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Efficient Energy Use

Optimization of gas delivery systems

MINLP models offer rigorous solutions to complex gas distribution problems which are particularly relevant in a world of new emerging energy technologies and rapidly changing conditions.

Objective

The main task of the project is to optimize gas delivery by pipelines using mathematical programming. The model developed considers injection of re-gasified LNG, biogas or SNG.

Results

The future expansion of the natural gas distribution network depends on the selection of an appropriate place for new LNG ports in Finland and their successful integration in the supply network. The influence of fuel price variations on the optimal natural gas network supply was studied by optimization of the system (see map in upper figure). Coloured circles (lower figure) represent the optimal network extension and a dot in the middle of a circle indicates that the LNG port (in Pori) supplies re-gasified LNG. The optimal solutions are clustered in different regions, representing four connection possibilities.

Conclusions

The model developed considers options of extending an existing pipeline network and possibilities to introduce gas from local sources (biogas, re-gasified LNG) in a multi-period formulation. It can be used as a tool for studying potential future gas distribution.

