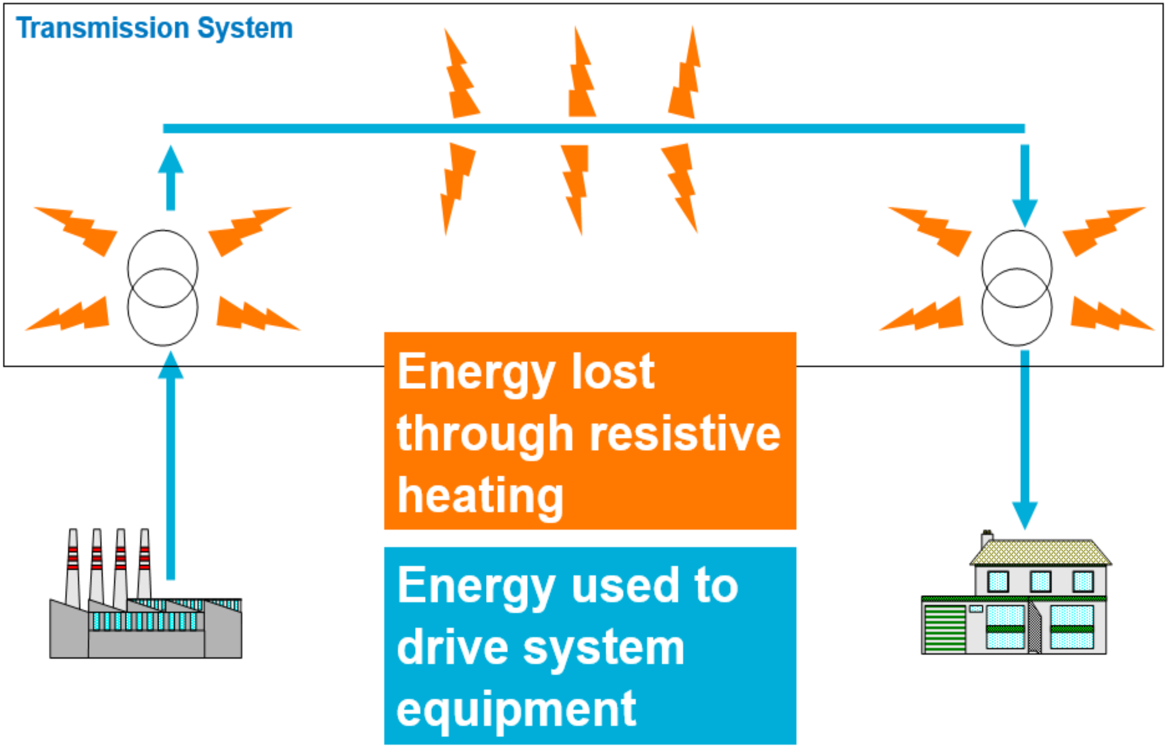
Transmission Losses

How Transmission Losses are calculated
July 2019

What are Losses?



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What are Losses?

Transmission Losses occur due to the physical properties of electricity transmission systems, principally resistance.

Two sources of losses occur in transmission systems. These are:

Fixed losses

- These occur within the iron cores of transformers, cables and overhead lines whenever the circuit is energised. The magnitude of these losses is not dependent on the magnitude of the current being carried by the conductor but rather the magnetic field created by the applied voltage and the induced currents this creates within the iron core. As the voltage is more or less constant, these losses are also considered non-varying

What are Losses?

Variable Losses

- These are the “classic” losses which vary with the current carried by the conductor. These losses occur in cables, overhead lines and transformers and are dependent on the degree of resistive heating experienced.
- Losses in transmission systems are a function of the current carried by the conductors. The loss experienced in a conductor carrying alternating current is given by the equation I2R, where I is the current and R is the resistance of that conductor. This resistance causes energy to be absorbed by the conductor which results in the conductor heating up in the same way as an electric bar heater or the element in a kettle. This energy is lost to the surroundings.
- The resistance of an individual conductor is in turn a function of the materials used in its construction, how these are combined, and the length of the conductor.
- Multiple transmission system components can be considered as a single route with its own characteristics. In this way the route that energy fed in to the north of Scotland takes to reach the demand centres in the south of England can be thought of as a very long conductor. As a longer length increases the overall resistance, and hence transmission losses, we can see that the location of generation infeed relative to demand will affect the level of transmission losses experienced.

Calculating Losses

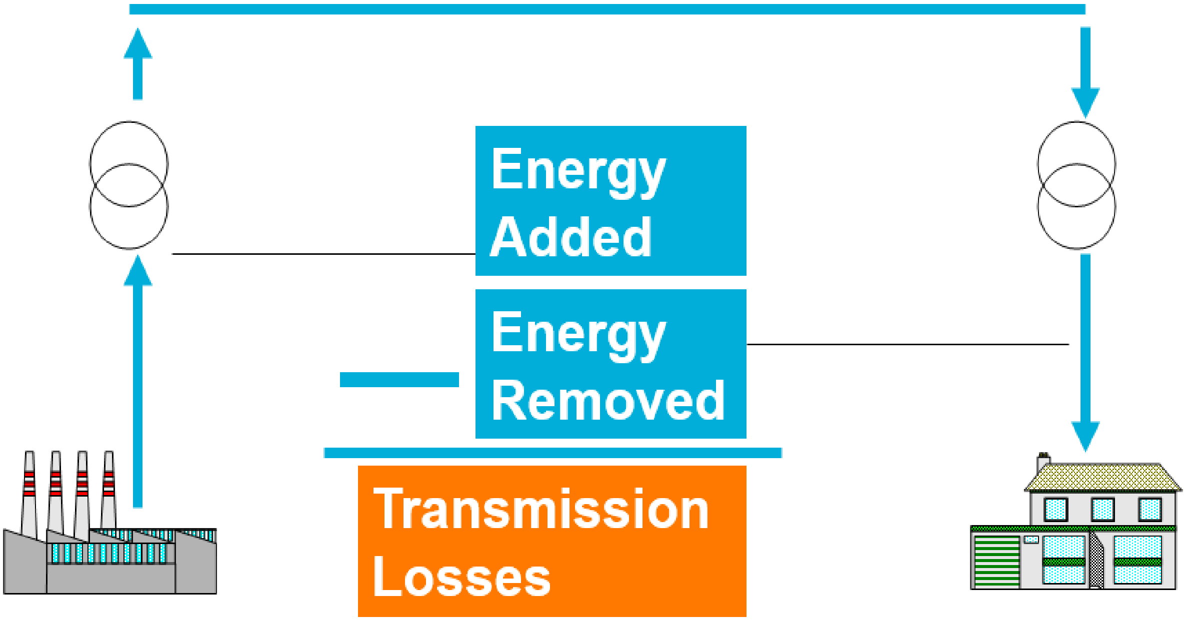
Total Transmission Losses calculated using:

- Elexon data for total metered demand (<0)
- Elexon data for total metered generation (>0)

$$\text{Losses} = \sum_{MWh>0} \text{MeteredOutput} + \sum_{\text{MWh}<0} \text{MeteredOutput}$$

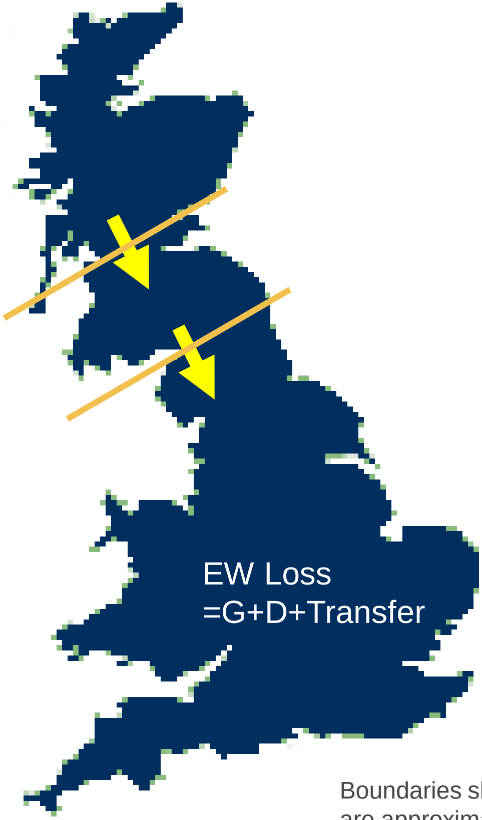
- Elexon meters same as those used for settlement *and therefore subject to change with the settlement process*

How do we measure them?



Calculating Regional Losses

- NGET maintain a mapping of BMU to zone
- Sum settlement metering for each BMU in each zone
- Include transfer in to and out of each zone
- Relies on:
  - ESO BMU-Zone Mapping
  - Settlement data
  - IEMS data



Boundaries shown are approximate

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Data verification

Use Elexon data where ever possible

- Same data as used in settlements process
- Independent

Regular checks of BMU to zone mapping to ensure no BMUs are not allocated

Boundary transfer taken from ENCC control room tool

Total of regional calculation compared to the total for GB

Factors Affecting Losses

- Distance between generation & demand "MW Miles"
- Materials used in the transmission network
- Voltage – Ohms Law $R = \frac{V}{I}$ (Technically in AC circuits its impedance rather than resistance)
- Demand (total current)
- **Main variable: Where generation feeds in to the network**

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