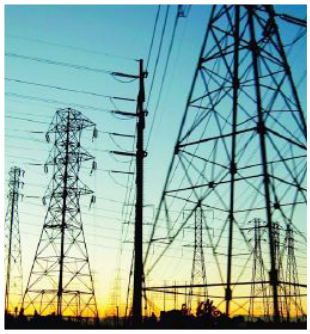

Optimal current injection to or extraction from a utility network

An algorithm has been developed that is applied to an inverter so that power can either be injected into the network optimally, or withdrawn. This will become increasingly important as 'green' technologies such as wind farms and solar panels are connected to the grid. It can be applied to a single phase or multi-wire power network so that the power reaches its destination where it is consumed with minimal losses. This increases the efficacy of utility networks.

Practically the algorithm is implemented through software installed on inverters and the efficiencies, increased capacity and importantly network stabilisation that result, will be of interest to utility providers who control power networks.

Benefits

- Decreased losses of energy on the distribution grid thereby leading to power savings
- Improved quality in power supply

Market

- Utility engineers controlling power networks, and owners of power generation facilities
- Industries needing clean power or with high electrical energy consumption
- Industries with large reticulation systems such as petrochemical plants and mines

Technical description

The most efficient way of transmitting power in a two wire single generator system occurs when the current is in phase with the generator voltage. In the case of multiple wires and generators, the way of transmitting currents with minimum losses becomes more complex to resolve, but is achieved by determining an equivalent Thévenin circuit that is representative of the whole network. A complicated mesh network may be represented as a simple Thévenin network for each phase.

The algorithm for injecting power into or extracting power from a network involves:

- Determining dynamically changing Thévenin parameters in the form of a Thévenin voltage and a Thévenin resistance of an equivalent Thévenin circuit with respect to each wire of a point of common coupling;
- Calculating a total Thévenin power for all the wires based on a specific amount of power at the point of common coupling and the determined Thévenin parameters; and,
- Calculating a dynamically changing optimal current to be injected into or extracted from the point of common coupling so as to inject or extract a specific amount of power based on the total Thévenin power and the dynamically changing Thévenin parameters.

Keywords:
algorithm, electricity, power optimisation, distribution

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5 - Early Prototype

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