

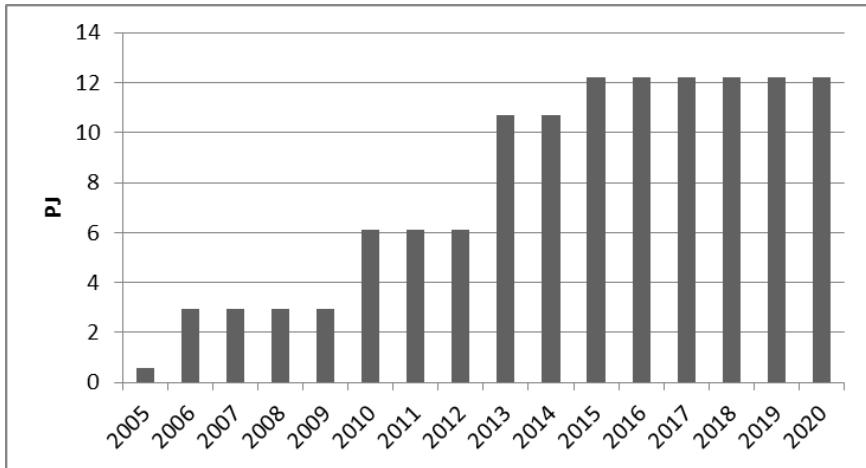
# Spending to Save: Evaluation of the Energy Efficiency Obligation in Denmark

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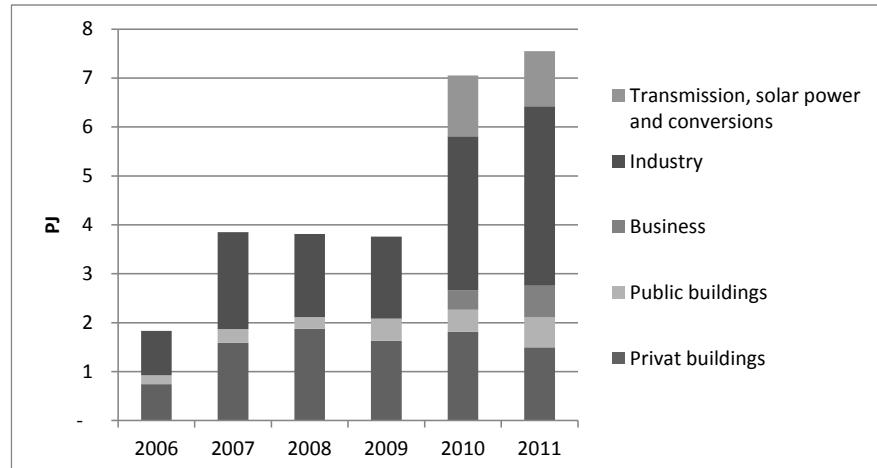
# Agenda

- Introduction: Target and reported savings
- Net impact: Two different approaches
- Analysis of technical accuracy
- Analysis of additionality
- Net impact results
- Dilemma: Accuracy versus simplicity

# Target and reported savings



**Development in the Danish EEO target.**  
(Target in first year savings)



**Reported savings in the Danish EEO  
2006-2011 distributed on sectors.**  
(123% of the target in 2011)

... but what does the EEO actually deliver?

# Net impact

## Reported savings

- Technical accuracy of calculations
- Additionality
- Rebound
- Spill-over

- 1) Assessment of the technical accuracy of the calculation of the savings based on review of documentation
- 2) Analysis of additionality based on interviews with end-users

## Statistical analysis of measured consumption

- Recorded energy before and after
- Action group and control group
- Detailed information about both groups

- 3) Statistical case study of heat savings in single family houses with district heating

# Technical accuracy

- Review of calculation methods and assessment of assumptions and conditions under which the calculations have been made
- 121 reported energy saving projects from 25 obligated parties reported in 2011
- Focus on the largest projects, 20% of the total reported savings for 2011

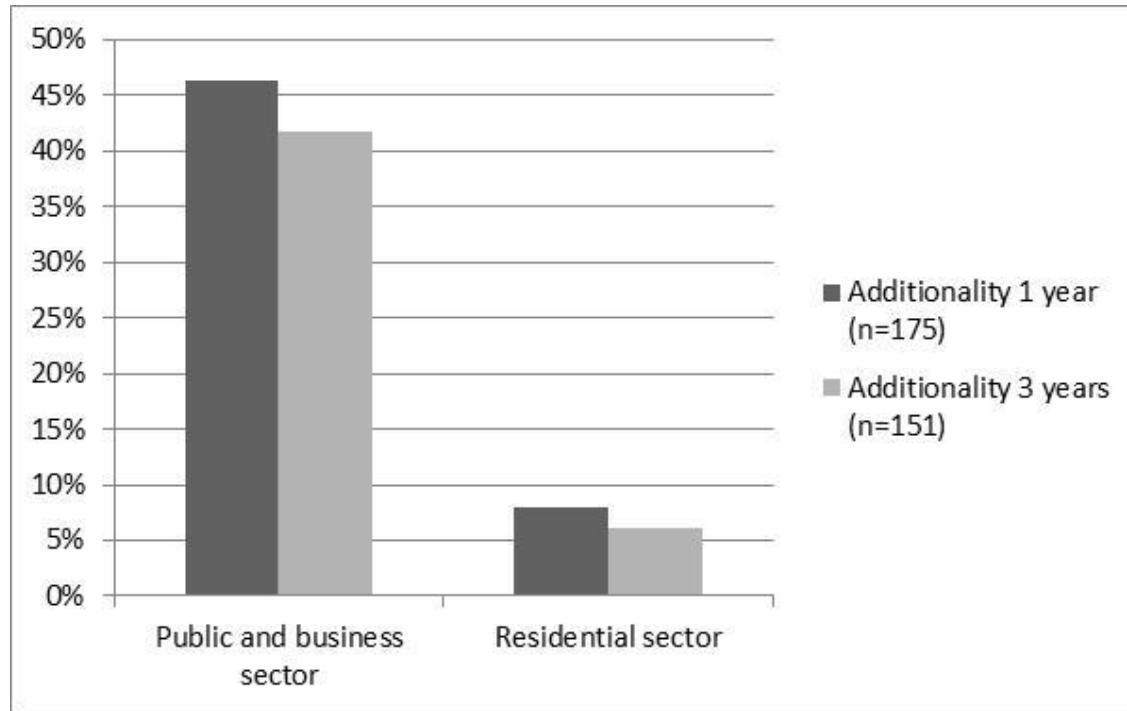
# Technical accuracy results

- Average 6% overestimation in the review.
- Mostly larger projects with specific calculation
- Calculation errors
  - Incorrect use of conversion factors, mistakes in quantifying the area of relevance to the energy saving measure etc.
  - Not taking the total energy balance into account when calculating the energy saving potential, e.g. ignoring extra energy consumption elsewhere in an industrial process.
- Improper/incorrect use of assumptions
  - Often open for interpretation
  - In some cases, the reference case is too lax resulting in estimates of too high energy savings.

# Additionality analysis

- 209 telephone interviews with end-users involved in the EEO (all energy forms and all end-use sectors).
- 30% of the projects represented in the evaluation (16% of the total obligation).
- 4 hypothetical questions in the interviews addressed the additionality:
  - To what extent were you, before you came in contact with [the energy distribution company], thinking about realising the energy saving project?
  - How likely is it that you, without contact to [the energy distribution company] or [other actors], had implemented the energy saving project within 1 year? / 3 years?
  - How critical to the implementation of the project was the subsidy that you received?
- The quantitative answers were converted to an additionality factor.

# Additionality results



**Average additionality for the public and business sector and the residential sector based on interviews with end-users (public and business sector n=129, residential sector n=46).**

# Additionality – methodological challenges

- Based on hypothetical questions
  - Strategic answers etc.
- Sample size
  - Residential sector n=46, non-residential sector n=129
- Response rate
  - Residential sector: 24%, non-residential sector 49%
- Lapse between implementation and interview
  - Maximum 2 years

# Net impact results

- The net impact is expectedly lower than the reported savings
  - Technical accuracy: 6% overestimation in the review of 121 concrete (mostly larger) projects.
  - Additionality: 20% for residential sector, 45% for public and business sector
  - Net savings: It is estimated that compared with "today's standard" leads to an overestimation of savings.
- Average net impact = 36%!  $7.54 \text{ PJ} \Rightarrow 2.74 \text{ PJ}$
- Statistical case study
  - Analysis of 166 district heating savings projects suggests that the effect on actual energy consumption is only 44% of the registered energy.

# Dilemma: Accuracy versus simplicity

- Do we need to measure the realised savings or the effect of the instrument?
- Higher <-> lower administrative and evaluation costs
  - Measured savings <-> reported savings
  - Measured additionality <-> stated additionality
- Added value of having precise measures of the savings?
- Experience with or recommendations for "simple" methods?