

# Handling maintenance priorities using multi criteria decision making

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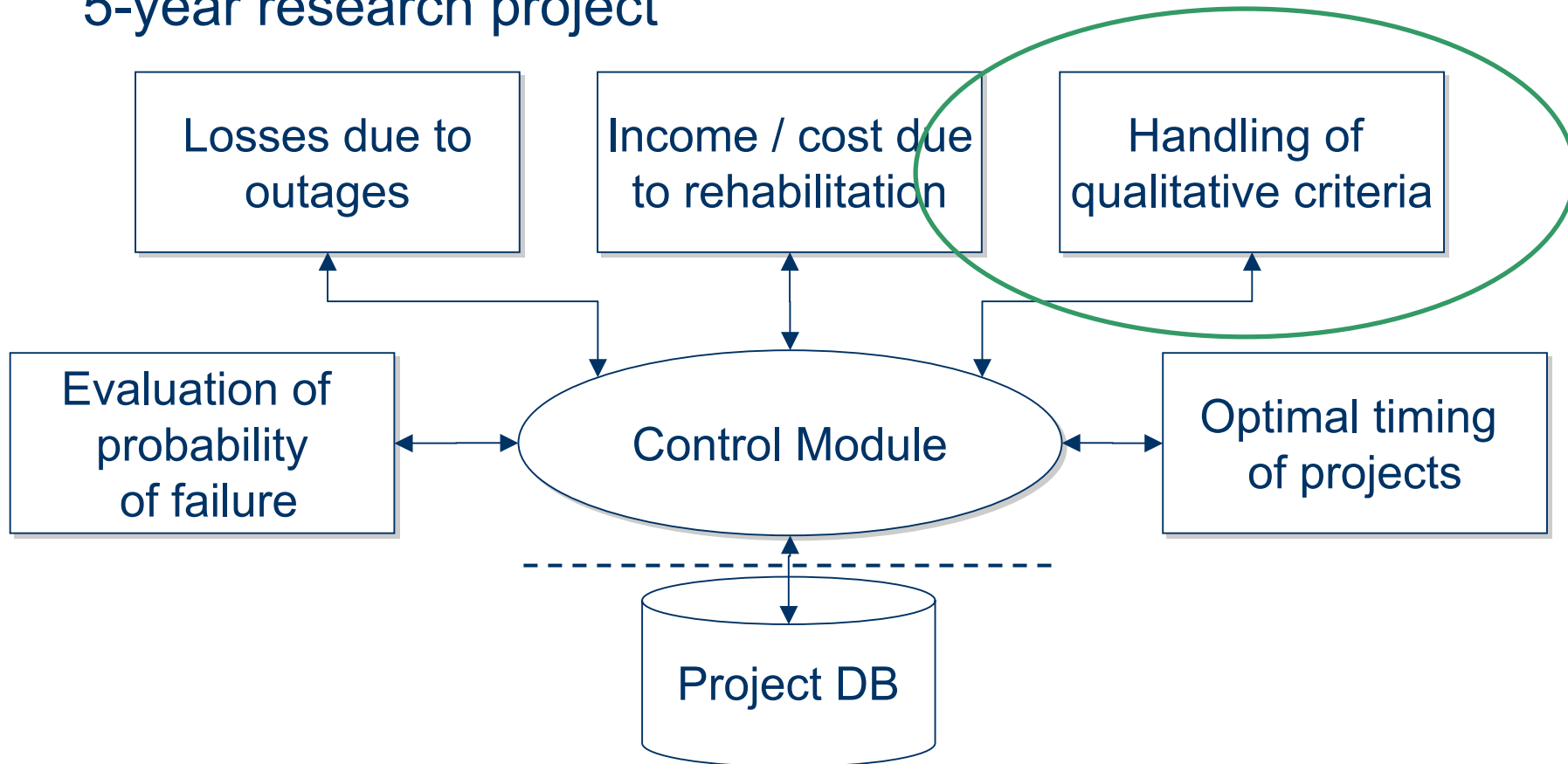
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# Introduction / background

- Substantial changes in the Norwegian power sector during the last decade
- Few new power plants being built
- Focus on operating and maintaining existing plants in an optimal manner
- When deciding what to do there are several criteria which need to be considered:
  - Economy
  - Safety
  - Environment

# Introduction / background II

- Holistic scheme for maintenance planning is the topic for a 5-year research project

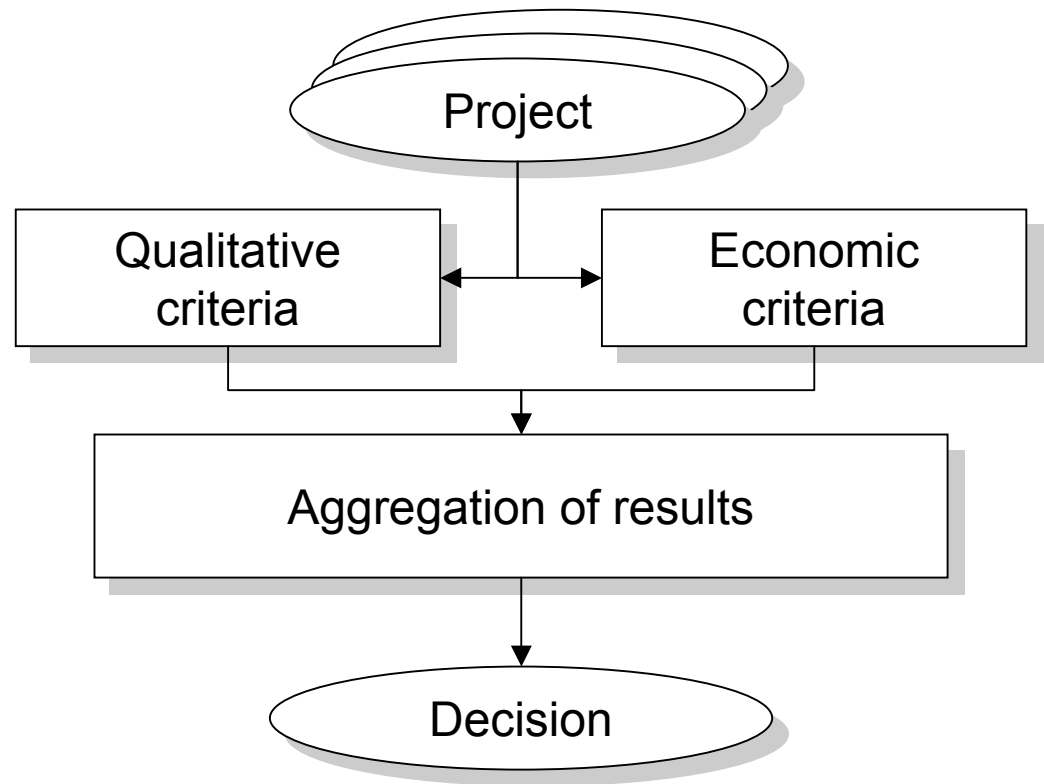


# The challenge

- The power companies face large portfolios of project proposals which the maintenance administration have to make priorities among
  - Limitations in funding, labour, time
- Projects proposals are launched due to many different reasons which are hard to compare
- The approach presented in the paper describes a decision support tool which aids the choosing between a variety of project proposals and selecting the projects being the best for the company's strategies

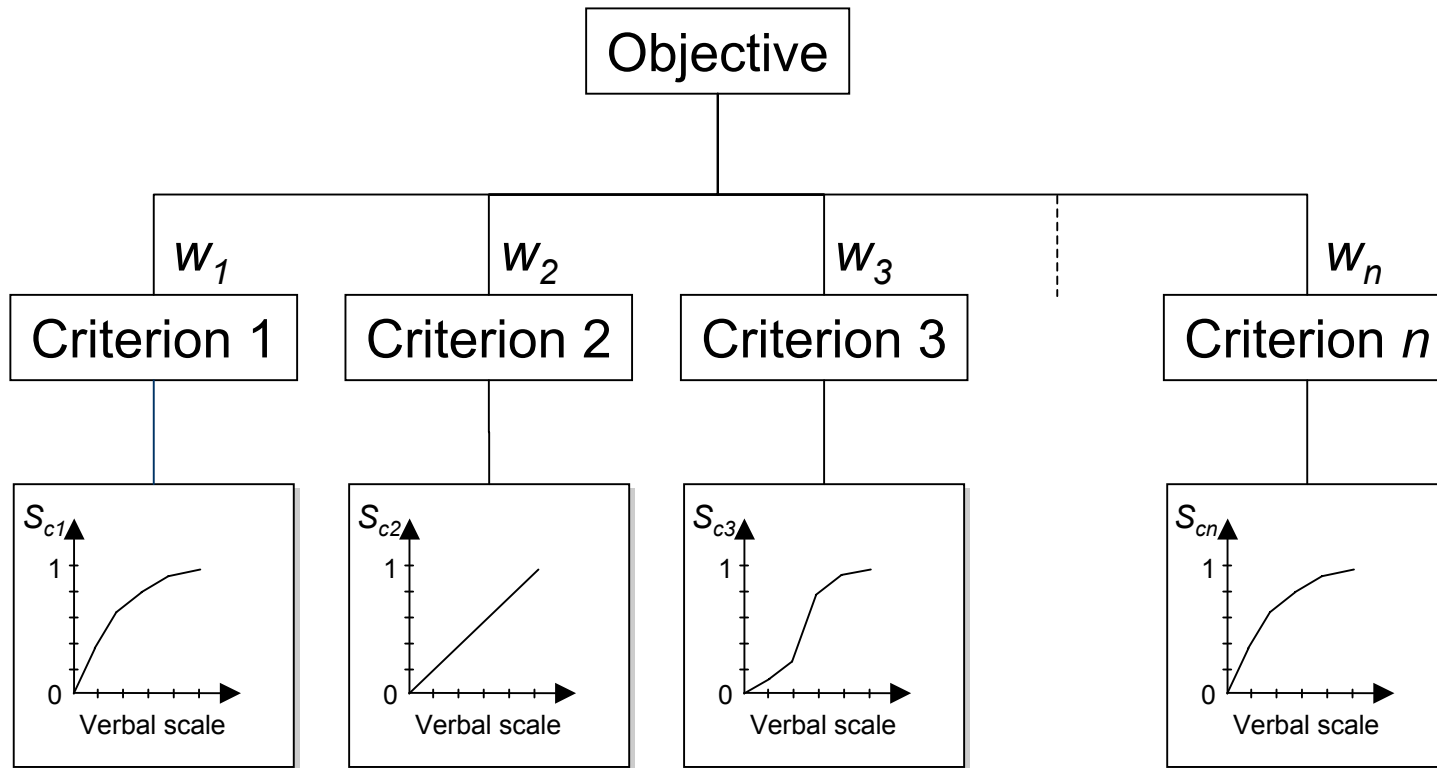
# Analysing strategies

- The presented approach gives two evaluation processes for the projects proposals
  - Economic criteria
  - Qualitative criteria



# Handling qualitative criteria

- To aid the inclusion of qualitative criteria into the overall project evaluation MCDM-methods is being used
- In the projects activities the AHP-method (*Analytic Hierarchy Process*) has been used
- Stages in structuring the decision model:
  - Identification of which decision criteria to be included
  - Establishing the relative weights of the criteria using the AHP-method and pairwise comparison
  - Establishing scores and scales for each criterion
- Using the decision model:
  - Evaluation each project using the model
  - Obtaining a *Qualitative Utility Value* (QUV) for each project





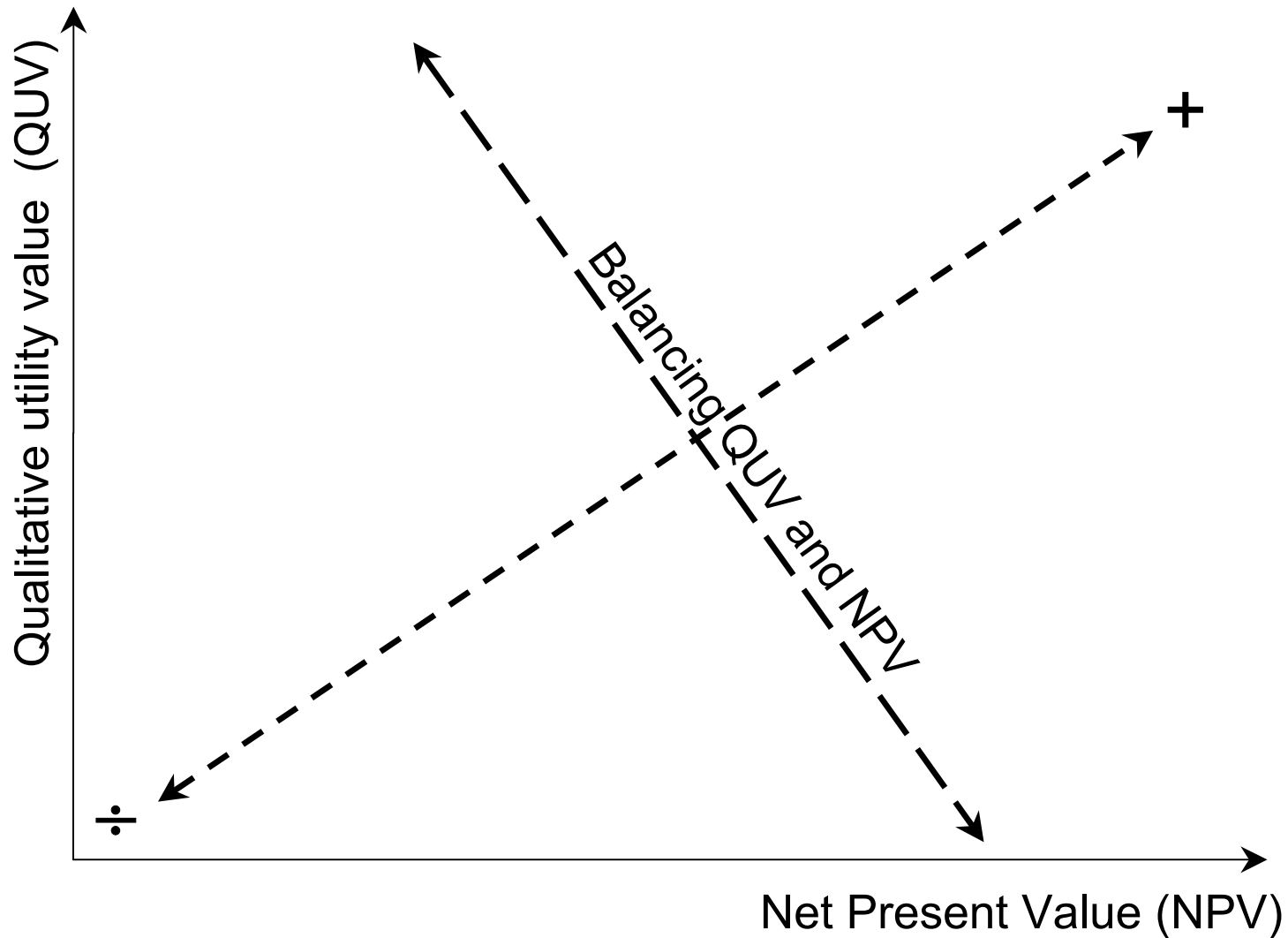
# Handling economic criteria

- The Net Present Value (NPV) is an important figure when comparing projects
- Economic analysis of maintenance projects is often treated a minimum cost approach.
- In the project activities another approach is chosen – namely to focus on the profitability of the projects

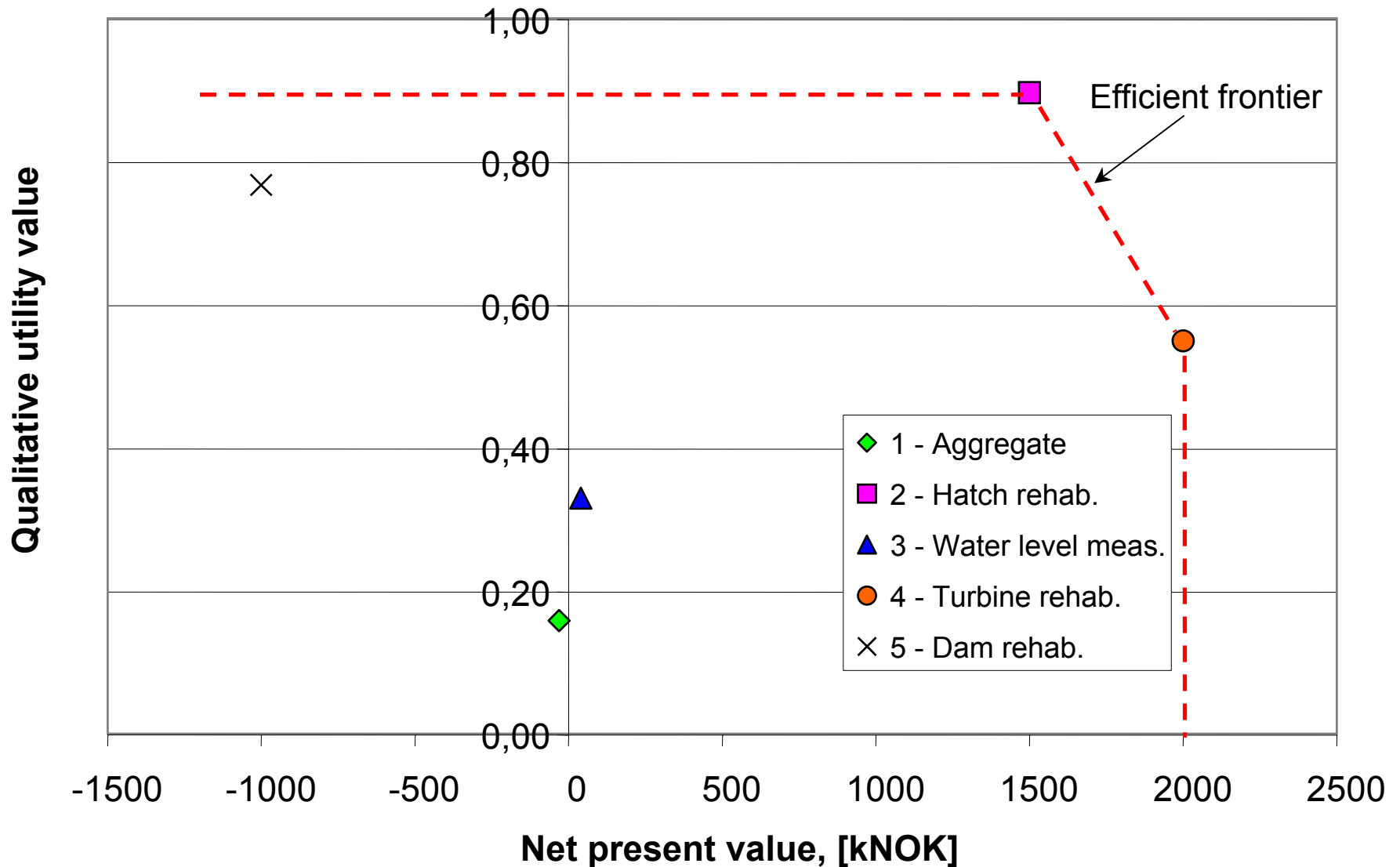
# Handling economic criteria II

- Cost elements included in the calculation of NPV:
  - Resources (labour, parts, transport, etc)
  - Unavailability costs during the project
  - Maintenance introduced costs
  - Other costs
- “Income” elements included in the calculation of NPV:
  - Increased power efficiency
  - Increased availability (reduced failure probability)
  - Deferral of future investments
  - Other income

# Results - Schematic view



# Example – results from evaluation



# What can be gained?

- Qualitative criteria that have effect on the analysis of a project are given explicit attention
- Requires a clarification of which aspects to be taken into account
- Possible to make a perspicuous representation of both economic and qualitative aspects of the projects
- Results from projects evaluation are systematically documented
- More consistent projects evaluation in case of multiple caseworkers

# Conclusions

- The paper presents a way of evaluating maintenance projects taking both economic and qualitative criteria into account
- Qualitative criteria are being structured using the AHP-method which have shown to be an effective tool for this purpose
- Using such an approach as outlined in the paper makes it easier to perform consistent evaluation of maintenance projects according to the company's strategies
- The MCDM-method does not make the decision, but it gives the decision maker a better basis for making the right choice.