Active losses on the 380-220-150 kV network

2016 Annual Report

1. Origin of active electrical losses

Active electrical losses on the network consist primarily of:

a) losses due to the magnetisation of transformers once they are live ('iron losses' or 'no-load losses');
b) losses due to the heating of windings in transformers when current is flowing through them ('copper losses' or 'load losses');
c) losses due to the heating of conductors in overhead lines and underground cables as a result of the power transmitted by such equipment.

While losses for the first group remain virtually constant, losses for the last two groups vary depending on the square of the current transmitted by the equipment in question. Losses also depend on the manufacturing characteristics of the equipment (length of the circuit, cross section of conductors and type of materials used in the conductors).

Consequently, active electrical losses on the network correspond to power that is dissipated in the form of heat, by natural ventilation or by forced cooling in order to keep the operating temperatures of equipment below the specified manufacturer's limit.

2. Method for determining losses

To determine the quantity of energy dissipated via losses during a given period, every day Elia records a large number of situations observed during the real-time operation of the network. This makes it possible to calculate the individual losses of each electrical circuit, factoring in the actual current running through the equipment in question. The variety of situations covered makes it possible to accurately take account of:

- the actual network configuration (equipment taken switched-off for maintenance, changes to circuits topology, etc.);
- the amplitude and profile of international power exchanges;
- the configuration of generation injected into the network;
- the amplitude and profile of offtakes from the network.

For any given situation, the power lost on the network is equivalent to the sum of losses on all equipment in the network in question.
The energy lost during a given period of time is equivalent to the sum of power lost in all situations during that period, with each situation weighted according to the duration of the occurrence.

3. Basis for calculating active losses on the federal network

Belgium's federal electricity network currently consists of equipment operating at nominal voltages of 380 kV, 220 kV and 150 kV. This equipment consists of overhead lines, underground cables, phase shifting transformers and power transformers which connect these voltages.

The basis for monitoring active losses in 2016 encompasses all equipment operating at nominal voltages of 380 kV, 220 kV and 150 kV, excluding equipment that is part of users' network connections. Power transformers connecting these voltages are also included, in addition to overhead lines, underground cables and phase shifting transformers.

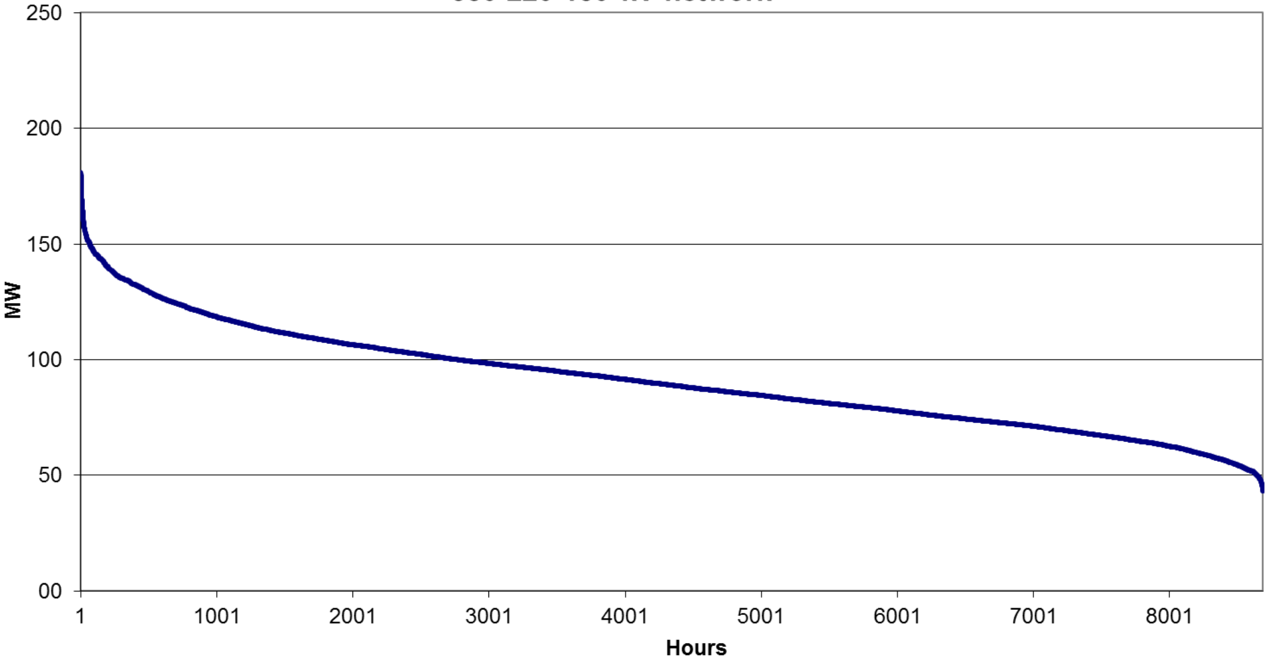
4. Actual losses in 2016 (in GWh)

The table below shows the actual losses in 2016 (in GWh) recorded by Elia on the 380-220-150 kV networks.

	Peak Hours	Off-Peak Hours	**TOTAL**
Q1	85,6	129,4	**215,0**
Q2	68,9	112,7	**181,6**
Q3	71,6	105,9	**177,5**
Q4	83,0	133,6	**216,6**
TOTAL	**309,1**	**481,6**	**790,8**

Monotone curve of losses 2016

380-220-150 kV network



5. Compensation in kind by the Access Responsible Party

Article 161 of the federal Grid Code (Royal Decree of 19 December 2002) states that each Access Responsible Party must compensate active network losses for all of its network accesses. Accordingly, ultimately, active losses observed on the federal network are compensated in kind by the sum of contributions by the Access Responsible Parties.

In order to formulate – in an objective, transparent and non-discriminatory way – the contribution expected from each Access Responsible Party, the contribution is expressed in the form of a percentage of net offtakes linked to the portfolio of the Access Responsible Party in question. For 2016, the percentage was :

1,35% for Peak-load hours; and
1,25% for Off-peak hours.

The table below shows compensation in kind (in GWh) carried out in 2016 by Access Responsible Parties based on this coefficient.

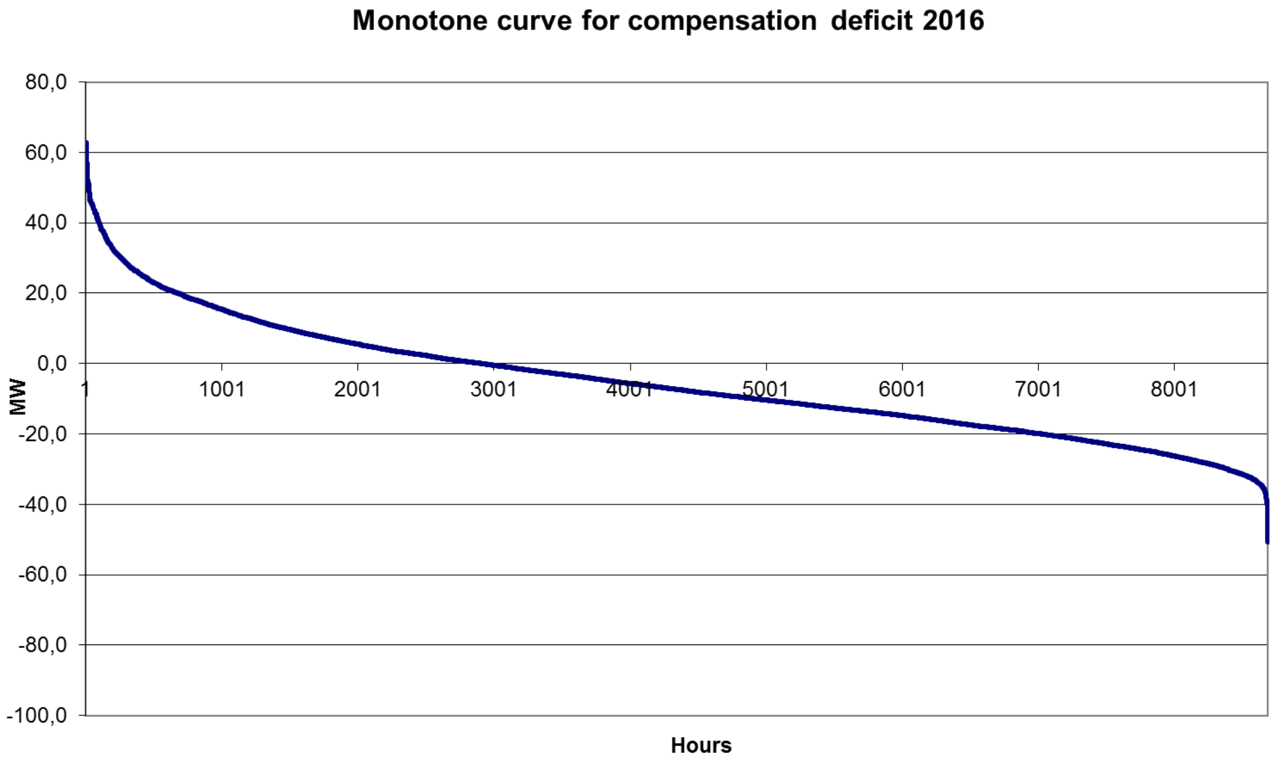
	Peak Hours	Off-Peak Hours	**TOTAL**
Q1	92,8	133,7	**226,4**
Q2	80,5	120,9	**201,4**
Q3	76,9	114,0	**190,9**
Q4	89,2	129,6	**218,8**
TOTAL	**339,3**	**498,2**	**837,4**

6. Deficit of compensation in kind in 2016

The deficit of compensation in kind during a given period is defined as the algebraic difference between actual losses and compensation in kind during the same period.

The table below shows the deficit (in GWh) for 2016.

	Peak Hours	Off-peak Hours	**TOTAL**
Q1	-7,2	-4,2	**-11,4**
Q2	-11,6	-8,2	**-19,7**
Q3	-5,3	-8,1	**-13,4**
Q4	-6,1	4,0	**-2,2**
TOTAL	**-30,1**	**-16,5**	**-46,7**



We can observe subsequently that the compensation coefficients applied per period in 2016 have led to an almost balanced compensation, thus neutralizing the deficit accumulated during the previous years.