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Transmission Losses

Appendix I

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Applying the *FES* in system planning

Appendix I provides information on the drivers that may impact the total volume of future transmission losses on the NETS. The transmission losses come from both fixed losses and variable (load-related) losses

Fixed losses are incurred by virtue of the system being energised and are more or less constant and independent from the loading of the circuits. They typically come from such things as transformer iron losses, high voltage corona losses in overhead lines and dielectric losses in cable circuits.

Variable losses, also known as load-related losses are proportional to the square of the load on the system. They typically come from the resistance of circuits and depend on the square of the current carried by the circuit (I2R). Therefore, load related losses change significantly with the loading of the transmission system. The nature of the transmission network is to carry large amounts of power efficiently using very high voltages. The use of very high voltage works to minimise losses by reducing the current in the circuits. In this way, the losses of the transmission network are only a small percentage of the power transmitted through it.

Future Transmission Losses

Losses of the electricity transmission network will change as the generation and demand connected to it changes. These changes will arise from factors such as the design and operation of the network, the distance between generation and demand ,and the circuit loading. If generation moves away from demand it tends to increase transmission losses as power needs to be sent longer distances.

The growth in large remote wind farms of recent years has tended to increase transmission losses because, when the wind blows, the power generated needs to be brought to demand, most of which lies around large heavily populated areas away from the wind farms. If this development continues with larger, more remote wind farms, as suggested by some of the Future Energy Scenarios, the losses when windy could be significantly increased. This however is not a bad thing as the transmission network will remain efficient, particularly with the network reinforcements needed to accommodate the new wind connections, and the lost energy will mostly have come from renewable sources.

In some scenarios, in which generation stays close to demand, the power flows over shorter distances and so losses are likely to remain consistent or even decrease. If generation connects mostly to the distribution networks rather than transmission so it feeds local demand, it could be a situation that reduces loading on the transmission network and therefore losses. However, in instances where excess power is exported from the distribution networks onto the transmission system, this could increase the losses on the transmission network. A disadvantage of having highly variable loading on the transmission network is that sufficient transmission capacity is needed to manage the different conditions. Increasing the amount of transmission network will have the natural effect of increasing the fixed transmission losses.

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