Abstract

This dissertation endeavors to make a contribution to the resolution of the problem of loss allocation in electrical distribution networks, with embedded generation.

The problem is divided into two parts: the allocation of network losses without the presence of embedded generation to the consumers; and the allocation of variations that occur in the losses after the consideration of embedded generation to the generators.

The work begins with a description of the problem of loss allocation, focusing particularly on the non-linearity involved. It continues with a critical review of the technical literature with particular reference to methodologies which allow the loss allocation in electrical networks, specially in transmission networks. There then follows an adaptation of several of these methodologies to the distribution networks outlining some necessary changes and also proposing the elaboration of new methodologies.

All the methodologies described in this work are then applied to a small network and the results are compared. The methodologies are also compared, with the help of a set of defined principles which are considered to be fundamental for an ideal loss allocation.

Finally, a methodology for loss allocation in distribution networks, with embedded generation, is proposed, which combines different concepts defined by several authors, in a way not hitherto found in the literature. The proposed methodology has two variants, one based on real power flows, the other based on the currents. The methodology tries to respect three main principles: the same losses are allocated only to one entity; the variations in losses that occur after the entering of embedded generation are allocated to generators; and the search to minimize crossed subsidizations.

The application of the variant of currents to a distribution network with realistic characteristics, yields of interesting results, since it makes loss allocation to consumers and generators, regarding not only the real power flows, but also the reactive power flows, for any power factor of the network users.