or refurbishment operations are performed shall not be considered as new products. Therefore, obligations set out in this Annex are not applicable to repaired or refurbished transformers, which were first placed on the market before 11 June 2014."

(2) Annex II is replaced by the following:

"Annex II

Measurement methods

For the purpose of compliance with the requirements of this Regulation, measurements shall be made using a reliable, accurate and reproducible measurement procedure, which takes into account the generally recognised state of the art measurement methods, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union."

(3) In Annex III the following paragraph is added:

"If Factory Acceptance Tests (FATs) are planned, which test minimum requirements set out in Annex I of this Regulation, the competent authorities in may decide to use witnessed testing during these FATs to assess compliance of the transformer under investigation or have an independent test house carry out such assessment on their behalf. The authorities may request a manufacturer to disclose information on any planned FATs relevant for witnessed testing."

(4) in Annex IV, point (c) is amended as follows:

"(c) Medium power transformers with amorphous steel core: Ao-50%, Ak".