Evaluation of energy efficiency activities

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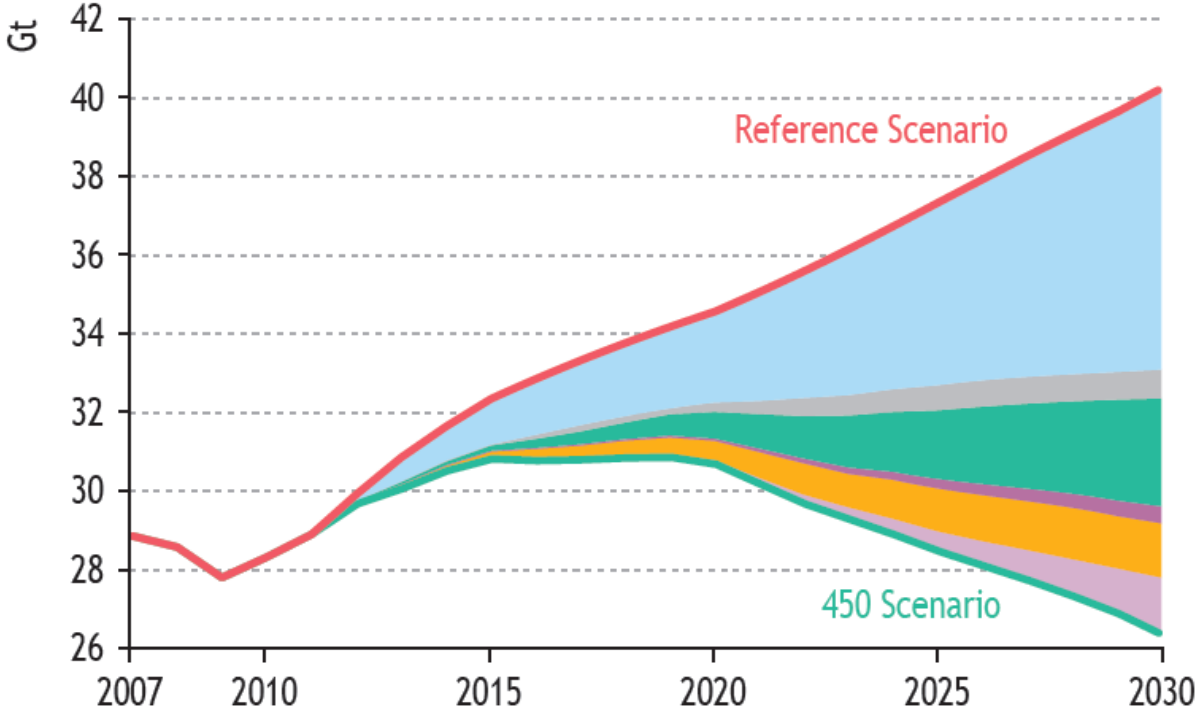
Background

- Partner in Ea Energy Analyses (2005-)
- Co-author to: “European Ex-post evaluation guidebook for DSM and EE service programmes” (2001)
- Project manager for “Evaluation of all Danish Energy Efficiency activities” (2008)
- International comparison of white certificates
- ESCO (Energy service companies) for households

ENERGY EFFICIENCY

A global perspective

Figure 5.8 • World energy-related CO_2 emission savings by policy measure in the 450 Scenario



	Abatement ($Mt CO_2$) 2020	2030
Efficiency	2 517	7 880
End-use	2 284	7 145
Power plants	233	735
Renewables	680	2 741
Biofuels	57	429
Nuclear	493	1 380
CCS	102	1 410

International Energy Agency, World Energy Outlook, 2009

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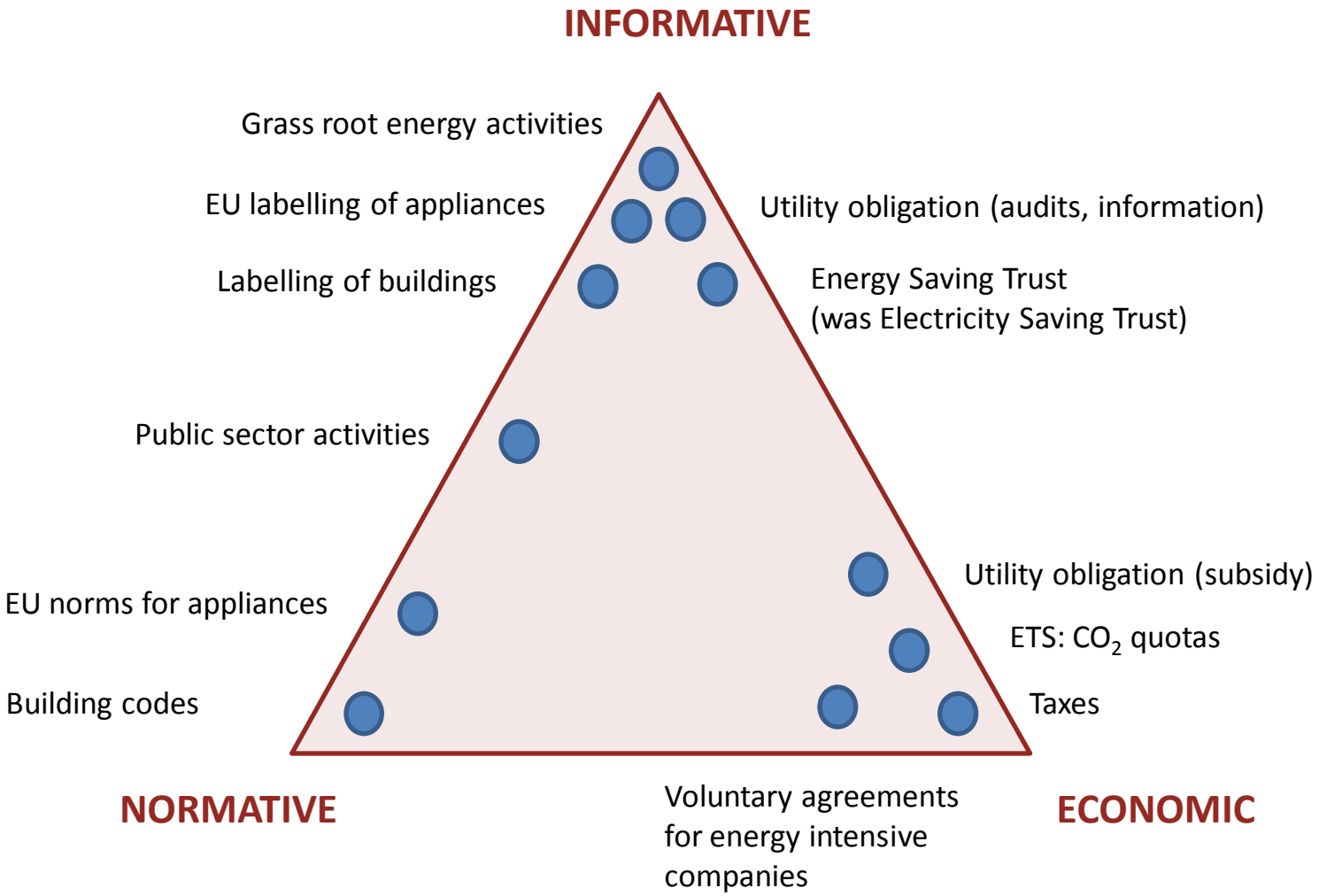
Is it possible with huge saving?

- Technical possible? Yes!
- Is it economic viable? Yes!
- Is it possible to design policy instruments to achieve this result? Yes!
- Are governments willing to activate the needed policy instruments? Maybe!

Danish energy efficiency instruments



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Nine EE activities

	Households	Public sector	Trade and industry	Energy intensive industry
CO_2-quotas	x	x	x	**X**
Taxes	**X**	**X**	x	x
Energy utilities obligation	**X**	**X**	**X**	**X**
Energy Saving Trust	**X**	**X**	x	x
Building codes	**X**	x		
Labelling, buildings	**X**	x		
Labelling, appliences	**X**			
NGO activilities	**X**			
EE in th public sector		**X**		

EVALUATION DESIGN

Evaluation

- Too few evaluation of energy efficiency activities
- Policy instruments for energy efficiency are not “mechanical”
- Often they do not work as intended!
- Important with quality evaluations!

Two types of evaluation

Process evaluation

What happened?

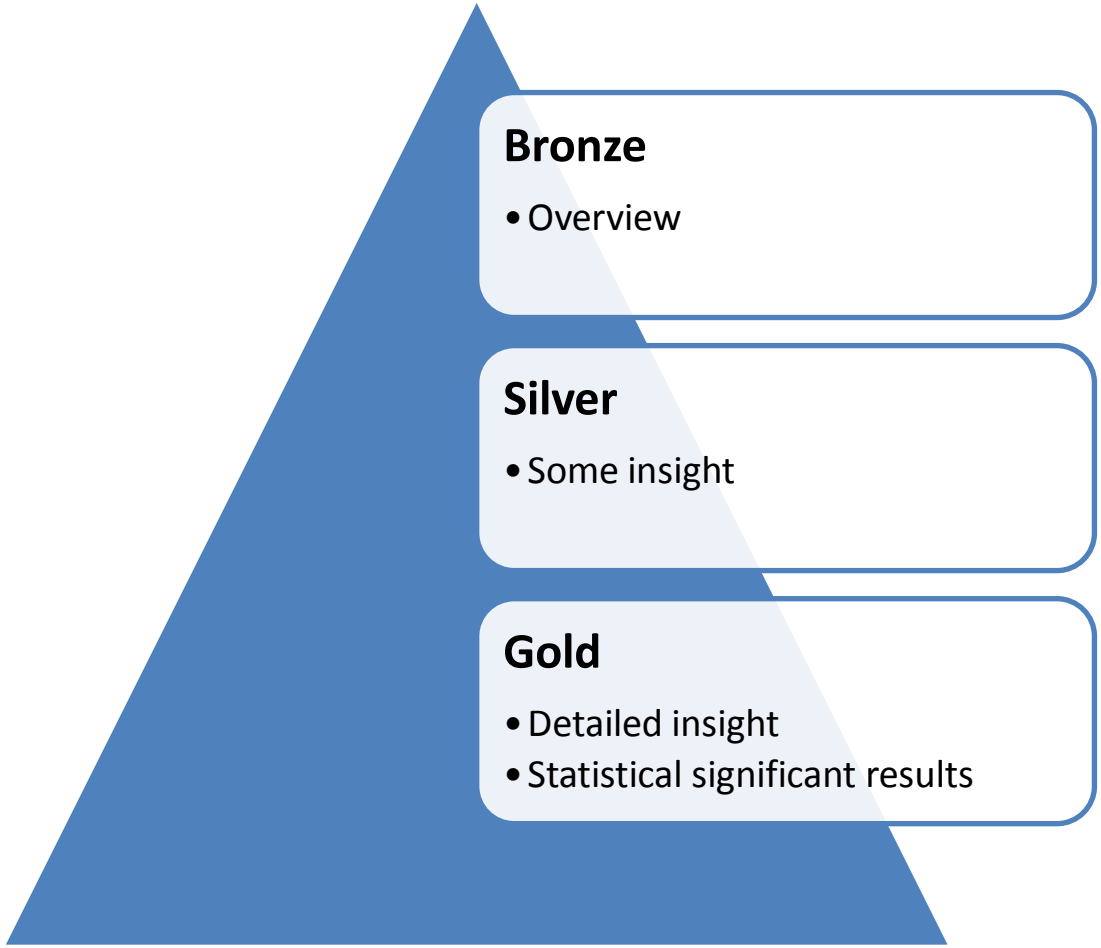
- Was information understood?
- What can be improved?

Impact evaluation

Real impact

- Additional kWh saved
- Controlled for changes in the surroundings
- Free riders
- Rebound

Simple or advanced



Balance

- A quality evaluation has a balance between
  - Evaluation questions
  - Methods
  - Data
  - Resources (costs)
- Evaluation = Systematic investigation with the purpose to deliver quality information in time

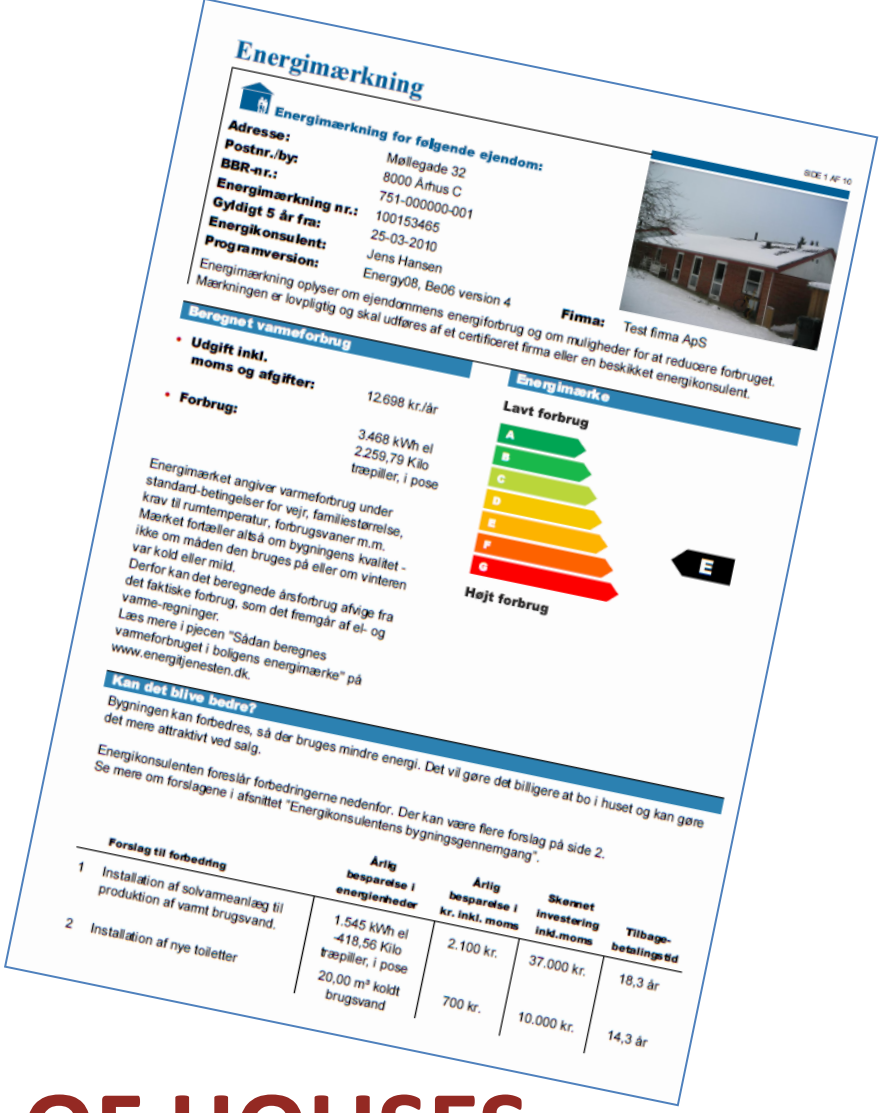
Example

- Information to households are supplied free of charge
- Households are asked
  - Did they find the information relevant?
  - Did they use the information to implement savings?
- Type of evaluation?
  - Process or impact?

Did they implement more saving project than a control group?

This is not described in the evaluation!

CASE:
ENERGY LABELLING OF HOUSES



Energimærkning

Energimærkning for følgende ejendom:

Adresse: Møllegade 32
Postnr./by: 8000 Århus C
BBR-nr.: 751-000000-001
Energimærkning nr.: 100153465
Gyldigt 5 år fra: 25-03-2010
Energikonsulent: Jens Hansen
Programversion: Energy08, Be06 version 4

Firma: Test firma ApS

Energimærkning oplyser om ejendommens energiforbrug og om muligheder for at reducere forbruget.
Mærkningen er lovpligtig og skal udføres af et certificeret firma eller en beskikket energikonsulent.

Beregnet varmeforbrug

- Udgift inkl. moms og afgifter: 12.698 kr./år
- Forbrug: 3.468 kWh el, 2.259,79 Kilo træpiller, i pose

Energimærket angiver varmeforbrug under standard-betingelser for vejr, familiestørrelse, krav til rumtemperatur, forbrugsvaner m.m. Mærket fortæller altså om bygningens kvalitet - ikke om måden den bruges på eller om vinteren var kold eller mild.
Derfor kan det beregnede årsforbrug afvige fra det faktiske forbrug, som det fremgår af el- og varme-regninger.
Læs mere i pjecen "Sådan beregnes varmeforbruget i boligens energimærke" på www.energitjenesten.dk.

Energimærke

Lavt forbrug

A B C D E F G

E

Højt forbrug

Kan det blive bedre?

Bygningen kan forbedres, så der bruges mindre energi. Det vil gøre det billigere at bo i huset og kan gøre det mere attraktivt ved salg.

Energikonsulenten foreslår forbedringerne nedenfor. Der kan være flere forslag på side 2.
Se mere om forslagene i afsnittet "Energikonsulentens bygningsgennemgang".

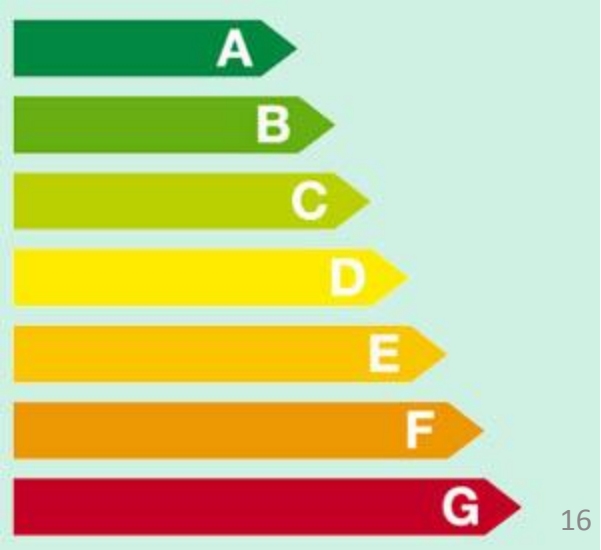
	Forslag til forbedring	Årlig besparelse i energienheder	Årlig besparelse i kr. inkl. moms	Skønnet investering inkl.moms	Tilbage-betalingstid
1	Installation af solvarmeanlæg til produktion af varmt brugsvand.	1.545 kWh el -418,56 Kilo træpiller, i pose 20,00 m³ koldt brugsvand	2.100 kr.	37.000 kr.	18,3 år
2	Installation af nye toiletter		700 kr.	10.000 kr.	14,3 år

Energy labelling of houses

- Danish implementation of a EU requirement
- When a house is sold an energy label must exist
  - A consultant inspects the house
  - Energy consumption is neutrally defined
  - Labelling report with concrete, individual recommendations, including pay-back time of investments
    - Insulation
    - Windows
    - Boiler
  - A label is defined: A-G (A best)

Success?

- Is this a good activity to promote energy efficiency?
- How do the cost of the energy label compare with the realised savings, than can be realetd to the label?



+/-

Plus

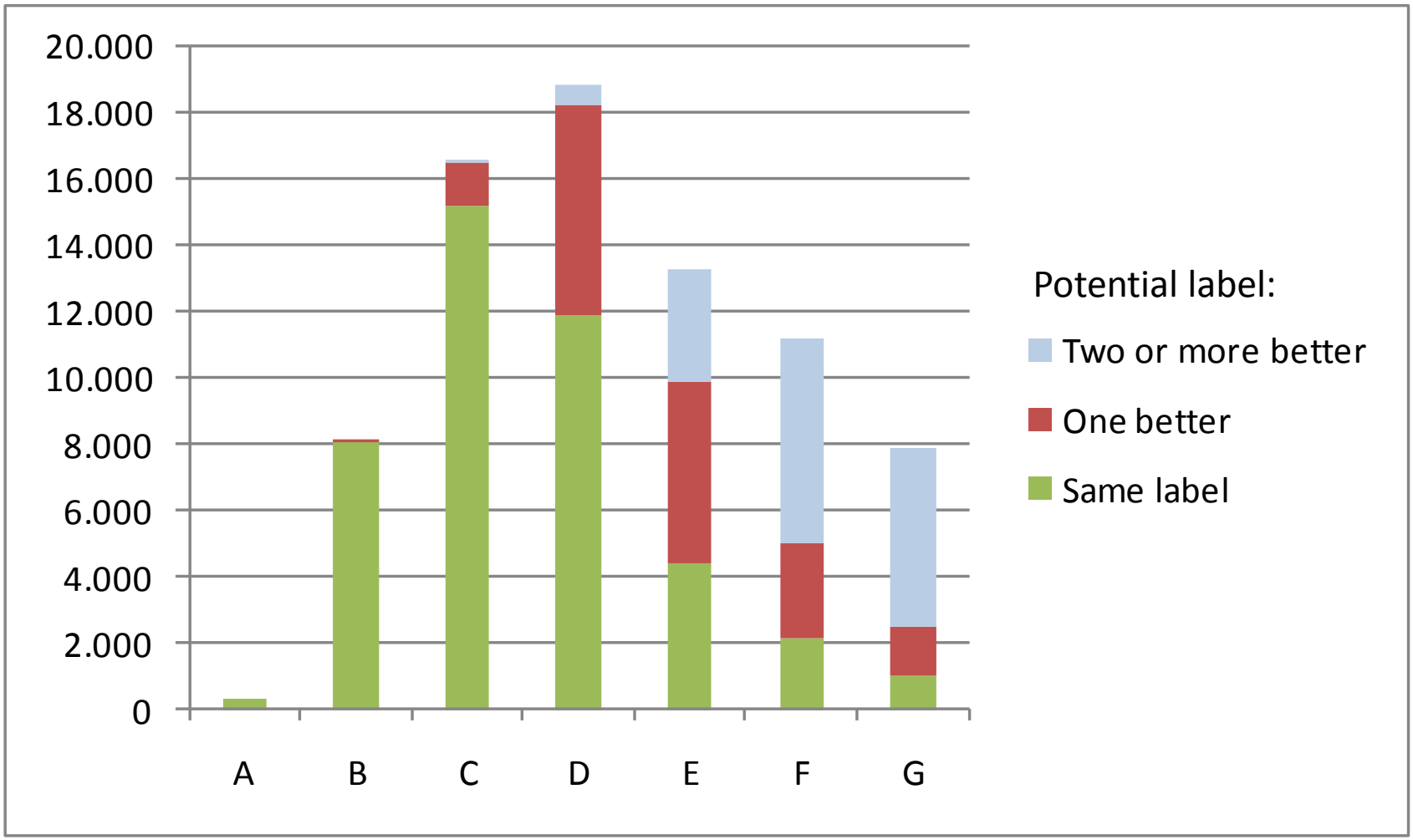
- Individual
- Neutral
- Concrete advise
- Action oriented
- Label = Clear and simple communication

Minus

- High costs (500 €)
- Only 50% of the sold houses have the label
  - No sanctions

- Voluntary action
- Can information be obtained otherwise?

Existing and potential label



76.000 houses with energy label

Triangulation…

- Large scale statistical analysis of energy consumption
- Review of labels and reports
- Interview with owners
- Statistical analysis of labels

Evaluation

- An impact evaluation was done
  - Statistical method based on billing data for natural gas consumption
    - Large number of houses: 4,000 houses, all traded 1999-2002
    - With and without label
    - Up to 4 years of data
    - Also detailed data about house and people
- Result:
  - No additional impact of label!

Additional impact

- House owners without a label had the same energy consumption as those with a label!
  - Same results for houses with high and low energy consumption!
- The recommended projects were often simple, well-known technologies like insulation and new windows
  - Owners without the label could obtain relevant information on their own hand

New development

- Label must be shown when advertising the house
- Label is now public
- Effort to reduce the costs per label

DSM: ENERGY COMPANY SAVING OBLIGATIONS

Obligations from 2010

	Obligation First years saving	Consumption	%
Electricity	2.9 PJ	122 PJ	2.3%
Natural gas	1.1 PJ	101 PJ	1.1%
District heating	1.9 PJ	103 PJ	1.8%
Oil (excl. transport)	0.2 PJ	107 PJ	0.2%
Total	6.1 PJ	433 PJ	1.4%

Freedom of means

- Obligation can be met
  - With any energy type
    - E.g. the electricity company can promote natural gas saving
  - In any sector
    - Not transport
  - Anywhere in Denmark
- Typical instruments
  - Energy audits
  - Information
  - Subsidies
  - Combination of these

The involvement rule

- The energy company must be actively involved in the project *before* the investment
  - *It is not a requirement that the project must be proven to be additional*

Addition energy saving = The amount of energy that is realised only due to the observed activity

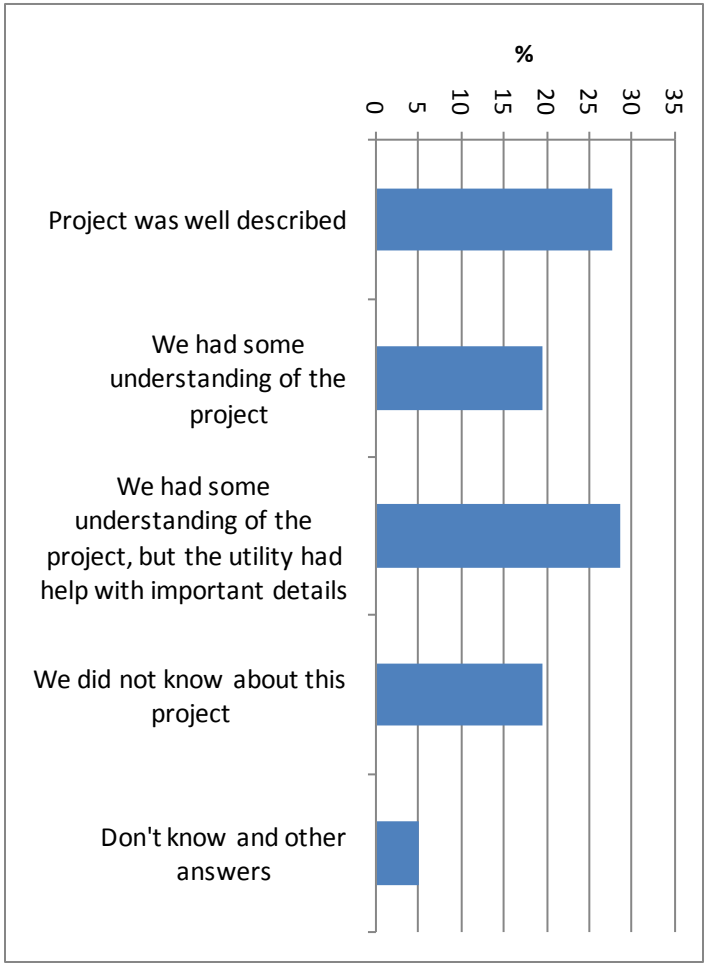
Examples – largest projects

Large volume	
Six step evaporator	56 GWh
Use of by-product hydrogen to produce steam	26 GWh
Converting of new type of town gas	23 GWh
Campaign for using clothesline instead of tumble drier	20 GWh
Partnership with chemical company	12 GWh
New natural gas steam boilers	11 GWh
Converting oil and electricity for heating to natural gas	10 GWh
Retrofitting boiler with flue gas cooler	9 GWh
Retrofitting kiln to optimize air flow	8 GWh

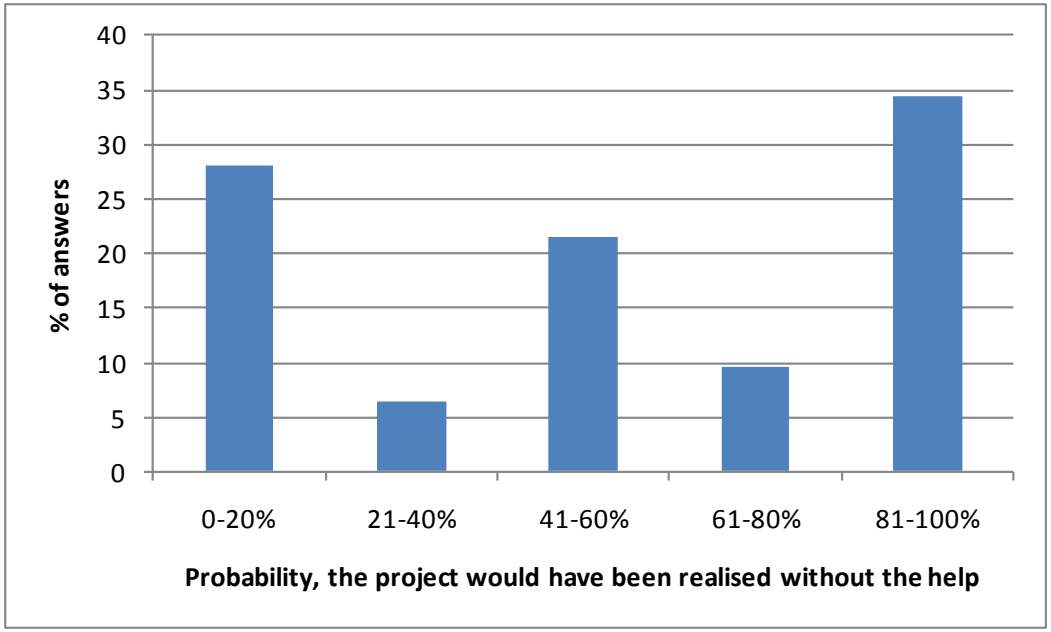
Evaluation

- Information about 105 large projects collected from energy companies
  - Title, investment, saving
  - All projects was recorded as realised
- Telephone interview
  - With relevant manager at industrial company
  - About the concrete project

To what extent did you know about the project – before the interaction with the energy company?



With what probability would the project have been realised within the next year – without the help from the utility?



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Conclusion

- Concluded that additional saving is in the order of 50% of registered saving!

CONCLUSION

Conclusion

- Evaluation of energy efficiency activities is important
- Can give drastic results!
- Do not have to be costly

END NOTES

Conferences

- International Energy Program Evaluation Conference
  - www.iepec.org
  - 9+10. June 2010, Paris
  - 2011 in USA
- European Council for Energy Efficient Economy
  - www.eceee.org
  - June 2011, France

Papers

- Danish energy efficiency policy: Revisited and future improvements
  - www.ea-energianalyse.dk/papers/2009_june_eceee2009_togeby.pdf
- A Danish Case: Portfolio Evaluation and Its Impact on Energy Efficiency Policy
  - Can be e-mailed
- Does energy labelling on residential housing cause energy savings?
  - www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf
  - www.eceee.org/conference_proceedings/eceee/2009/Panel_3/3.068/Paper/
- The effect of building regulations on energy consumption in single-family houses in Denmark
  - www.ea-energianalyse.dk/reports/the_effect_of_building_regulations_on_energy_consumption_in_single_family_houses_in_Denmark.pdf

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