Research proposal

Company: Gasunie Transport Services, Infrastructure Planning Department

Problem description and research questions

The Dutch national gas transmission system is an efficiently built infrastructure. To keep its size up to date, periodically a number of relevant transmission circumstances is selected and subsequently simulated. It is desirable that these circumstances constitute a limited set, since each of them needs to be examined in more detail, in order to determine whether the network is capable of handling them. If not, this may trigger an investment.

These circumstances are generated before each evaluation in an automatic process, leading to a complete set of so-called stress-tests. Within this set, many items may be similar or even exactly the same. A process of similarity checking is required to determine which items can be skipped for further processing. Some work has been done on this topic, but many questions remain unanswered.

Mathematically a stress-test, or more generally any individual transmission situation, can be expressed in terms of quantities of gas (on an hourly basis) that enter or leave the network at the various entry or exit points. This can be represented as a vector in an n-dimensional space. The challenges are:

* To what extent is the current approach, using a distance correlation matrix, suitable to deal with network and transmission aspects? Do other comparison techniques, or generalised distance definitions, provide better incorporation options for these aspects?
* Which of the network topology and physical gas transmission aspects (such as pressure drop, compression and blending) are relevant to take into account in such similarity checking?
* In what way could an appropriate desired accuracy level be determined?

Work on these issues may shed a different light on the use of techniques mentioned above, or even result in a totally different approach.

Internship / master thesis

This research work is a team effort. During the research you act as a member of a multidisciplinary team of mathematicians, physicists and other scientists at the planning department of Gasunie Transport Services in Groningen.