DIPARTIMENTO DI INGEGNERIA DELL'ENERGIA ELETTRICA
E DELL'INFORMAZIONE "GUGLIELMO MARCONI"
University of Bologna - School of Architecture and Engineering

30 September, 2014 – Room 0.6 – time 9:45

Lecture

Optimal Power Flow – an Introduction

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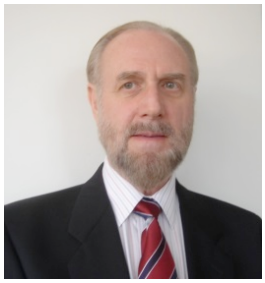
Outline of Lecture - The subject of this introductory talk is a calculation that is used in the operation and control of most large well-developed electric power systems, as well as in system planning. The calculation is a fundamental one, and will be used much more widely in the future.

Ordinary power flow calculates the flows and voltages in a static generation-transmission network, given specific target values for the "control" variables: quantities such as generator MWs and voltage settings, and also the MW and MVAR values at load points. The common power flow algorithms are Newton's method and (mostly for contingency analysis) fast decoupled.

Optimal power flow (OPF) calculates values of the control variables that optimize some "objective function" – frequently the loads are treated as fixed. Typical objectives are: minimize generation cost, minimize transmission MW losses, minimize changes in controls, and maximize MW transfers. This optimization must be done while respecting all system physical and operating limits, in power system's normal state and usually also (with "preventive security") in all post-contingency conditions.

This talk outlines the basic idea of OPF, and some of its main applications. Optimizing a large network securely is a major, important, difficult calculation, as seen by the fact that new algorithms and computer programs are continually being researched and developed. Unlike ordinary power flow, there are no standard OPF algorithms (yet). There are many hundreds of proposed OPF solution methods. There are dozens of commercial OPF computer programs, each of which is suitable for specific applications and which has its own strengths and weaknesses. This introductory talk limits itself to the principal OPF concepts, and does not attempt to describe any of the many algorithms.

The Speaker



Brian Stott is a Member of the US National Academy of Engineering (2005) and an IEEE Fellow (1983). In his early career, he taught in universities in England, Turkey and Canada. Then he spent seven years as leader of a development team on electric power system control center applications at the Electric Energy Research Center in Rio de Janeiro, Brazil. n 1984 he co-founded Power Computer Applications Corporation in Arizona, USA, to develop network analysis methods and software for power systems security and markets. This software includes power flow, state estimation, and optimal power flow, and is used in electric power system control centers throughout the world. His company was acquired in 2000 by Nexant Inc, to whom he remains a consultant.