DTU Management Engineering
Department of Management Engineering

Investment Behaviour and Uncertainty in Energy Saving

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Relevance - challenges, problem or opportunity?

Danish energy policy includes ambitious targets for energy savings that are important for reducing CO2-emissions and the dependency of fossil fuels. Large saving potentials exist, however, there is great uncertainty related to the specific implementation of savings and limited knowledge of behavioural, structural, and economic obstacles leading to a slow implementation. The project will analyze these issues with special focus on the industrial sector.

Research question?

- Where is the uncertainty in energy saving investments (technology, markets, etc.)?
- Which mathematical model can help us in finding a good investment strategy?
- Can financial products be used to control/quantify the risk of e-saving investments?

Conceptual model/theory

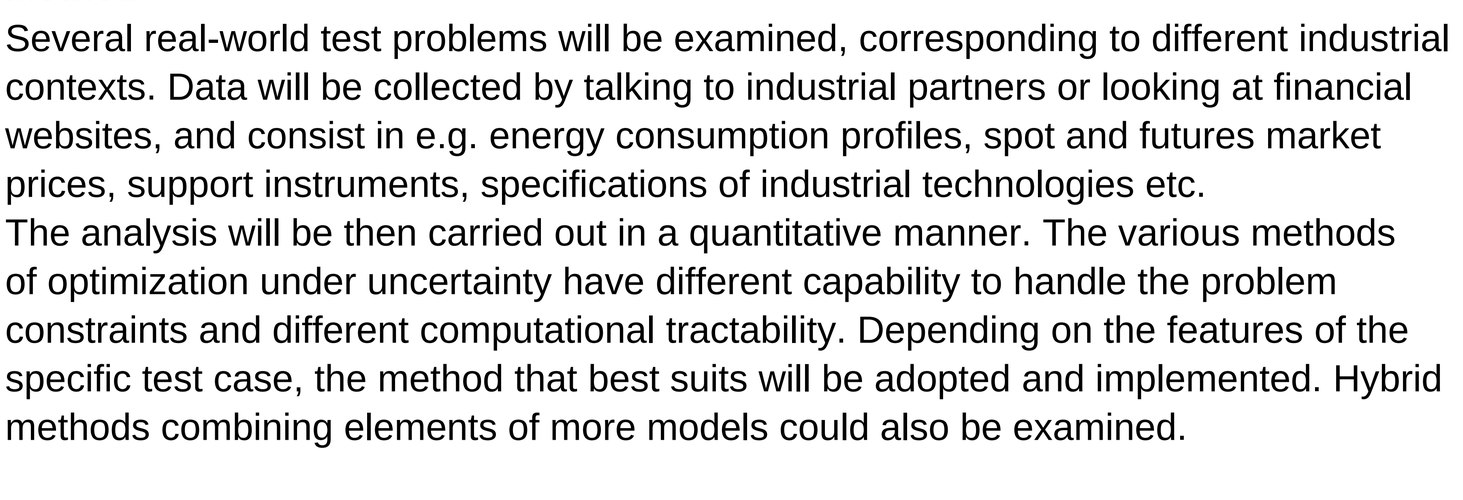
During the project the main theories behind optimization under uncertainty will be taken into account. They include Multi-Stage Stochastic Programming, Robust Optimization, Stochastic Dynamic Programming and Real Option Theory. Different techniques for Scenario Generation will also be studied in order to simulate the dynamics of the risk factors. These elements will allow us to create advanced mathematical models for risk management, valuation of energy saving investment projects and determining energy investment portfolios with different risk exposure.

Method

Several real-world test problems will be examined, corresponding to different industrial contexts. Data will be collected by talking to industrial partners or looking at financial websites, and consist in e.g. energy consumption profiles, spot and futures market prices, support instruments, specifications of industrial technologies etc.
The analysis will be then carried out in a quantitative manner. The various methods of optimization under uncertainty have different capability to handle the problem constraints and different computational tractability. Depending on the features of the specific test case, the method that best suits will be adopted and implemented. Hybrid methods combining elements of more models could also be examined.

Expected results

- Definition of new models for analyzing energy saving investments and determining an optimal investment strategy or portfolio
- A decision support tool based on stochastic optimization will be developed enabling a combination of financial products
- Long-term additional energy savings, provided by the overall SAVE-E research project, of around 3-5% implemented in Denmark by 2030



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Funded by:

InnovationsFonden
FORSKNING, TEKNOLOGI & VÆKST I DANMARK

DTU Danmarks Tekniske Universitet

Start and completion date:

1 April 2015 to 31 March 2018

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UNEP DTU partnership

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