Preventing power outages

Power system contingency analysis on the GPU

To provide electricity to everyone, large complex power systems are needed. These systems consist of generators (coal or gas generators, nuclear power plants, wind turbines, etc.) and a network of lines and cables to transmit and distribute the generated power.

To prevent power outages, it is imperative that the power system is always operating within the physical limits of the system. For any realistic demand of power, and generation satisfying that demand, the power system has to function properly. This can be checked solving the power flow problem. Moreover, the power system has to keep functioning properly even when a transmission line fails, either by accident or because it is taken out of service for maintenance. Checking whether the power system will indeed stay functional is called contingency analysis.

The GPU, i.e., the CPU of graphics cards, is quickly becoming a popular platform for many numerical analysis applications. It provides SIMD (single instruction, multiple data) parallel computing within a simple desktop computer. Many algorithms run much faster on the GPU than on a single CPU, while the GPU is much cheaper than parallel machines.

The goal of this Master's thesis project is to conduct research into fast solutions of the contingency analysis problem. Specifically, the development of contingency analysis algorithms that are suitable for the GPU, as well as the GPU implementation of these algorithms.

For more information contact Prof.dr.ir. C. Vuik (c.vuik@tudelft.nl, 015-2785530).