A stochastic multistage mixed integer optimization modell for investment in natural gas infrastructure

In the Ramona project financed by Statoil, Gassco and the Norwegian Research Council we have over the last five years developed a optimization tool for analyzing investments on the Norwegian continental shelf.
Typical decisions are which gas fields to develop, when to develop and corresponding technology choice. Other decisions regards which pipelines to build and compressors. Even more importantly we consider the decisions on how to link all this together based on:
-       The need to share pipeline infrastructure between several fields

-       Access to spot markets

-       Contractual obligations

-       Technical constraints on natural gas qualities and blending on gas from different fields

-       System effects based on physical properties of natural gas flow

Uncertainty is present in many parts of this decision problem. We consider both long term uncertainty like market trends, new field discoveries, the properties of new fields and short term uncertainty like market variations and rare events.
The model horizon is 10-40 years and the time resolution used is flexible.

The underlying model is a mixed integer multi-stage stochastic program with recourse. The presentation focus on the natural gas system, model choices and model structure, the scenario tree and solution methods.

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