Sharing EERS in Denmark

Kirsten Dyhr-Mikkelsen, Ea Energy Analyses

EERS Workshop, Bangkok
Thursday, 27th March 2014

Ea Energy Analyses

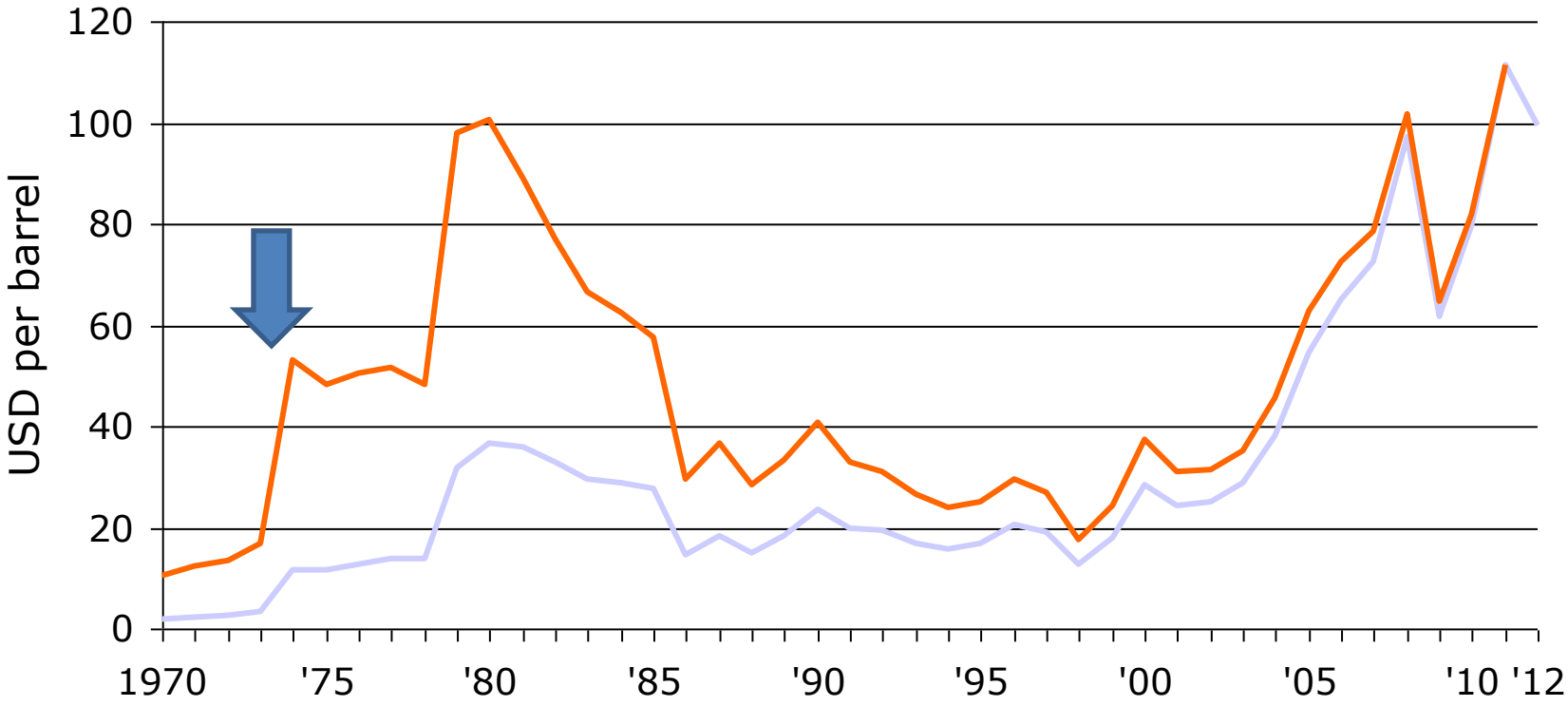
Ea Energy Analyses

- Founded in 2005 in Copenhagen, Denmark
- Today 33 employees and students
- Energy systems and policies analyses
- Interdisciplinary integration in close dialogue with client and stakeholders
- Clients world-wide

Agenda

- Historical background
- EEO system in brief
- Impact of the EEO
- Supervision of the EEO
- A dynamic system through evaluation

Once upon a time …



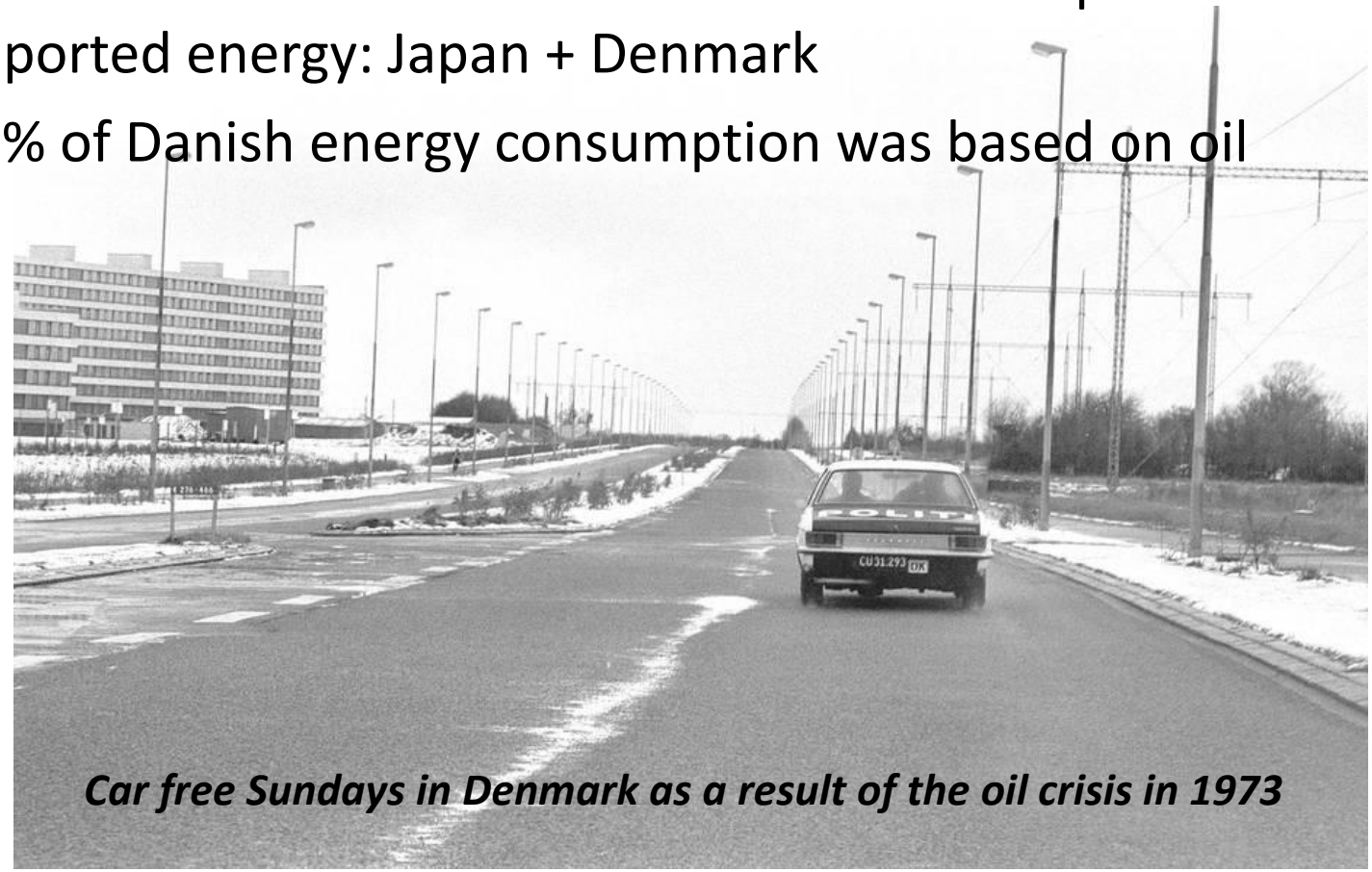
** Prices for 2012 only cover the first 6 months*

Source: Danish Energy Agency

Ea Energy Analyses

Denmark 40 years ago

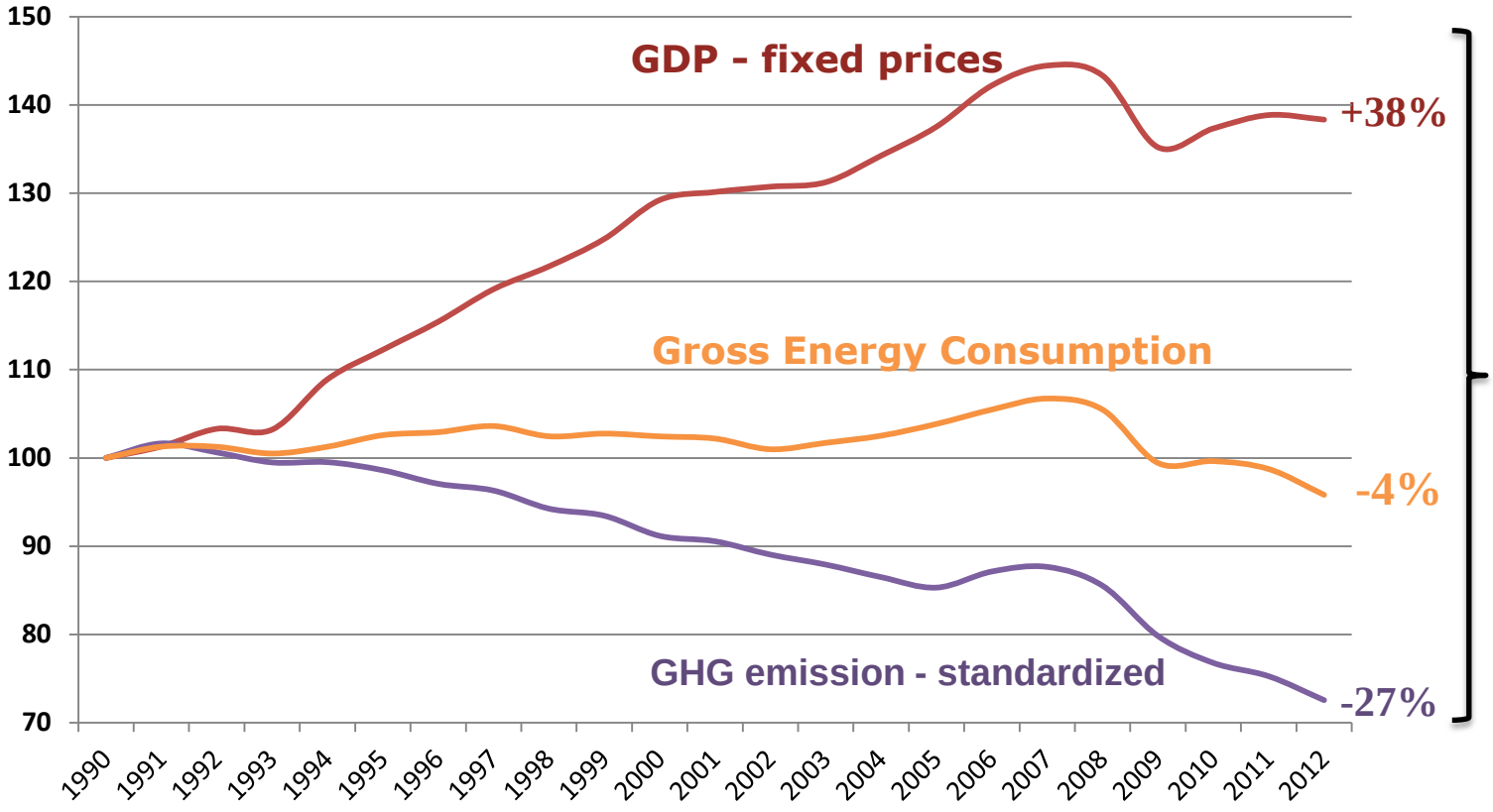
- 1973-74 oil crisis: Two countries were 99% dependent of imported energy: Japan + Denmark
- 93% of Danish energy consumption was based on oil



Car free Sundays in Denmark as a result of the oil crisis in 1973

Source: Danish Energy Agency

Since then decoupled GDP and energy consumption

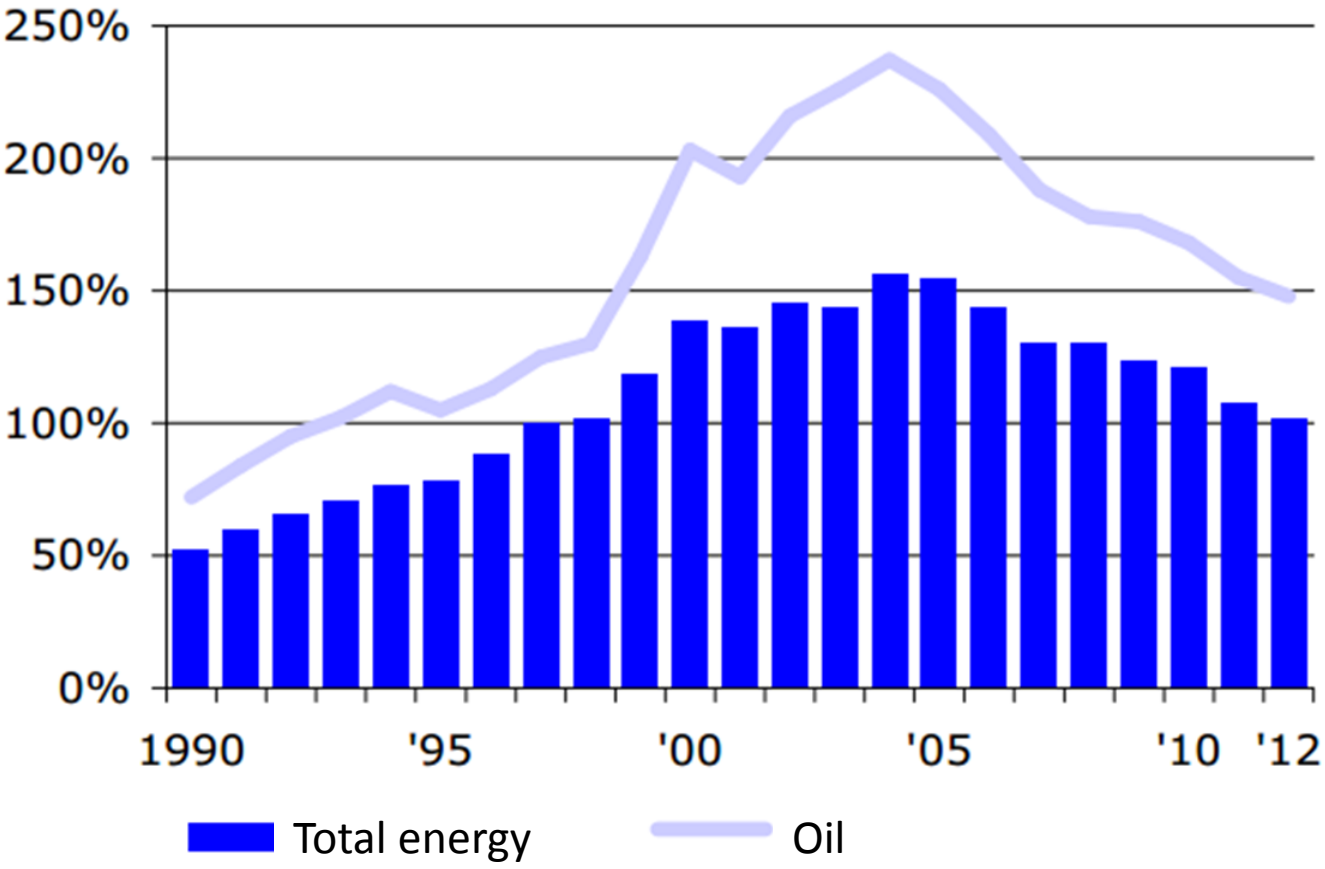


Two reasons: EE & RE

Source: Danish Energy Agency

Ea Energy Analyses

Degree of self-sufficiency



Overall 17% renewable energy in own production; 43% in electricity

Source: Energistatistik 2012, Danish Energy Agency

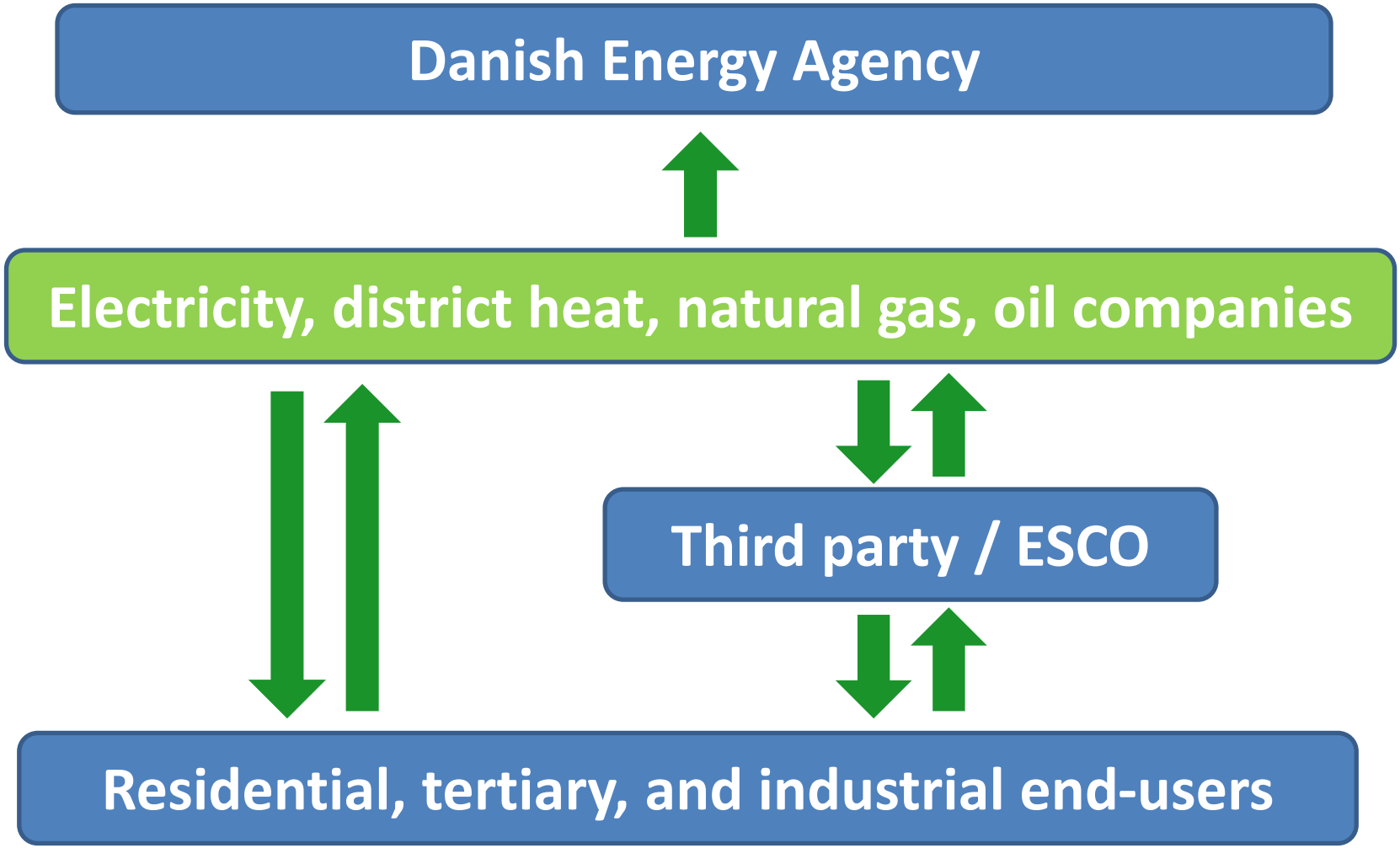
LESSON LEARNED AFTER 40 YEARS:

EVEN VERY COST-EFFECTIVE ENERGY EFFICIENCY DOES NOT HAPPEN ON ITS OWN

Creating a drive for EE

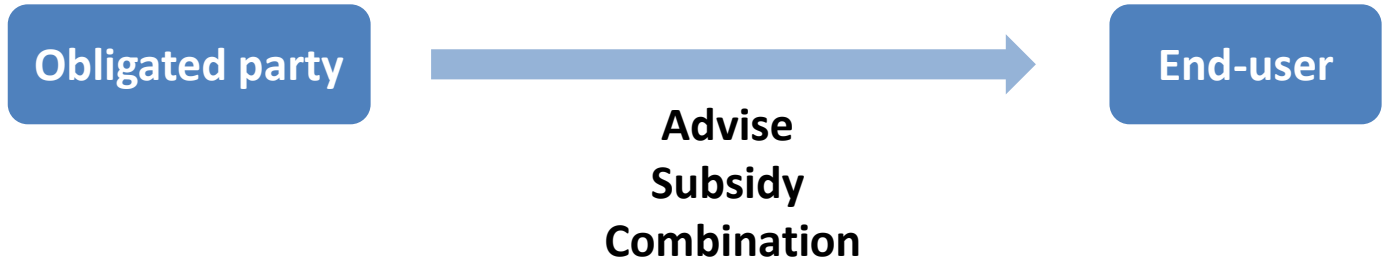
THE DANISH EEO SYSTEM IN BRIEF

Danish EEO system structure



Ea Energy Analyses

Types of internvention agreements

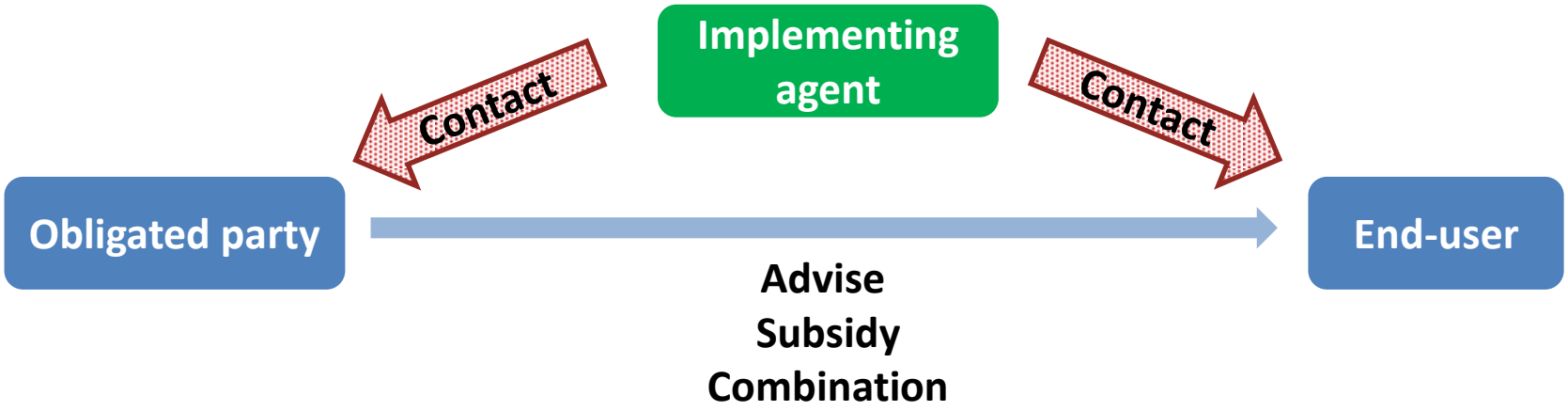


OBS: No loans!

Ea Energy Analyses

Types of intervention agreements

Enabling contact, but not part of agreement chain



Ea Energy Analyses

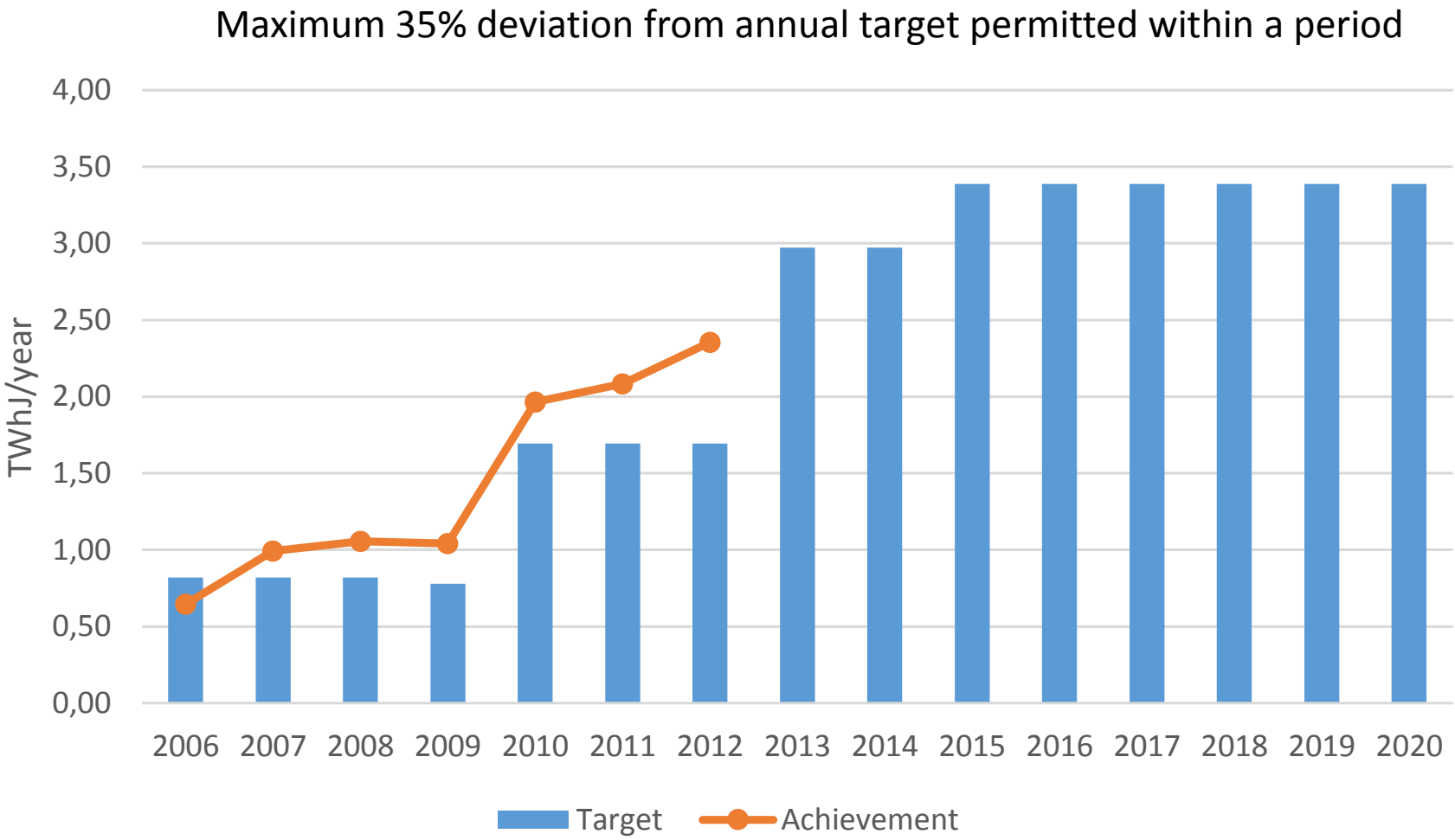
Eligible end-uses

- Electric equipment
  - ~~White goods, IT/office equipment~~, and lighting
- Space heating, space cooling, ventilation, and domestic hot water
  - Technical systems
  - Building envelope
- Industrial process equipment and systems
- Transport
  - Fuel saving tyres and efficient cars/vans
- District heating network
- (Decentralised renewables)

Danish EEO design features

- Target (adjusted every three years):
  - Approx. 2% of final energy consumption annually
- Obligated parties (entities issuing the energy bills):
  - Electricity, district heating and natural gas network distributors
  - Oil retailers
- Third party access to implementation
- Eligible EE measures:
  - All economic sectors
  - All end-uses and all energy types/vectors
- Calculation of savings:
  - List of deemed savings, standardized calculation methods, and engineering estimates for more complex measures
- Incentives and penalties:
  - Penalties for underperformance
- Cost-recovery via tariff surcharge

Target and achievement development



Ea Energy Analyses

What's in it for the Danish utilities?

- Energy efficiency is necessary for our society
  - Mutual social responsibility
    - Security of supply, economic growth, zero carbon 2050
  - Let us make the most of it
- Electricity companies have a long history of providing energy efficiency services
  - Originally non-profit consumer owned (el+dh distribution)
  - "Free" energy efficiency services since early 1990s
  - Demand-side management plans every two years
- Leverage to create good customer relationship
- Possibly to explore new business areas?

IMPACT OF THE EEO

Overall

- Overall government objective
  - ”Establish a cost-effective agreement with the energy utilities, which ensures that efforts are exposed to market mechanisms. “

Agreement 13 November 2012

- Core idea of EEO
  - Utilities are obligated to create a market push and permitted to recover program costs

The key impact questions

1. Are the utilities in fact instrumental to the realisation of the savings?
   - Are they driving forward EE (= utility push)?
2. What are the achieved energy savings?
   - Gross and net energy savings?
3. What are the associated costs?
   - Utility costs  Our focus today
   - Socio-economic costs

1. Utility push

Utility involvement before realisation of savings

Hand-over of "reporting rights" of the savings

Signed agreements for +20 MWh savings required

Example of practise: Online forms for residential

Quote from template agreement for deemed savings

- *"It has been agreed that the right to report the energy savings to the Danish Energy Agency is transferred to the company below.*
- *The customer cannot subsequently sell the energy savings to other side (another external operator or distribution/retail company).*
- *This agreement is made **before** the customer has entered a binding agreement with supplier of this/these energy savings, which is covered by this agreement."*

2. Energy savings

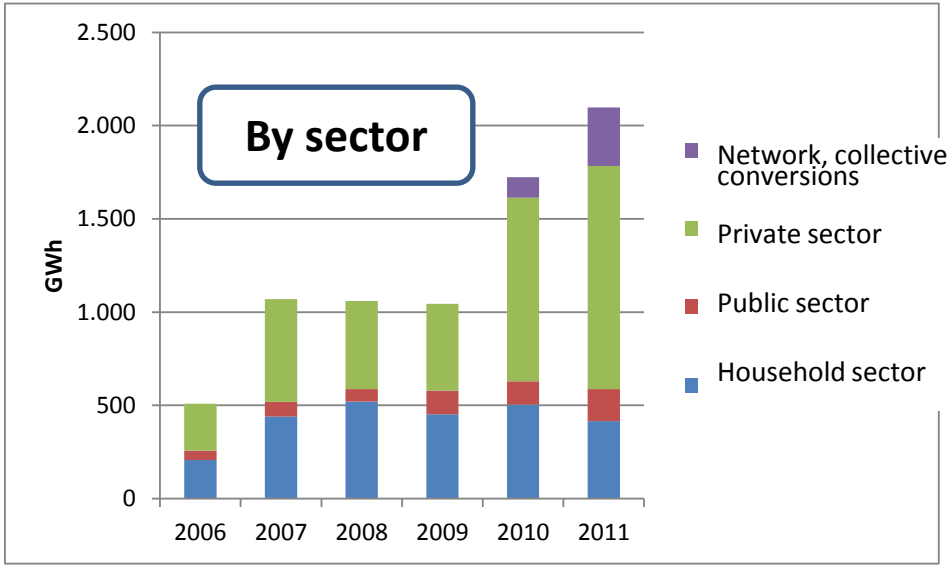
Evaluation every 3 years

2012: Additionality 20-45%

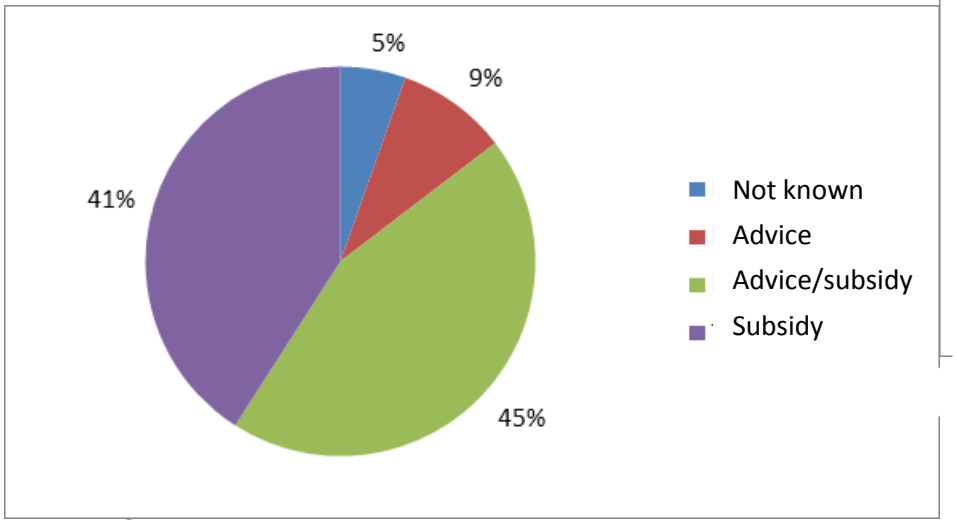
Translated in to a “utility involvement” requirement in day-to-day work

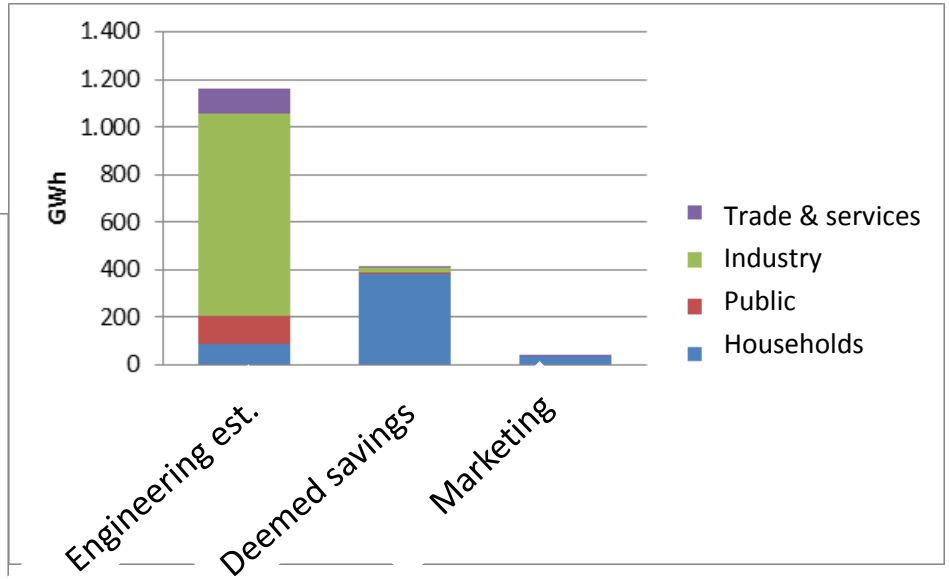
Target achievement

By sector



By type of intervention





By calculation method

Ea Energy Analyses

3. Associated program costs

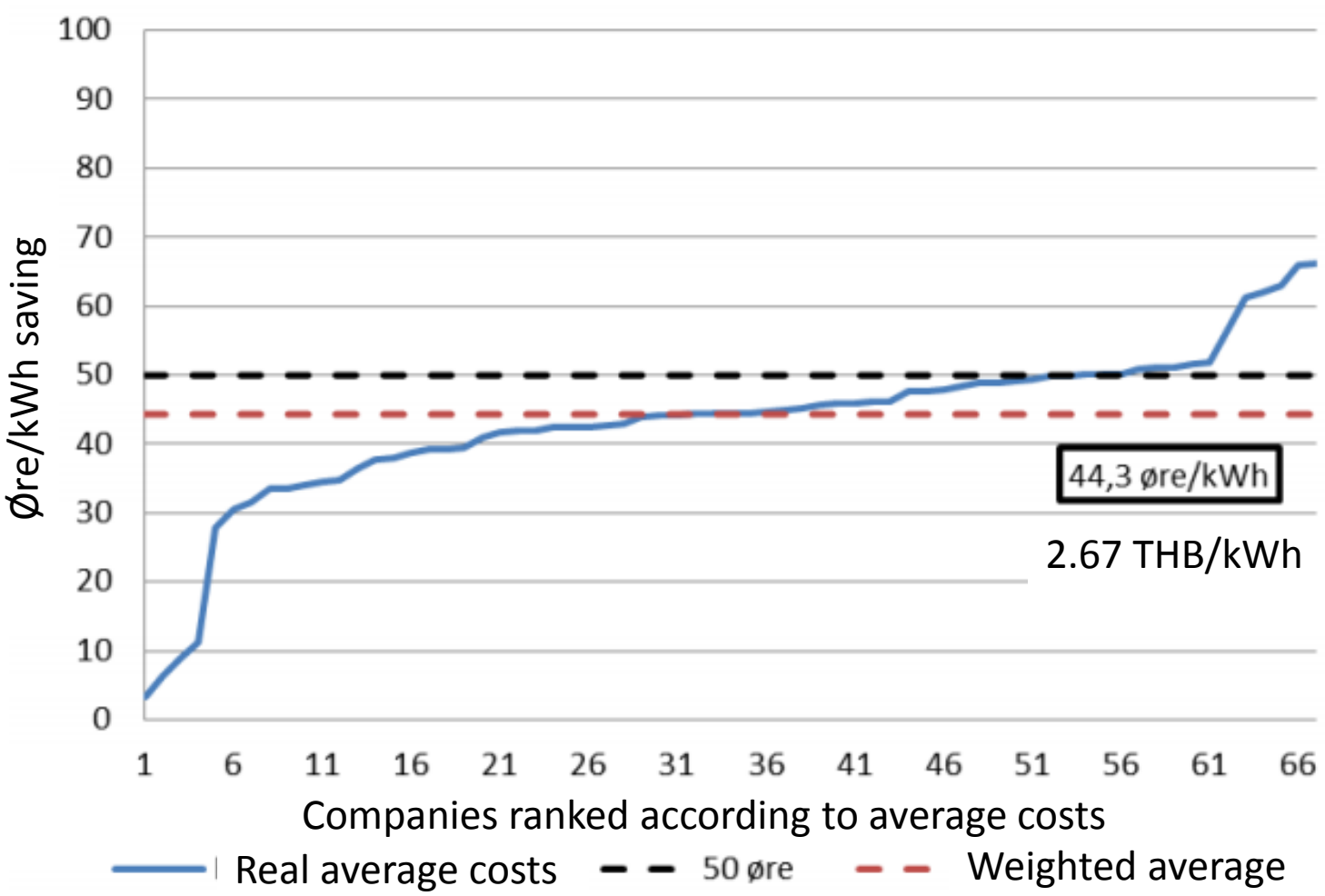
- Utility costs
  - Activity costs
  - Administration costs
  - … not loss of revenue from energy sales

- Issues debated publically
  - Cross-subsidisation between sectors
  - Value for money – a concern especially expressed by large industrial end-users

How is cost transparency achieved?

- Annual benchmark comparison of utility costs
  - Broken down by administration cost and activity costs
- The Danish Energy Agency may request …
  - Highest 5% account for how they have ensured cost-effectiveness, including their focus areas, methods, costs, and market orientation
  - Companies with lowest costs to account for their focus areas, methods and calculation of costs
  - Up to 25 companies at any time
- Possible sanctions
  - No penalty but specific performance agreement between the Danish Energy Agency and the utility in question
  - If no agreement can be reached then the Danish Energy Agency may impose special rules

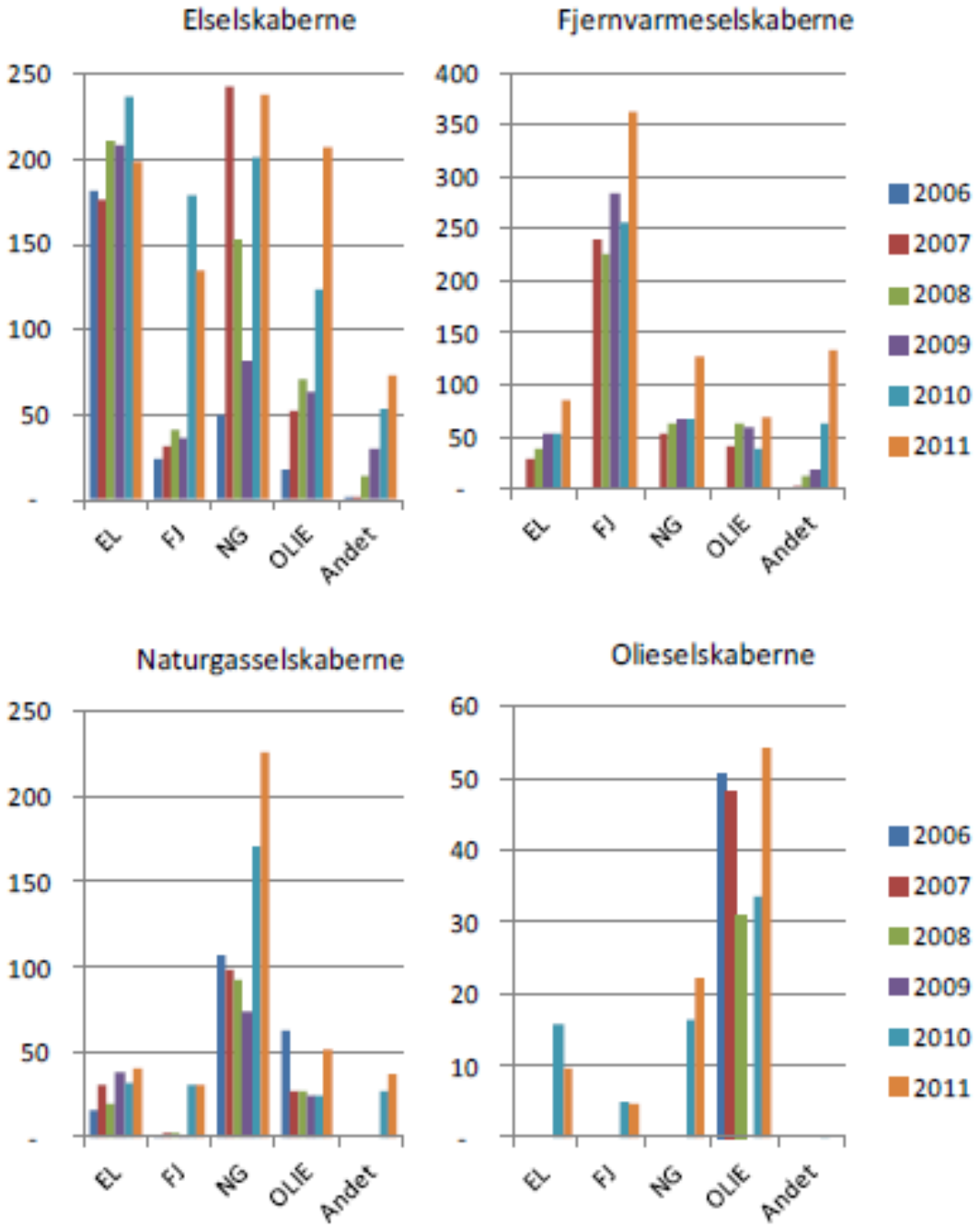
Benchmark 2012 for electricity distribution companies



Ea Energy Analyses

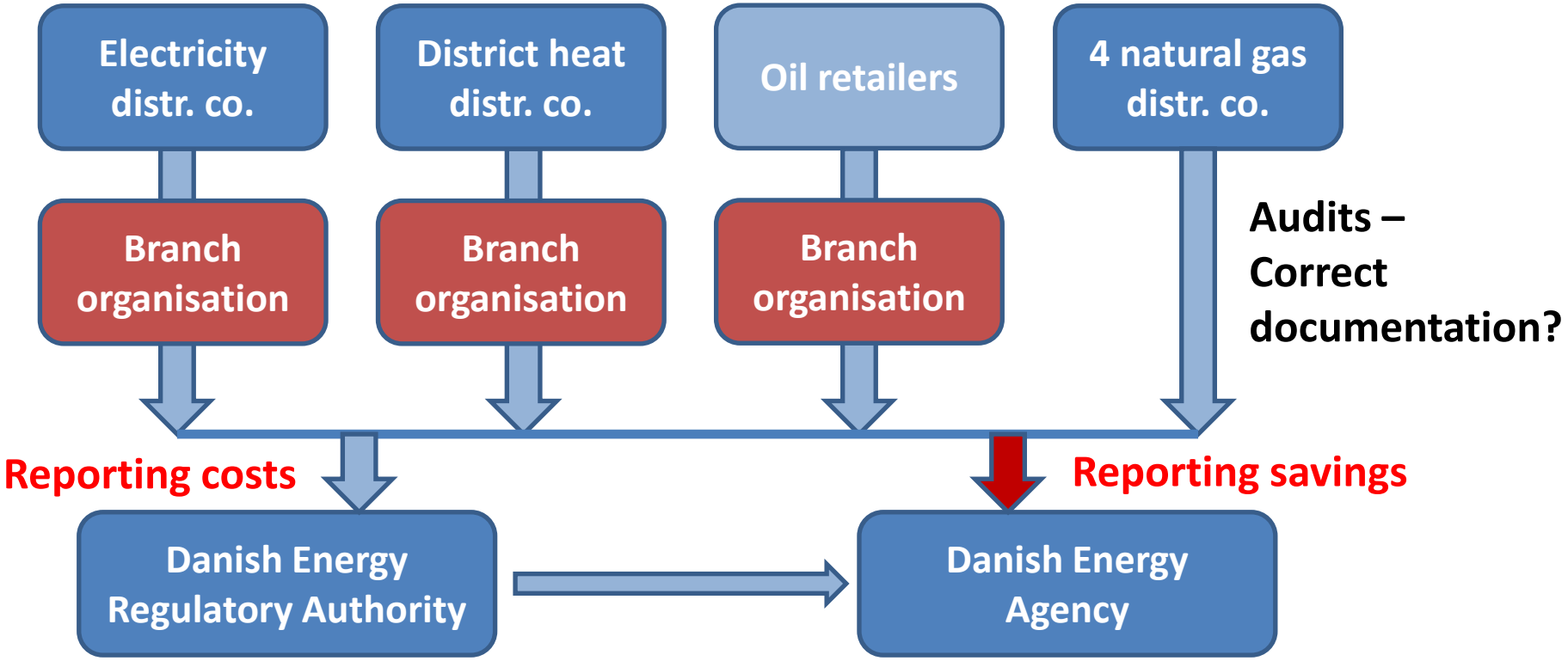
2010 first year savings and utility costs

Companies	Cost	Saving registered	Average cost per saving (1 DKK = 6.02 ฿)	
	mill DKK	*GWh*	*DKK/kWh*	*฿/kWh*
Electricity	379.5	908	0.42	2.52
Natural gas	144.6	344	0.42	2.53
District heat	200.8	704	0.29	1.72
Oil	24.2	72	0.33	2.02
TOTAL	**749.1**	**2,029**	**0.37**	**2.22**


Elselskaberne
250
200
150
100
50
-
EL
FJ
NG
OLIE
Andet
Fjernvarmeselskaberne
400
350
300
250
200
150
100
50
-
EL
FJ
NG
OLIE
Andet
2006
2007
2008
2009
2010
2011
Naturgasselskaberne
250
200
150
100
50
-
EL
FJ
NG
OLIE
Andet
Olieselskaberne
60
50
40
30
20
10
-
EL
FJ
NG
OLIE
Andet
2006
2007
2008
2009
2010
2011

SUPERVISION OF THE EEO

Annual reporting and assessment



- Balance – Justified costs?

- Balance – Obligation met?
- Sample checks – Adherence to rules?

Ea Energy Analyses

The Danish Energy Agency must …

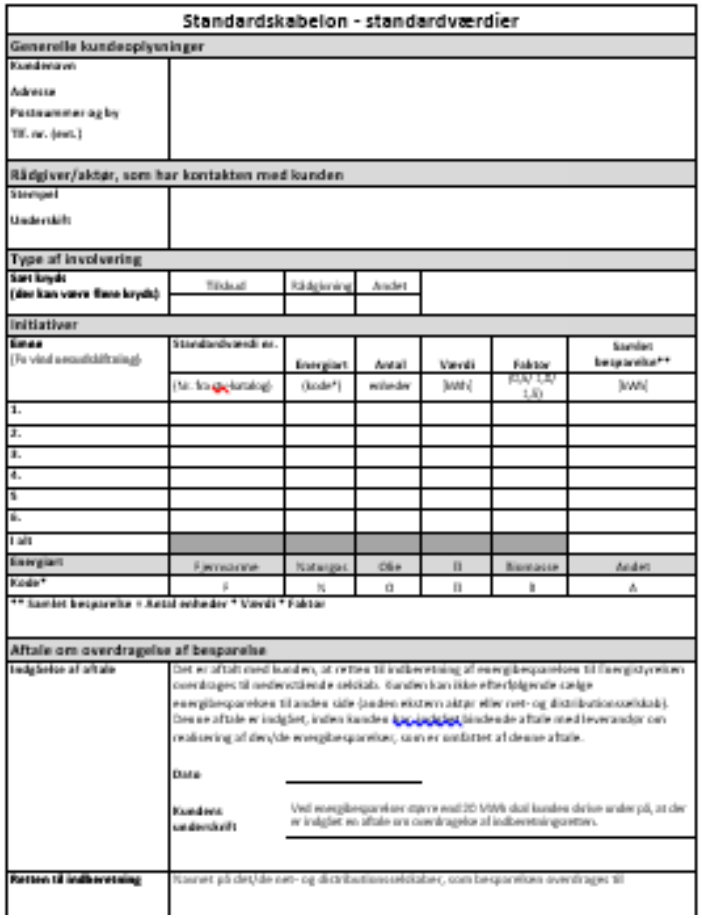
- Monitor progress
  - Annually sum up reported progress
    - Balance – Obligation met?
    - Balance – Justified costs?
- Verify claims
  - Sample checks – Adherence to rules?
    - Annually and every three years
- Evaluate
  - Policy cost-effectiveness and adjustment needs?
    - Independent evaluation

Based on only a few summary tables

Utilities must …

- Ensure documentation
  - Proof of involvement, savings, and costs in the form of agreement documents, accounts, etc.
  - Is not required submitted to the Danish Energy Agency but must be ready for random sample inspection
  - Internal audit and external audit
- Report information to the authorities annually on
  - Savings to the Danish Energy Agency
    - Electricity, district heating and oil companies report to their branch organisation which compile data into aggregated figures (8 small tables only for each sector).
  - Costs to the Danish Energy regulatory Authority

Documentation requirements – Deemed savings



Standardskabelon - standardværdier

Generelle kundeoplysninger

Kundenavn Adresse Postnummer og by Tlf. nr. (evt.)	

Rådgiver/aktør, som har kontakten med kunden

Stempel Underskrift	

Type af involvering

Sæt kryds (der kan være flere kryds)	Tilskud	Rådgivning	Andet	

Initiativer

Initiativ (Fx ved renoveringsforanstaltning)	Standardværdi nr. (fx fra xxx-katalog)	Energiart (kode*)	Antal enheder	Værdi (kWh)	Faktor (0,97; 0,82; 1,0)	Samlet besparelse** (kWh)
1.						
2.						
3.						
4.						
5.						
6.						
I alt						

Energiart	Fjernvarme	Naturgas	Olie	El	Biomasse	Andet
Kode*	F	N	O	E	B	A

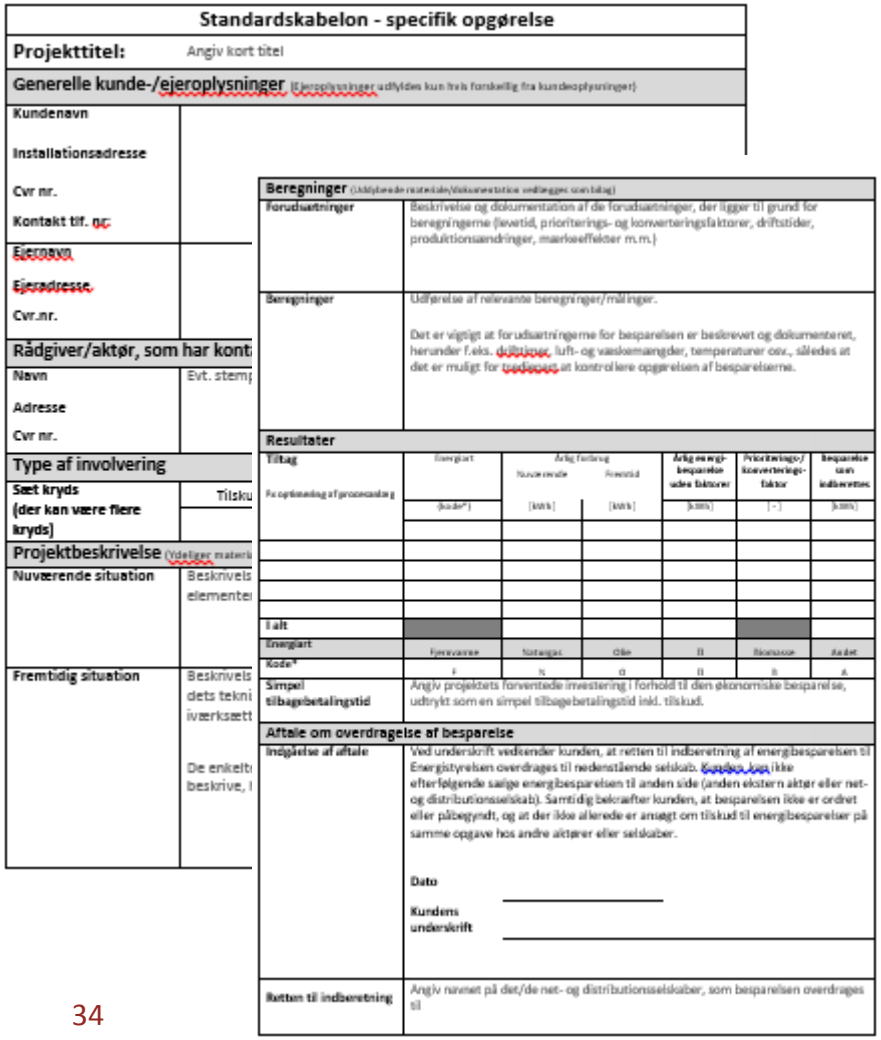
** Samlet besparelse = Antal enheder * Værdi * Faktor

Aftale om overdragelse af besparelse

Indgåelse af aftale	Det er aftalt med kunden, at retten til indberetning af energibesparelsen til Energistyrelsen overdrages til nedenstående selskab. Kunden kan ikke efterfølgende cashe energibesparelsen til anden side (anden eksternt aktør eller net- og distributionsselskab). Denne aftale er indgået, inden kunden [illegible] bindende aftale med leverandør om realisering af den/de energibesparelser, som er omfattet af denne aftale. Dato: _____ Kundens underskrift: Ved energibesparelser større end 20 MWh skal kunden denne underskrift, at der er indgået en aftale om overdragelse af indberetningsretten.
Retten til indberetning	Navnet på det/de net- og distributionsselskaber, som besparelsen overdrages til

- Customer identification
- Third party implementing agent
- Types of intervention
- Initiatives
  - Title, id.no., energy types, number, kWh, adjustment factor, total kWh
- Agreement of transfer of ownership rights

Documentation requirements – Engineering estimates



Standardskabelon - specifik opgørelse

Projekttitel:	Angiv kort titel
Generelle kunde-/ejeroplysninger (Ejeroplysninger udfyldes kun hvis forskellig fra kundeoplysninger)	
Kundenavn	
Installationsadresse	
Cvr nr.	
Kontakt tlf. nr.	
Ejernavn	
Ejeradresse	
Cvr.nr.	
Rådgiver/aktør, som har kont	
Navn	Evt. stemp
Adresse	
Cvr nr.	
Type af involvering	
Sæt kryds (der kan være flere kryds)	Tilsku
Projektbeskrivelse (Vedlægger materi	
Nuværende situation	Beskrivels elementer
Fremtidig situation	Beskrivels dets tekni iværksætt De enkelt beskrive,

Beregninger (Uddybende materiale/dokumentation vedlægges som bilag)	
Forudsætninger	Beskrivelse og dokumentation af de forudsætninger, der ligger til grund for beregningerne (levetid, prioriterings- og konverteringsfaktorer, driftstider, produktionsændringer, mærkeeffekter m.m.)
Beregninger	Udførelse af relevante beregninger/målinger. Det er vigtigt at forudsætningerne for besparelsen er beskrevet og dokumenteret, herunder f.eks. driftstimer, luft- og vandmængder, temperaturer osv., således at det er muligt for tredjepart at kontrollere opgørelsen af besparelserne.

Resultater

Tiltag	Energiart	Årlig forbrug: Nuværende	Årlig forbrug: Fremtid	Årlig energi-besparelse uden faktorer	Prioriterings-/ konverterings-faktor	Besparelse som indberettes
Fx optimering af processtyring	(kode*)	[kWh]	[kWh]	[kWh]	[-]	[kWh]
I alt						

Energiart	Fjernvarme	Naturgas	Olie	El	Biomasse	Andet
Kode*	F	N	O	E	B	A

Simpel tilbagebetalingstid	Angiv projektets forventede investering i forhold til den økonomiske besparelse, udtrykt som en simpel tilbagebetalingstid inkl. tilskud.
Aftale om overdragelse af besparelse	
Indgåelse af aftale	Ved underskrift vedlægger kunden, at retten til indberetning af energibesparelsen til Energistyrelsen overdrages til nedenstående selskab. Kunden kan ikke efterfølgende sælge energibesparelsen til anden side (anden elstern aktør eller net- og distributionsselskab). Samtidig bekræfter kunden, at besparelsen ikke er ordret eller påbegyndt, og at der ikke allerede er ansøgt om tilskud til energibesparelser på samme opgave hos andre aktører eller selskaber. **Dato** _____ **Kundens underskrift** _____
Retten til indberetning	Angiv navnet på det/de net- og distributionsselskaber, som besparelsen overdrages til

- Customer identification
- Third party implementing agent
- Types of intervention
- Project description
  - Current situation
  - Future situation
  - Assumptions and calculations
  - Results
    - Name, energy types, current kWh, future kWh, annual kWh savings, adjustment factor, total kWh
- Agreement of transfer of ownership rights

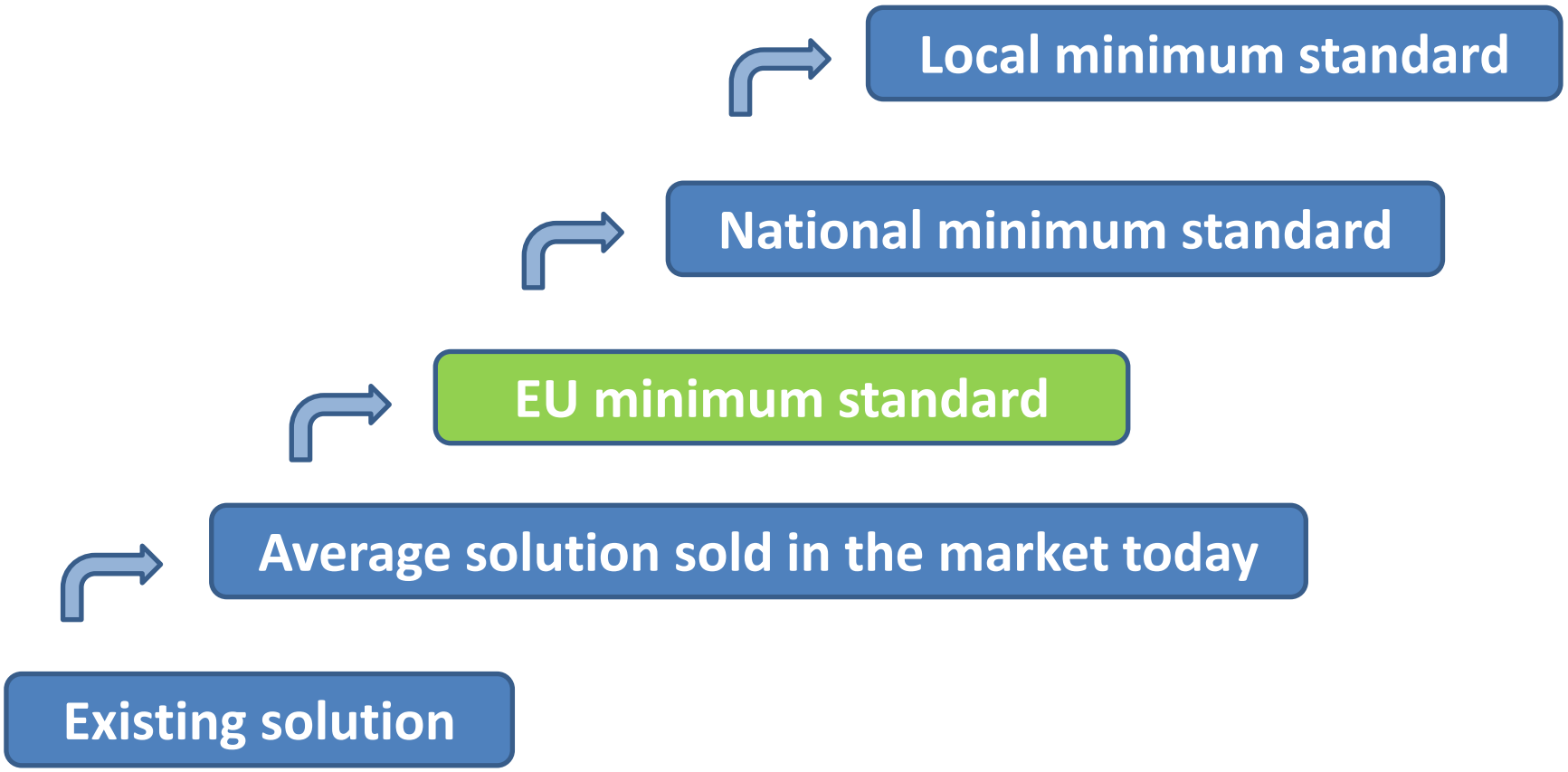
Quality assurance

- Every other year internal audit
- Every other year independent third party audit
  - May be part of overall company quality management system
- Spot check by the Danish Energy Agency
- Verification unit (new as of 2013)
  - Can pre-approve methods and verify projects
    - For example, how to calculate the baseline for EE improvements in relation to production line expansion
  - Voluntary and services must be paid for

Calculating savings

- Deemed savings (= standard values)
  - Smaller, standardised activities, typically in homes and other buildings.
  - If a deemed savings value is available for a given saving, then this must be used.
- Engineering estimates (= specific calculation)
  - Are used in situations where there is no deemed savings value, typically be larger and integrated projects in industrial enterprises or public institutions
  - If engineering estimates is used for parts of an overall project, then the entire project must be calculated specifically, including the effect of initiatives where deemed savings values exist
- Market survey a specific marketing activity

What is our baseline?



Ea Energy Analyses

Baseline approaches by measure type

Measure category	Baseline approach
Appliances, white goods, IT, office equipment, and lighting	• Average solution sold in the market • EU minimum standard
Heating/cooling/ventilation systems and domestic hot water systems	• Average solution sold in the market • National minimum standard
Building envelope	• National minimum standard • Existing solution
Industrial process equipment	• Average solution sold in the market • EU minimum standard • Existing solution
Transport	• Average solution sold in the market • EU minimum standard • Existing solution/behaviour
Renewable energy	• Existing solution • Alternative solution sold in the market

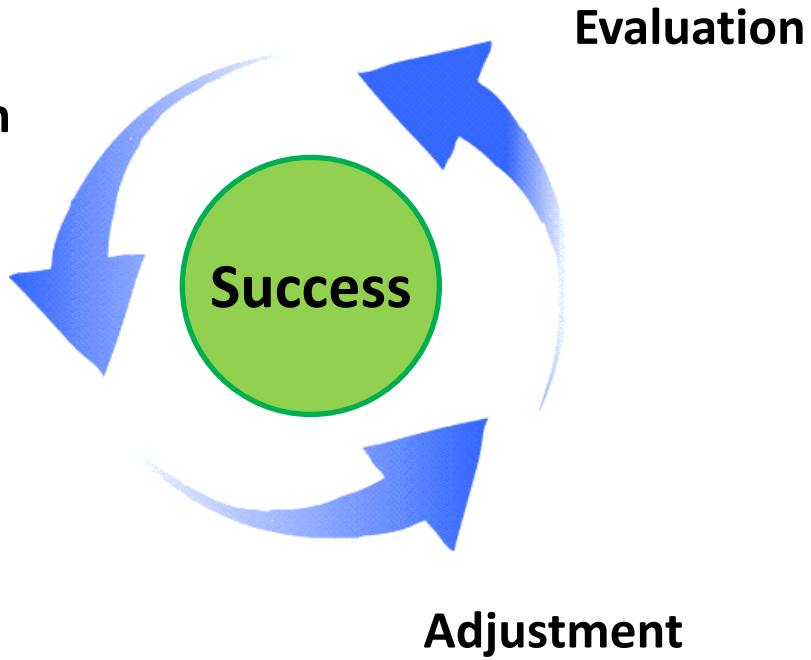
Example: LED lighting

- Description: Replacement of halogen with LED
- **Before: Existing 12 V 10 W halogen lighting**
- **After: 1.5 W LED lighting (socket G4)**
- Deemed savings: 8 kWh/year/item
  - (10 W – 1.5 W = 8.5 W, approx. 940 hours/year)
- Restrictions in application: Households or similar with operating hours below 1,000 hours/year.

Example: EE motor

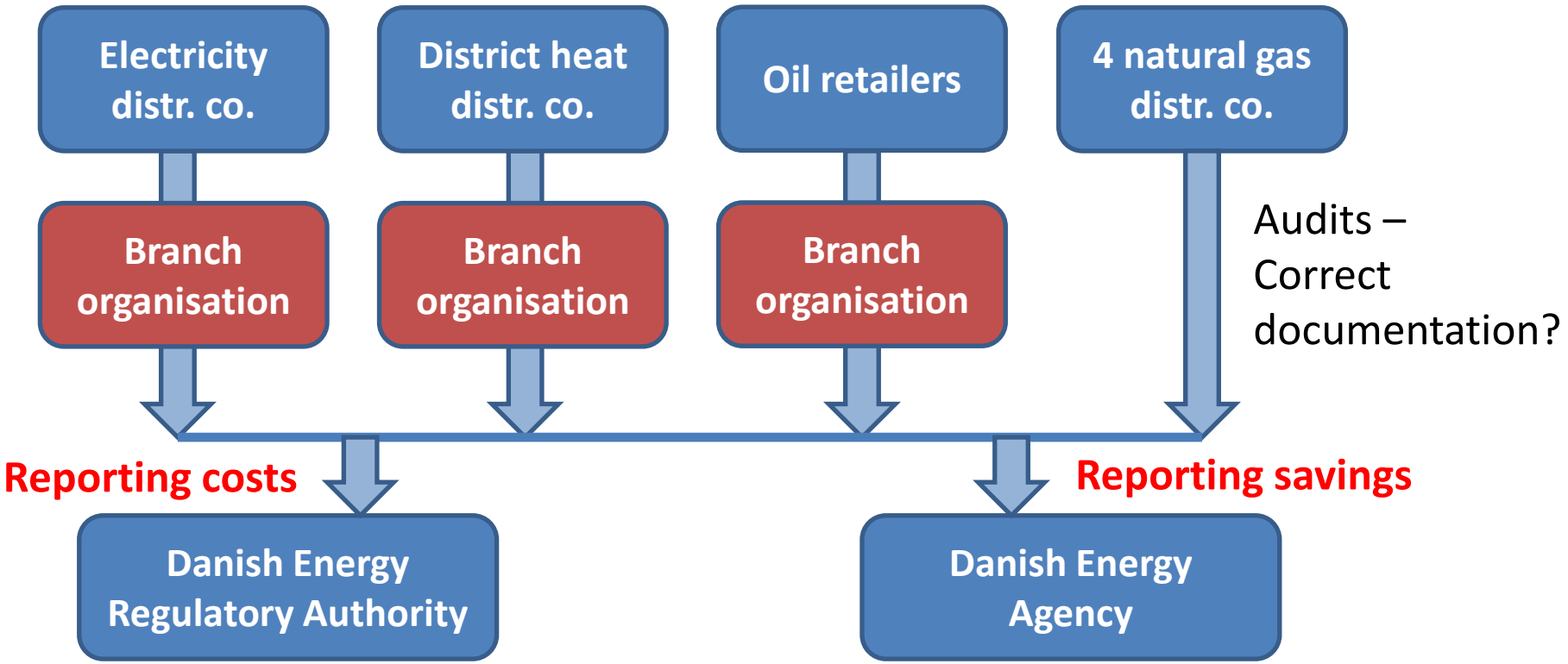
- Description: Replacement existing motor that has broken down with energy efficient motor
- **Before: Motor below EU minimum energy performance standard**
- **After: Motor of the same size but at EU standard or better**
- Deemed savings: Annual standard saving (kWh/year) per hour of use * annual hours of operation for the motor
- Restrictions in application: Only applicable as of 1 January 2015 and until and including 31 December 2016.

EVALUATION



Ea Energy Analyses

Full scale assessment



- Balance – Justified costs?

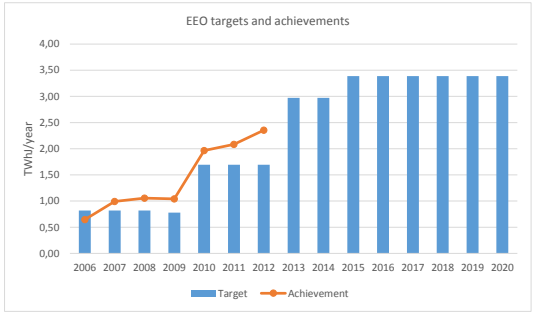
- Balance – Obligation met?
- Sample checks – Adherence to rules?
- **3 year independent evaluation – Policy cost-effectiveness and adjustment needs?**

Evaluation

- Commissioned before end of each obligation period
- Evaluator must be independent third party
- Must address
  - Rules and guidelines
    - Freedom of methodology => innovation and reduced costs
    - 2011-2013: Targeting efforts at buildings and industries
  - Organisation
    - Market orientation (market access for relevant parties)
  - Savings impact and costs
    - Additionality (= net impact)
    - Utility costs, end-user costs, socio-economic costs

Consequences for utilities?

- Leniency in start-up phase
  - E.g. district heating as novice had a slow start
  - Steadily increasing obligation instead of high start value
    - 3-year periods with annual targets



- Penalties
  - Target deficit is added to the next year
  - Potential loss of license
  - Name and shame?

Example of application of evaluation results

- 2008 evaluation
  - Observation: Additionality only max 50%
    - Adjustment: 15% extra increase in planned target
- 2012 evaluation
  - Observation: Several measures with a simple payback time of less than 1 year receive substantial subsidy (primarily relevant for industry)
    - Adjustment: Limitation on payback time but not with regards to subsidies in % of investment

Example of application of evaluation results (continued)

- 2012 evaluation
  - Observation: Lack in quality of documentation and savings calculations
    - Adjustment example: More detailed guidelines and establishment of a verification unit that is charged with pre-approving documentation and calculations
  - Recommendation: Obligated companies with high cost should be subject to increased supervision
    - Adjustment: The Danish Energy Agency can require detailed information including target areas, methods, costs and marked involvement of the obligated parties with the 5% highest costs per kWh reported

Thank you for your attention!

Contact details:
kdm@eaea.dk
+45 6039 1709
www.eaea.dk

Ea Energy Analyses

Recommendations to Thailand

- EERS carefully tailor-made to Thai context
- How to minimise costs?
  - Freedom in utility approach can lead to cost-effective savings
  - Simplicity and standardisation are key to reducing the administrative costs
  - Net-impact is important but does not have to be proven in all steps of the process
- How to ensure continued success?
  - Evaluation results and new political agendas should repeatedly be translated into design adjustments

+400 hundred companies, but DEA receives only 7*8 tables

Skema 1: Realiserede besparelser opdelt på sektorer og energiarter

	TJ	Fjernvarme	Naturgas	Olie	El	Kul mv	Biomasse	Øvrige	Total
1	**Husholdninger**								
	Specifik opgørelse								
	Standardværdier								
	Markedspåvirkning								
2	**Offentlig sektor**								
	Specifik opgørelse								
	Standardværdier								
	Markedspåvirkning								
3	**Produktionserhverv**								
	Specifik opgørelse								
	Standardværdier								
	Markedspåvirkning								
4	**Handel og service**								
	Specifik opgørelse								
	Standardværdier								
	Markedspåvirkning								
5	**Kollektiv sol**								
6	**Ledningsoptimeringer**								
7	**Transport**								
8	**Konverteringer**								
	Husholdninger								
	Offentlig sektor								
	Produktionserhverv								
	Handel og service								
9	**Korrektioner (+ og - fra sidste år)**								
	Total								

Skema 2: Realiserede energibesparelser opdelt på teknologier/områder og opgørelsesmetoder

Slutanvendelse/TJ	Husholdninger				Offentlig sektor				Produktionserhverv				Handel og service				Total
	Standard-værdi	Specifik opgørelse	Markeds-påvirkning	I alt	Standard-værdi	Specifik opgørelse	Markeds-påvirkning	I alt	Standard-værdi	Specifik opgørelse	Markeds-påvirkning	I alt	Standard-værdi	Specifik opgørelse	Markeds-påvirkning	I alt	
Klimaskærm																	
Vinduer																	
Kedler																	
Elvarme – Rumvarme																	
Varmeanlæg																	
Ventilation																	
Belysning																	
Procesudstyr																	
Køling																	
Trykluft																	
Pumper																	
Elmotorer- og transmission til intern transport																	
Mindre energiforbrugende apparater																	
Øvrige																	
Total																	

Skema 3: Realiserede besparelser inden for hver energiart opdelt efter levetid og område (prioriteringsfaktorer).

TJ	Prioteringsfaktor		
	0,5	1	1,5
Fjernvarme			
El og individuel biomasse			
Kvotebelagte brændsler (olie, naturgas, kul)			
Ikke-kvotebelagte brændsler (olie, naturgas, kul)			

Skema 4: Realiserede besparelser ved konvertering

Fra	Til	TJ
El	Fjernvarme, Kvotebelagte brændsler (olie, naturgas, kul)	
El	Ikke-kvotebelagte brændsler (olie, naturgas, kul) Biomasse	
Fjernvarme Kvotebelagte brændsler (olie, naturgas, kul) Biomasse	El	
Fjernvarme	Kvotebelagte brændsler	
Fjernvarme	Ikke-kvotebelagte brændsler Biomasse	
Ikke-kvotebelagte brændsler (olie, naturgas, kul)	El	
Ikke-kvotebelagte brændsler (olie, naturgas, kul) Biomasse	Fjernvarme,	
Kvotebelagte brændsler	Fjernvarme	
Kvotebelagte brændsler	Ikke-kvotebelagte brændsler	
Ikke-kvotebelagte brændsler	Ikke-kvotebelagte brændsler	
Biomasse	Biomasse	
	Total	

Skema 5: Det enkelte selskabs omkostninger

		Omkostninger (1.000 kr.)
1.	Samlede omkostninger til opnåelse af de indberettede energibesparelser, jf. skema 1	
2.	Heraf omkostninger til administration	
3.	Øvrige omkostninger (1 minus 2)	

Skema 6: Fordeling af branchens omkostninger

		%
1.	Net- eller distributionsselskabernes samlede omkostninger	100%
2.	Andel, der går til administration	
3.	Andel, der går til eksterne aktører via direkte aftaler mellem et net- og distributionsselskab og/eller dettes koncernforbundne selskaber	
4.	Andel, der går til direkte tilskud til slutkunden fra et net- eller distributionsselskab og/eller dettes koncernforbundne selskaber	
5.	Ander, der går til køb af realiserede energibesparelser hos et andet net- og distributionsselskab	
6.	Ander, der går til realisering i et net- og distributionsselskab og til aftaler med koncernforbundne selskaber (pkt. 1 minus pkt. 2, 3, 4 og 5)	

Skema 7: Det enkelte selskabs gennemførelse af audits

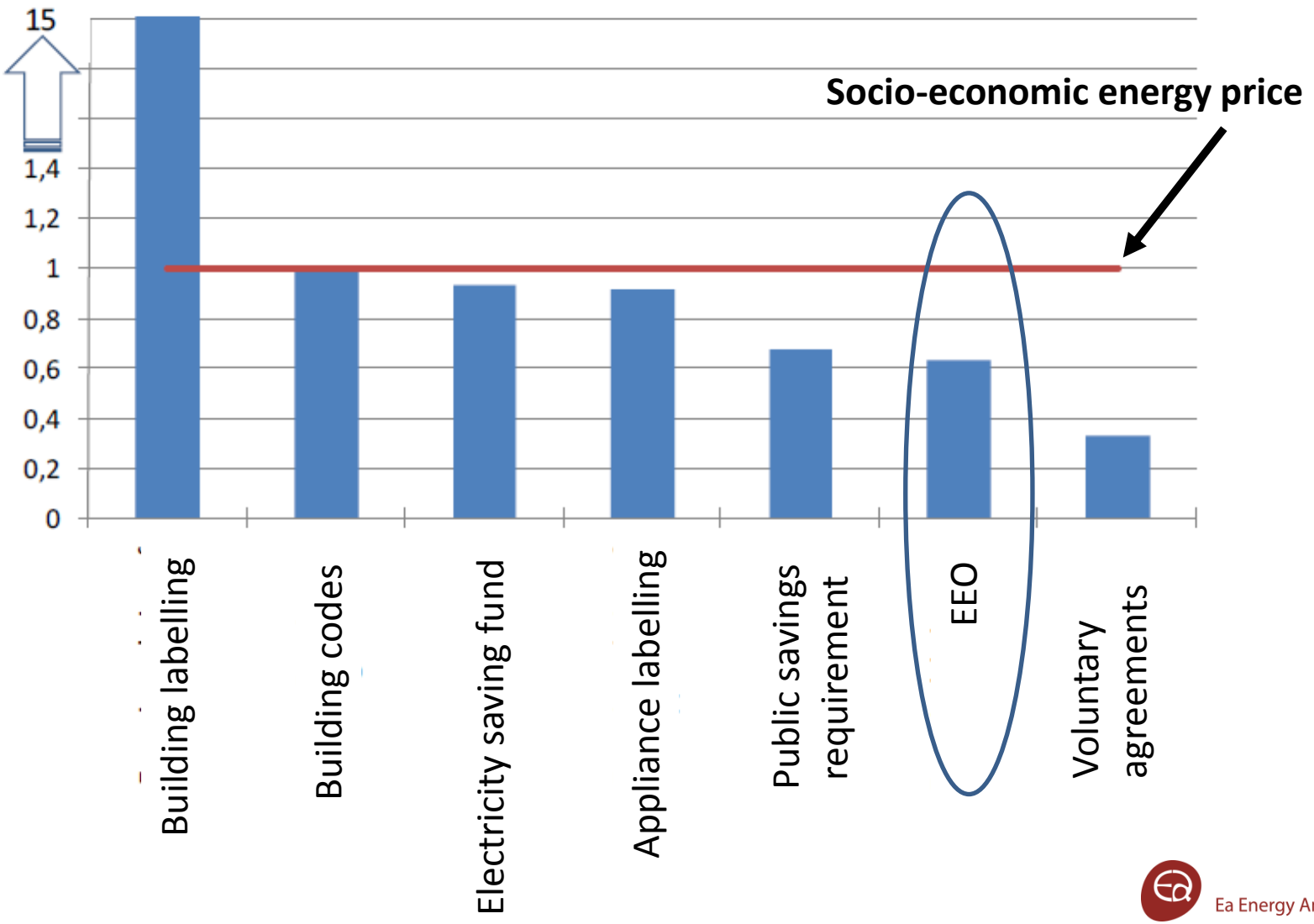
(Sæt kryds hvis gennemført)	Intern audit	Ekstern audit
Selskabets navn		

Skema 8: Afsluttede, men ikke overdragede energibesparelser

Branche	Ikke overdragede energibesparelser TJ

Ea Energy Analyses

Socio-economic cost-effectiveness



Ea Energy Analyses

Keeping administration simple

- Large degree of freedom
  - Intervention method (advise, financial support, both)
  - Target group (any)
- Involvement prior to initiation of EE is required
  - Templates for documentation of involvement and achieved savings
- Deemed savings in addition to engineering estimates
  - Assistance for engineering estimates
- Reporting via branch organisations

Engineering estimates

- Who can make the engineering estimates?
  - Anyone
- How are they checked and by who?
  - Internal and external audits
  - Sample check by Danish Energy Agency
  - Verification unit