Energy efficiency in French electric grids

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AGENDA

- Main stakeholders of the French electric grid
- Introduction to electrical losses
- Focus on electrical losses in TN: audit & solutions
- Focus on Electrical losses in DN
- ADEME’s actions to support EE in energy grids

Main stakeholders of the French electric grid

Implementation of energy policies & regulation by the Ministry for energy

Support of energy & env. policies implementation & innovation

Regulation of gas & electricity market by CRE

Energy generation
Competitive market

enercoop L'énergie militante
ENGIE
TOTAL direct energie
EDF

Energy transport & distribution
Regulated monopole

RTE
ENEDIS L'ELECTRICITE EN RESEAU

Local distribution enterprises

Commercialisation/ services offers*

*energy supply (competitive market since 2009), consumption monitoring, load shifting operations, energy savings actions financing…

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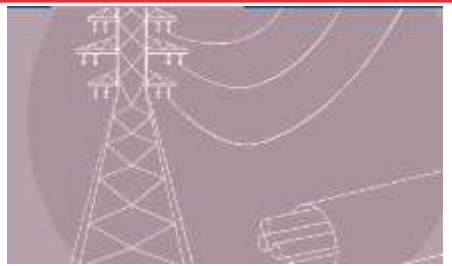
Introduction to electrical losses in France



In 2018, electrical losses on TN were estimated to **11 TWh / 2.16% of the injected energy** (production + importation)*
This figure stable for 10 years

80% correspond to energy dissipated due to Joule effect and corona effect on HV and VHV (rest lost in electrical substations)

Even if **losses are influenced by factors external** to TSO & DSO (power, distance, cables section, grid density, climate conditions…) many actions were implemented to reduce them:

- Improvement of energy efficiency of existing equipment (transformers, substations…)
- Improvement of network topology and configuration

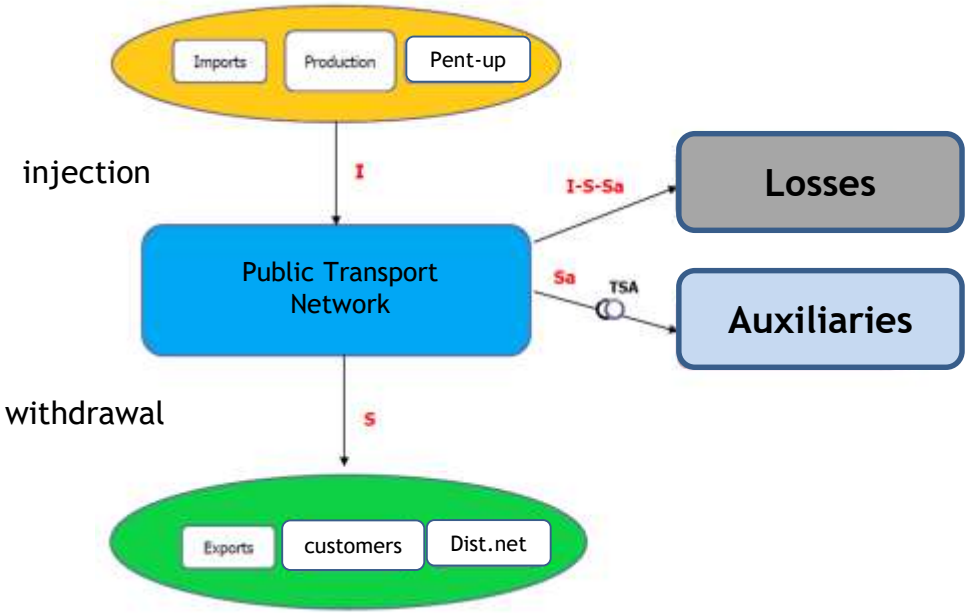
*source : https://bilan-electrique-2018.rte-france.com/reseau-de-transport-taux-de-pertes/

Electrical losses in TN: results from the audit

Scope of the audit (1/3)

Scope: development, maintenance and operation of the public electricity transport grid

Method: measurement of ≠ between the energy injected into/withdrawn from the transmission grid)

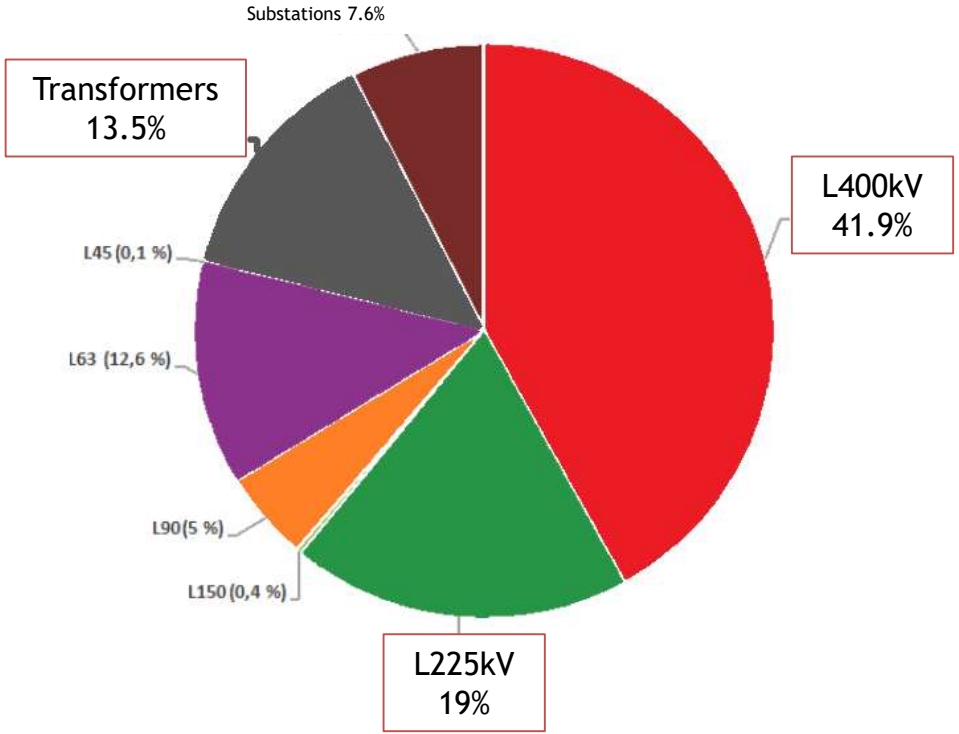


Auxiliaries: cooling of transformers, conditioning, lighting, heating of buildings & control-command equipment

Electrical losses in TN: results from the audit

Origins and costs (2/3)

10,513 TWh lost in 2014



Electrical losses in TN: results from the audit

Potentials measures for EE improvement (3/3)

Development & engineering
(new methods for losses ass. Incl. criterion for detection of losses constraints, asset management…)

Maintenance
(predictive maintenance, cleaning of air cooling systems of transformers…)

Operation
(method/process improvement to speed actions impl., staff awareness raising, topology change…)

R&D/Innovation
(new surface treatment of bare conductor, new measurement sensors…)

Energy management
(ISO 50001, effective losses calculation from measured data…)

Electrical losses in DN: results from the audit

- Electrical losses on DN : 23 **TWh** (6,3% of injected energy) – *in 2015*

- **Technical losses**
  - Independent from quantity of energy (due to transformers, auxiliar services…)
  - Dependent from quantity of energy (losses during the distribution in the lines)

  ➔ **Around 3,5 % (of injected energy)**

  ➔ Mostly in MV/LV substation

- « **Non technical losses** » : energy theft, errors in accounting, non payment by customers…

Electrical losses in DN: results from the audit

Potentials measures for EE improvement

Local Voltage Regulation

(Q=f(U))

Phase balance thanks to Smart Meter in LV Grids

Low Loss Transformers

ADEME's actions to support EE in energy grids

R&D/Innovation

- Postes Intelligents project > digitalization of electric transformers incl. sensors install) to facilitate grid management https://www.ademe.fr/postes-intelligents-0
- VENTEEA project : Q=f(U) on Middle and low Voltage Grid tested. Other tests to be conducted on higher voltage grid https://www.ademe.fr/venteea-0
- Other Smart Grids projects : https://www.ademe.fr/smart-grids-first-results-from-french-demonstrators

Support to EE measures implementation

- Publication of a guide to help operators to limit energy losses in low voltage transformers (see https://www.ademe.fr/transformateur-distribution-economies-denergie

Thank you for your attention

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