Energy Efficiency

The Danish Experience

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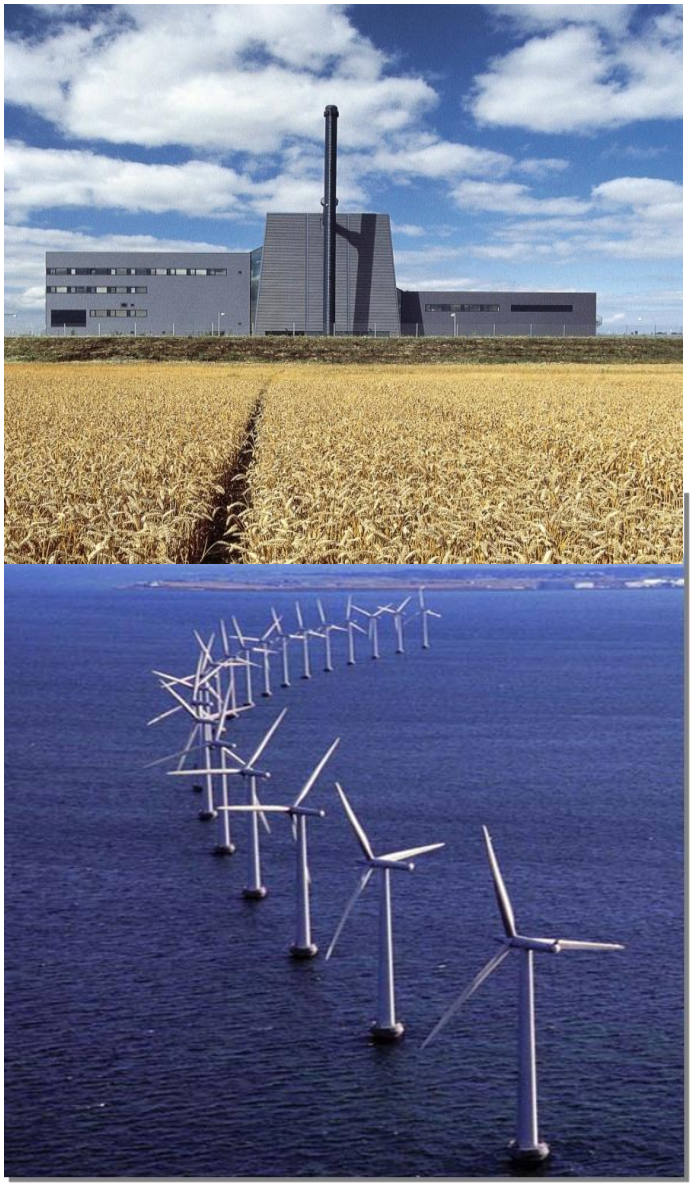
Agenda

- Denmark's track record – an experience we can share
- A few words about the Ukraine – Denmark Energy Centre



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Denmark, 40 years ago

99 % dependent on imported fossil fuels, the country was badly hit by the oil price shock of 1973-74

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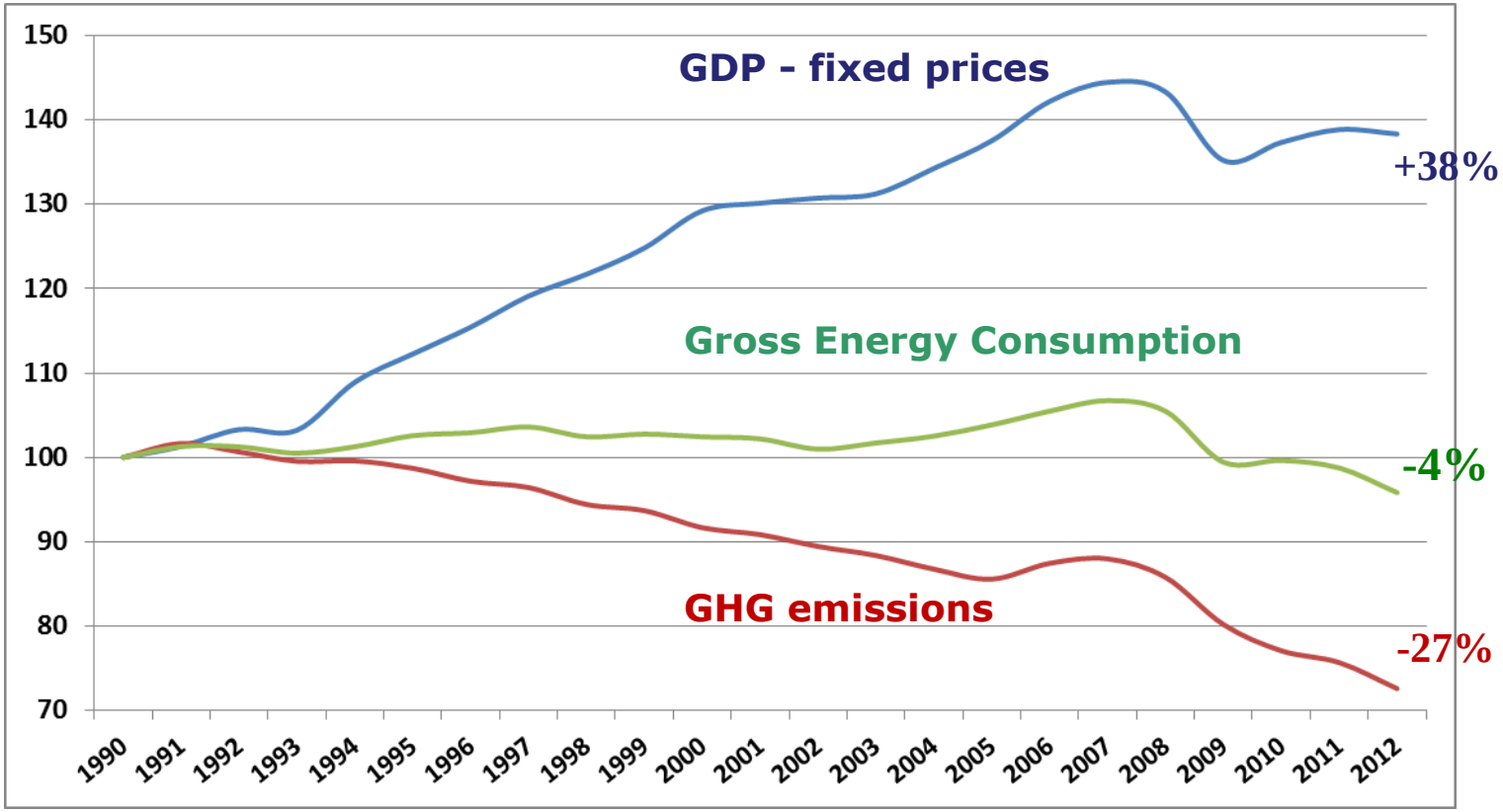
Our recent "green growth" track record

Doing more with less



Energy consumption per GDP-unit is lower than in any other EU-country

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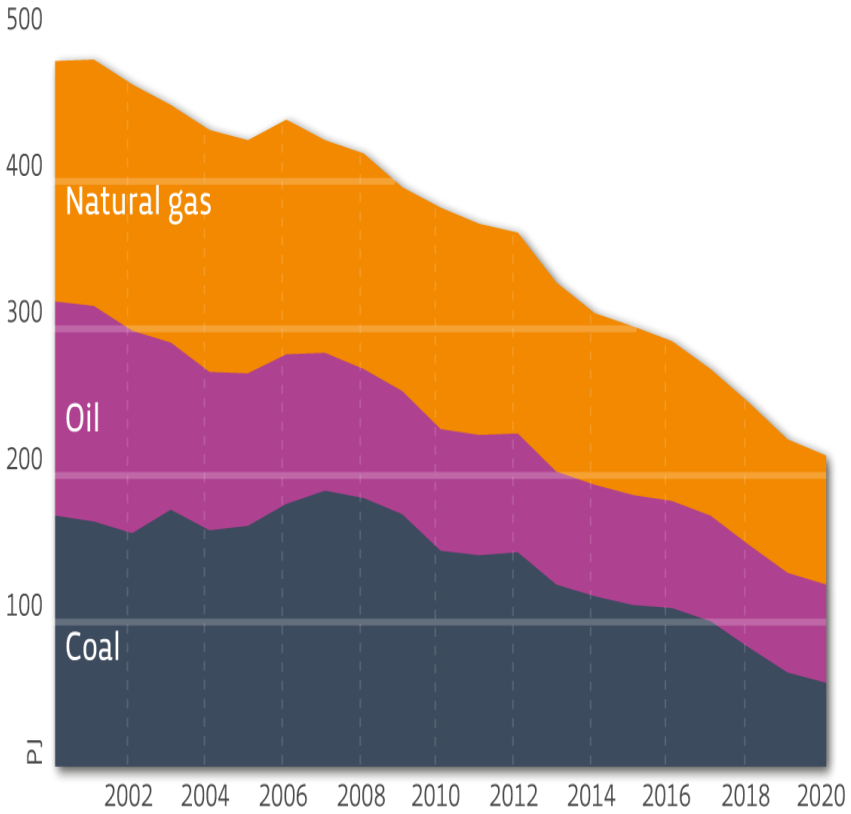
Ambitious targets for 2020 and beyond



- **2020**: GHG emissions reduced by 34 % (compared to 1990)
- **2035**: Electricity and heating 100% from renewable energy
- **2050**: 100 % renewable energy in all sectors, including transport

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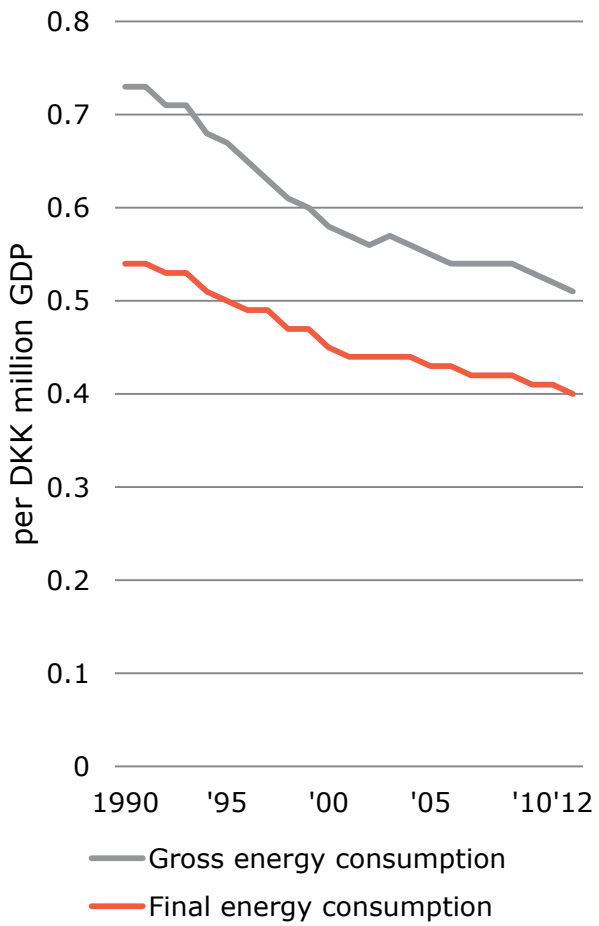
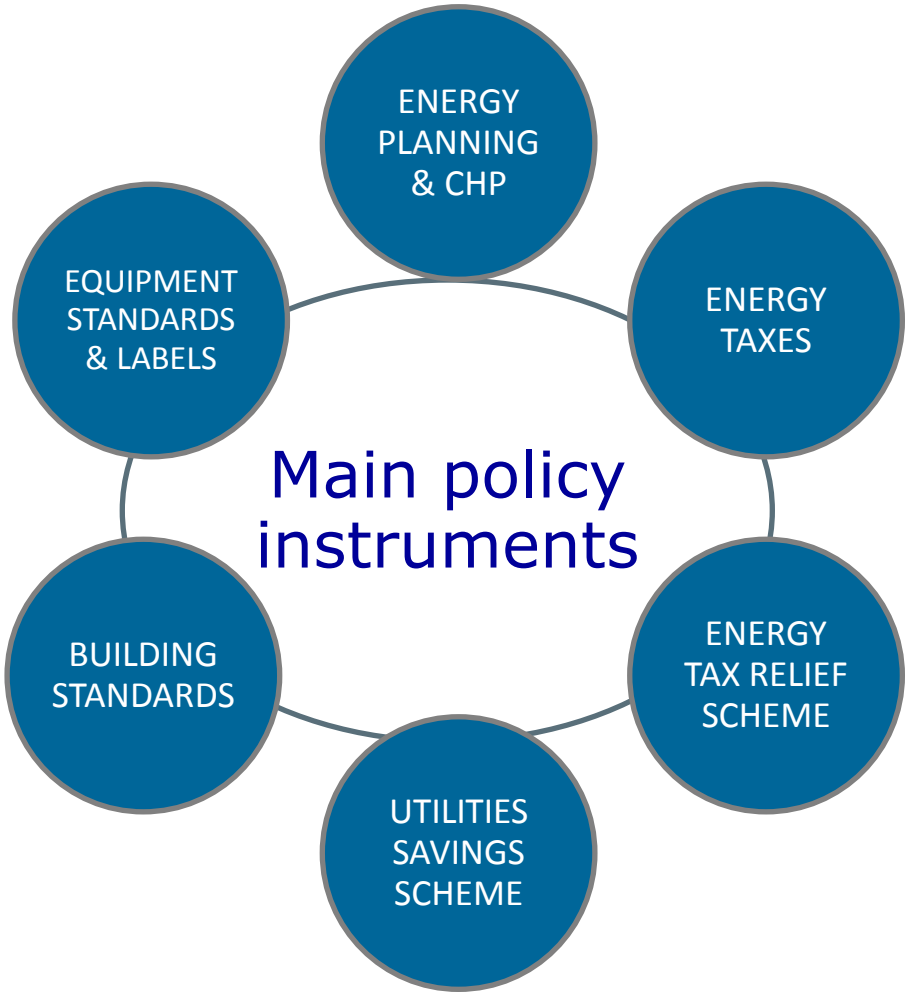
Energy efficiency

The cheapest (and cleanest) energy resource





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Combined Heat and Power (CHP)

- In thermal power plants, fuel efficiency is often < 40 %
- CHP can increase fuel efficiency to > 90 %
- More than 60 % of Danish homes have district heating from CHP-plants, most of them highly efficient and biomass-fired
- CHP and district heating were the first big steps towards a green economy

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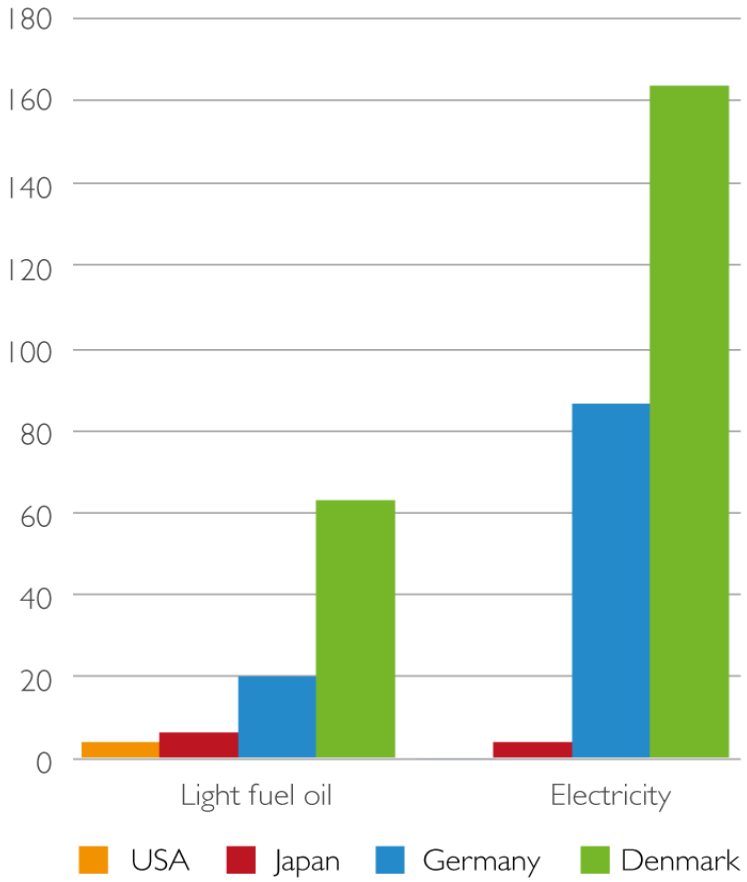
Energy taxes – an efficient incentive



- Taxes on energy increase the value of energy savings and the incentive for energy efficiency
- Energy prices do not reflect the long-term costs of pollution and CO_2-emissions: Energy taxes may compensate for this.
- Energy taxes create revenue for the treasury
- Energy taxes may also ease the acceptance of more stringent energy efficiency regulation

Energy taxes in € per MWh
Source: IEA 2012 (US tax on electricity not available)

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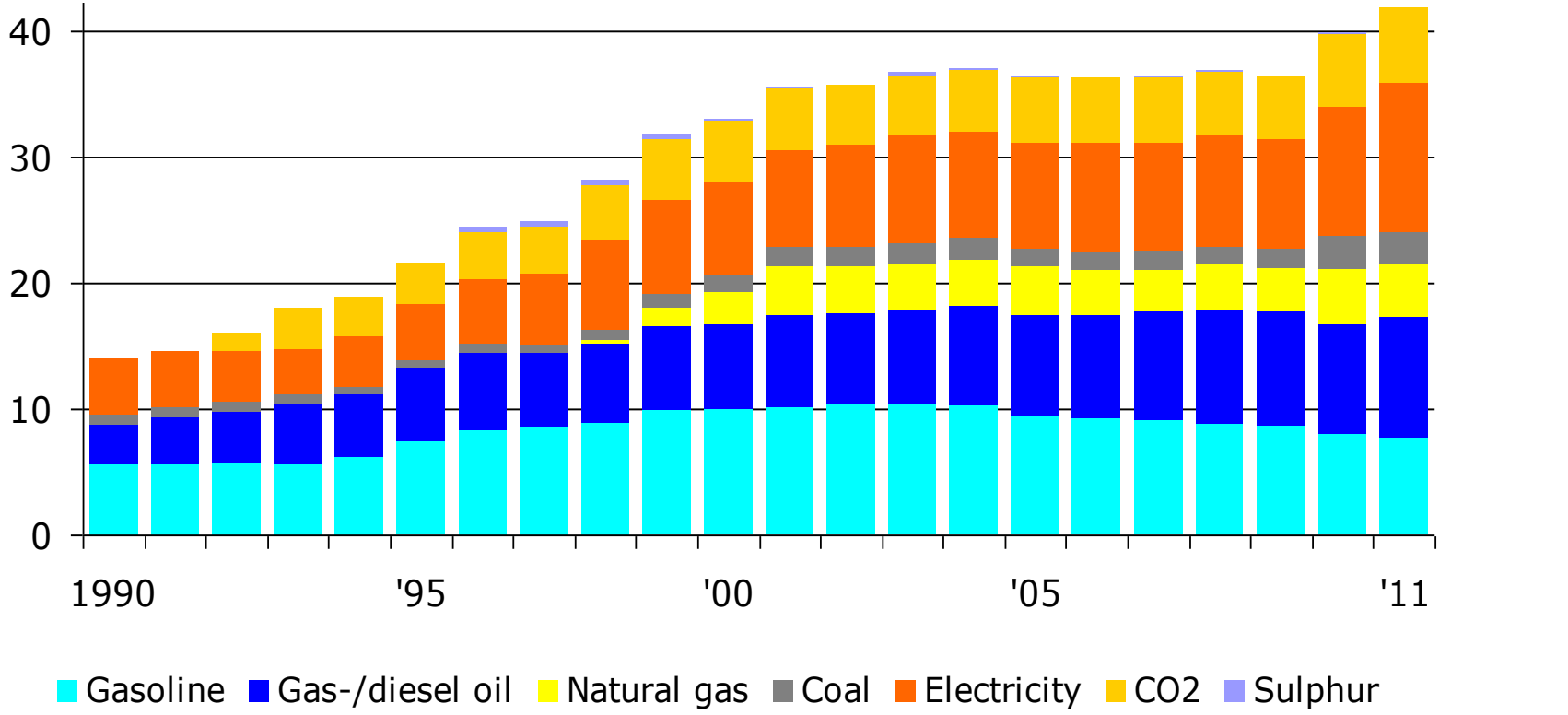
Revenue from energy taxes

Total revenue 2011 = 2.4% of GDP



On top of this comes taxes on private cars – up to 180 % on the least fuel-efficient. This has made the Danish stock of private cars the most fuel-efficient in Europe.

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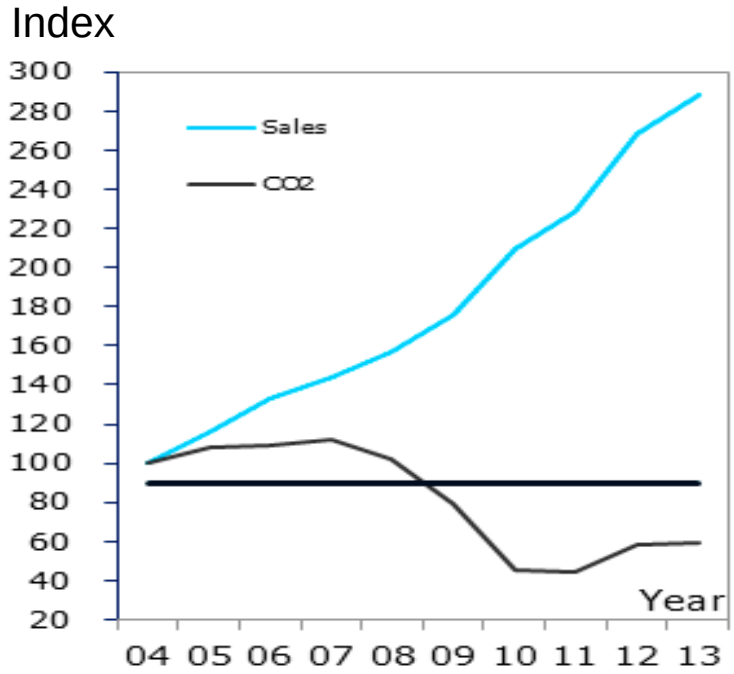
Energy management ⇨ Tax relief

- Voluntary scheme
- Participants must implement ISO50001 energy management
- EE-projects with pay-back time 4 years or less must be implemented
- In return, participants pay no energy taxes for 3 years (or longer, if contract is renewed)
- Relevant for large, energy intensive operations, where tax relief exceeds costs of energy management and investments



Novo Nordisk, Denmark's most valuable company and a world leader in diabetes care, joined the scheme and reduced CO_2-emissions by 40 % while sales increased by 300 %

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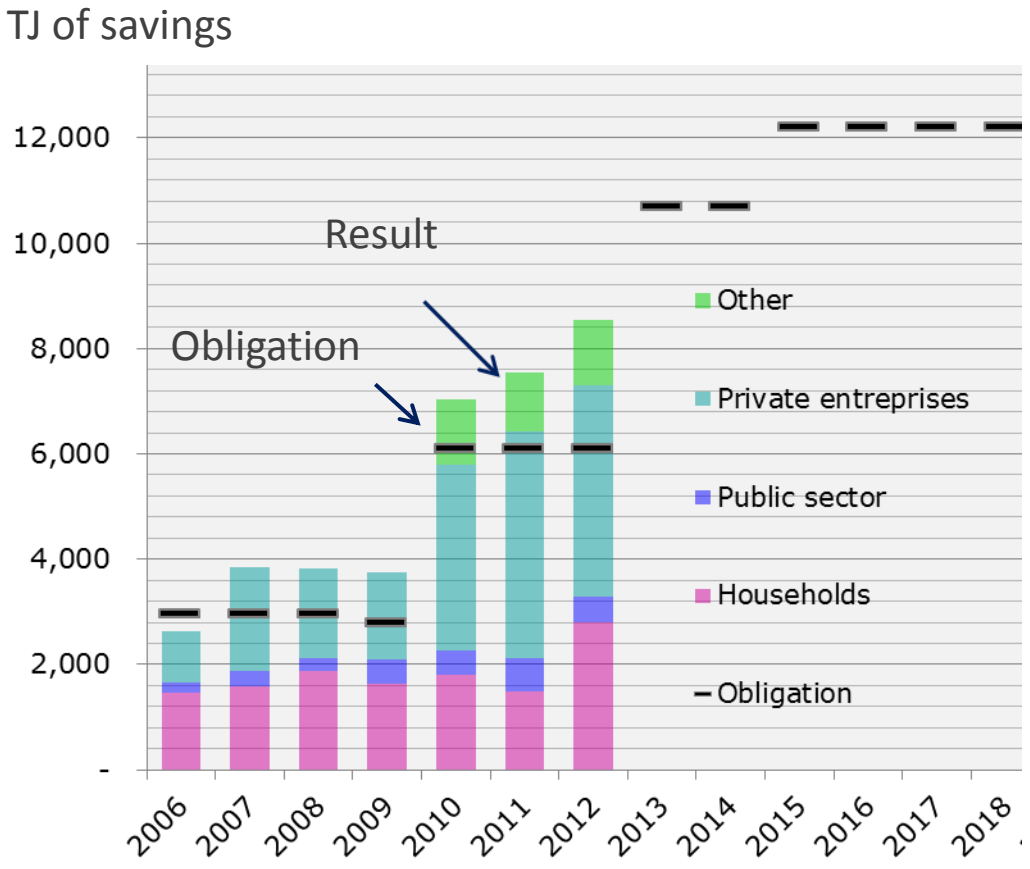
Energy utilities obligation scheme

- All energy utilities must make customers save a certain amount each year
- Each utility can choose customer types, technologies and incentive types as it prefers
- Typical incentives are free advice and a (limited) investment subsidy
- Savings must be additional and well-documented
- Costs are covered by a small, standard levy on all customers' energy bill



Savings in 2013 = 2,6 % of total Danish non-transport energy consumption

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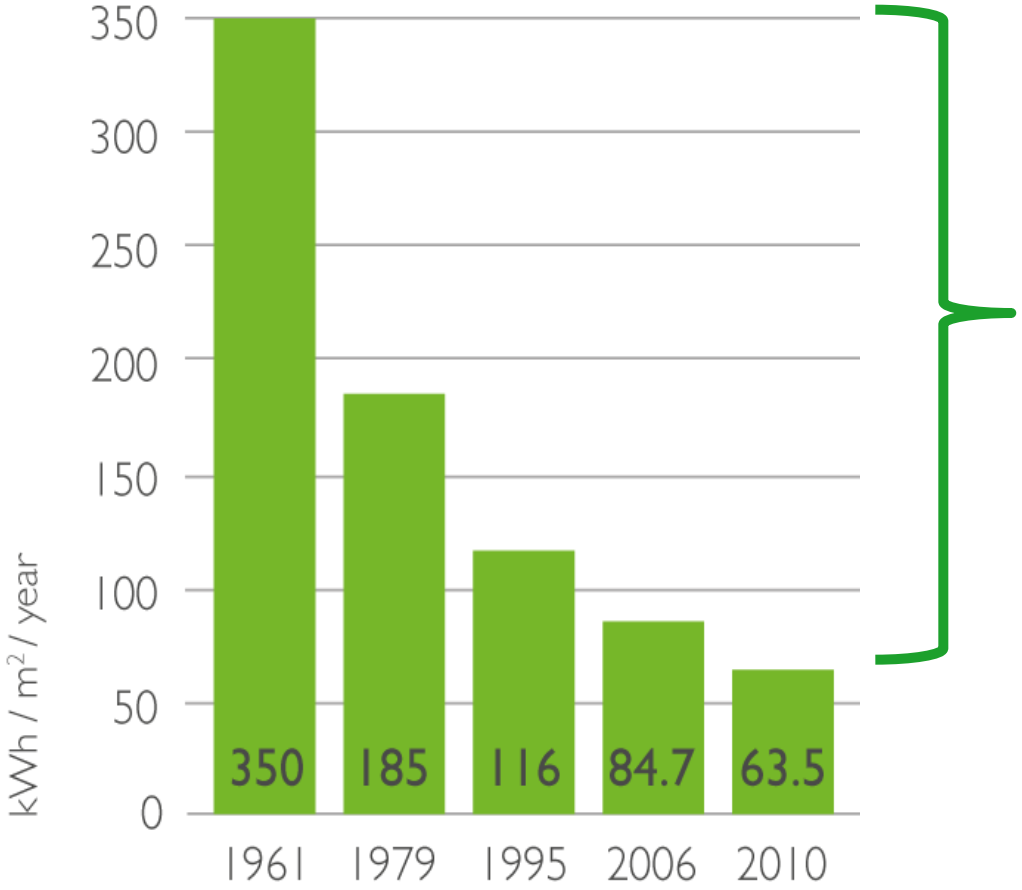
Danish track record for buildings



80 %
reduction

Maximum allowed energy demand per m² heated floor space and per year in a new, 150 m² Danish home

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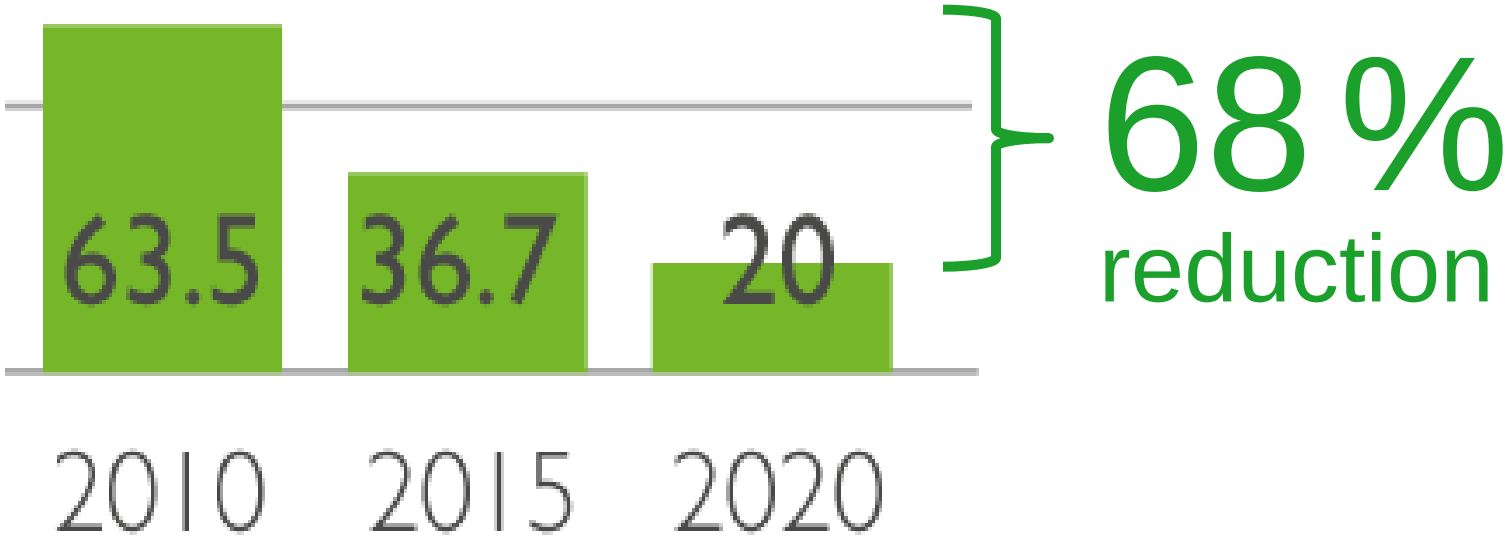
And where do we go from here?



Maximum allowed energy demand per m² heated floor space and per year in a new, 150 m² Danish home

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In 2013 30% of all new floor space was built to the 2015 or 2020 standards rather than the present, mandatory standard

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Turning potential into actual savings

(Regulation is key)

- Mandatory minimum standards
- Choose how – but not if – you comply
- Overcomes ”market failures”
- Provides long-term cost-efficiency
- Spurs innovation

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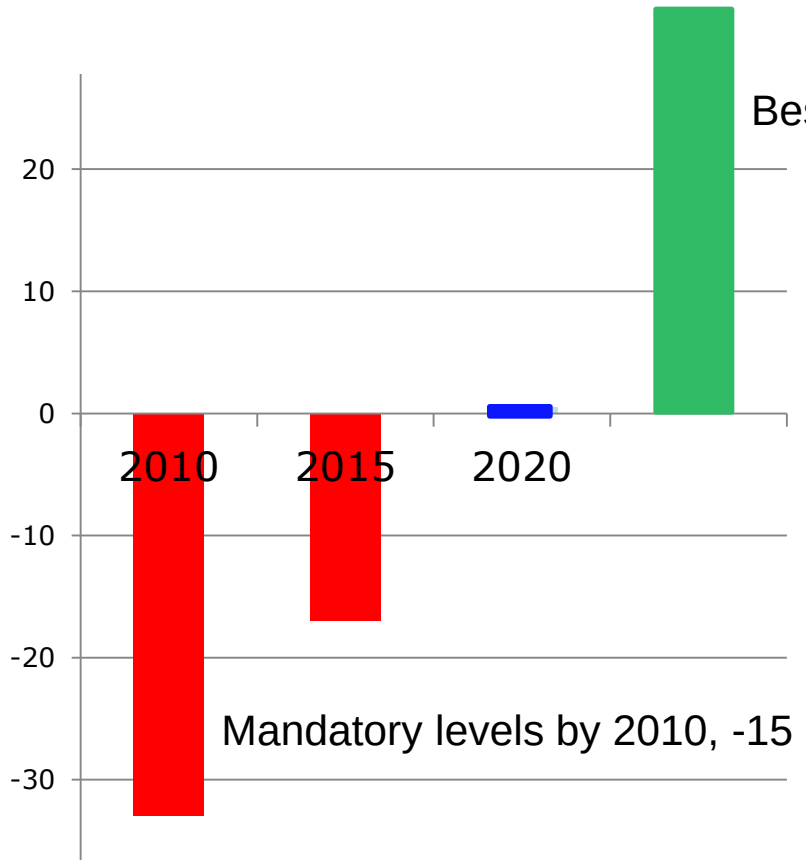
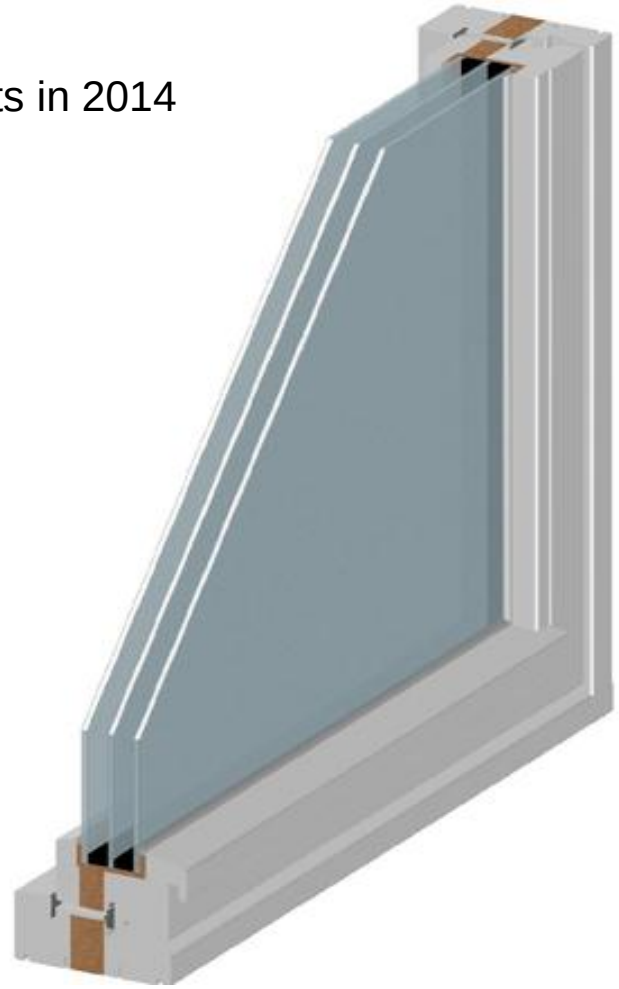
Regulation ⇨ Innovation



kWh/m^{2}year
Heat loss + solar gains during a Danish heating season



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Why building sector efficiency?

- Large share of national energy consumption – up to 40 %
- Huge savings potential in simple, proven and cost-effective technology
- Industry is mostly local
- Buildings have a long life-time

Missing this opportunity locks in future costs and emissions

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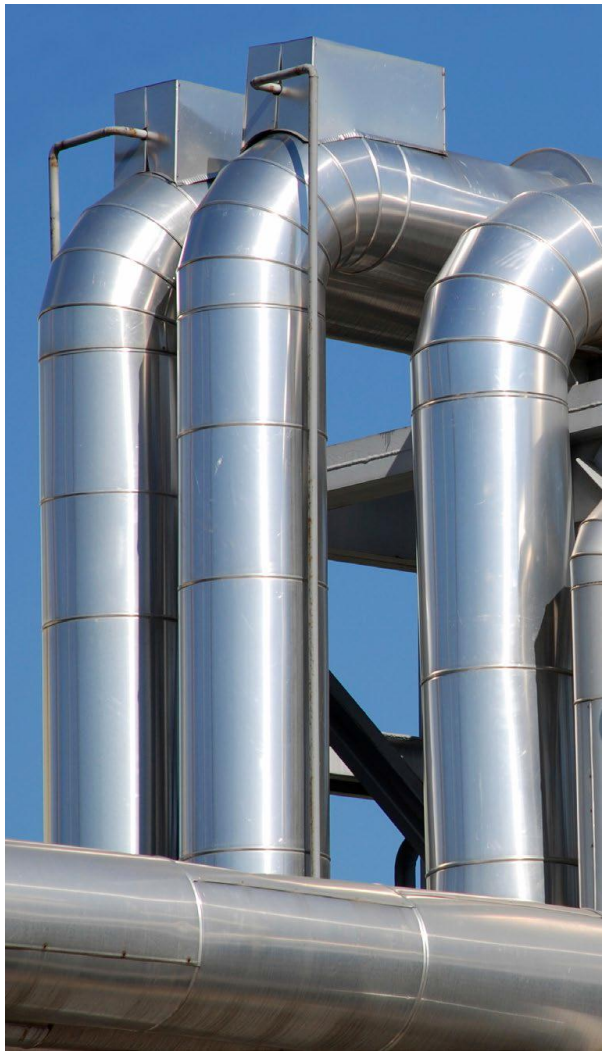
Key lessons from the Danish case

- EE turns a profit. Poor EE is a waste of money
- EE is not rocket science – there is huge potential in simple, proven, cost-efficient solutions
- EE does not happen by itself – government must push and keep pushing, decade after decade
- Do tax and regulate – but make sure you get stakeholders on board
- Make market forces *serve* rather than *dictate* your objectives



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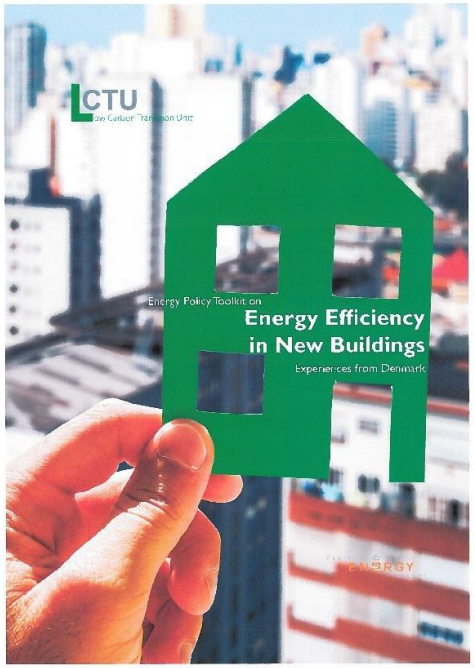
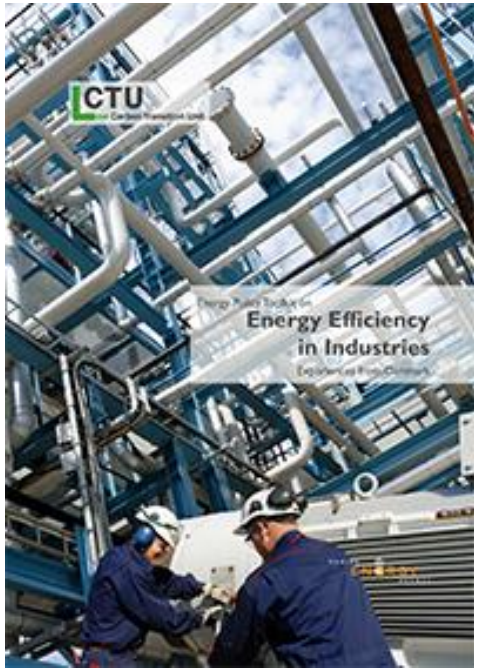
Policy toolkits

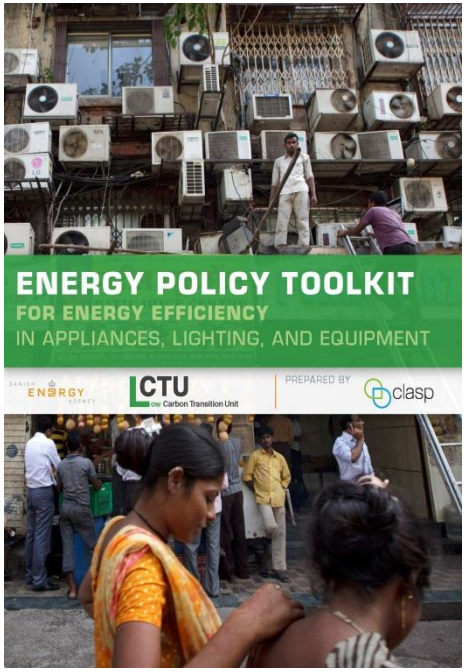
Sharing 40 years of EE experience



Buildings



Industry



Appliances

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Ukraine – Denmark Energy Centre

- Budget 2 million Euro, to be funded by the Danish Government
- Bilateral agreement to be entered with Ukraine's Ministry of Energy and Coal Industry
- Also involved:
  - Ukraine's State Agency of Energy
  - Efficiency and Energy
  - Ukraine's State Environmental Investment Agency
- 3 year programme, expected to start by early 2015
- "Authority-to-authority" technical cooperation

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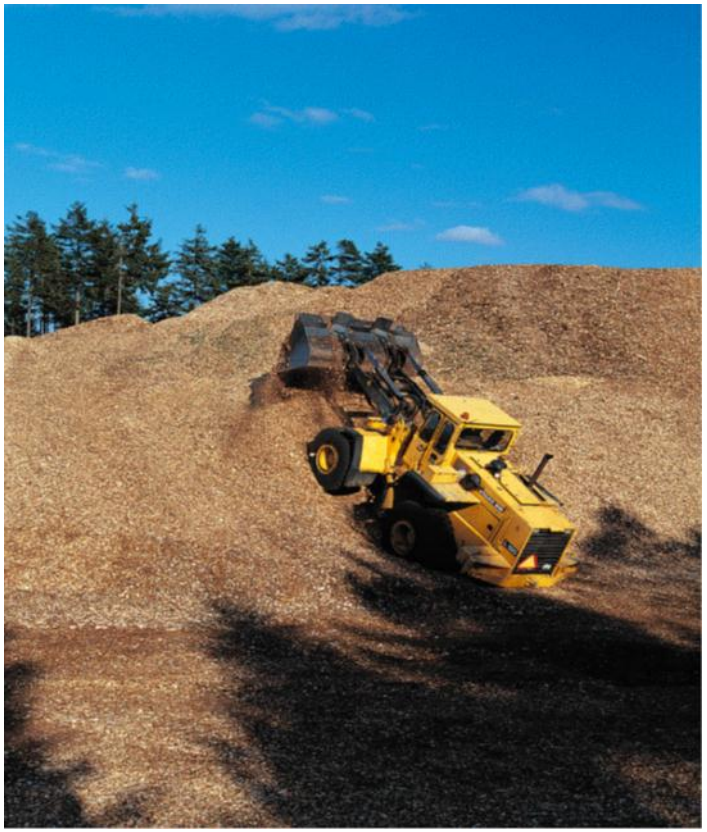
Energy Centre – areas of activity

Methodologies and tools/software for:

- National Energy Balance
- Energy system scenario analysis
- Greenhouse gas registry and UNFCCC reporting
- Monitoring of EE at industrial sub-sector level
- Analysis of integration of RE-power in regional grids

Analysis of:

- Options for increased use of RE in the heating sector



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Thank you for your attention

Learn more at www.ens.dk/lctu

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Extra slides

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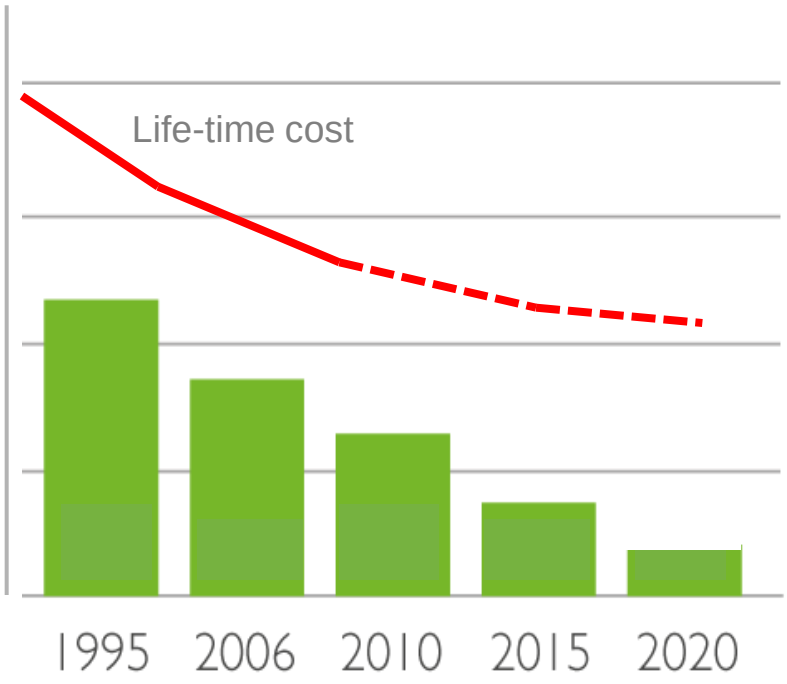
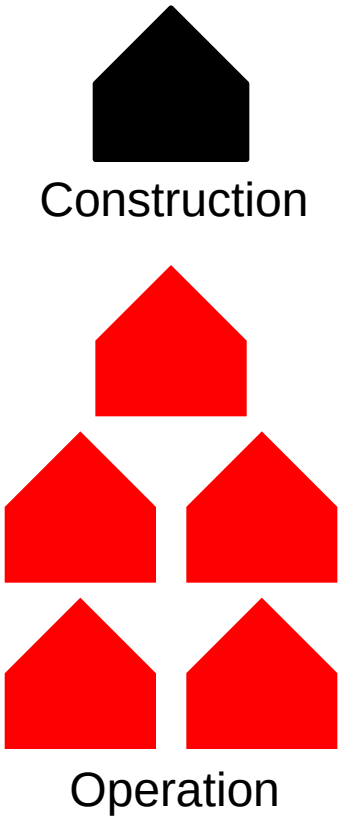
But what about the cost?





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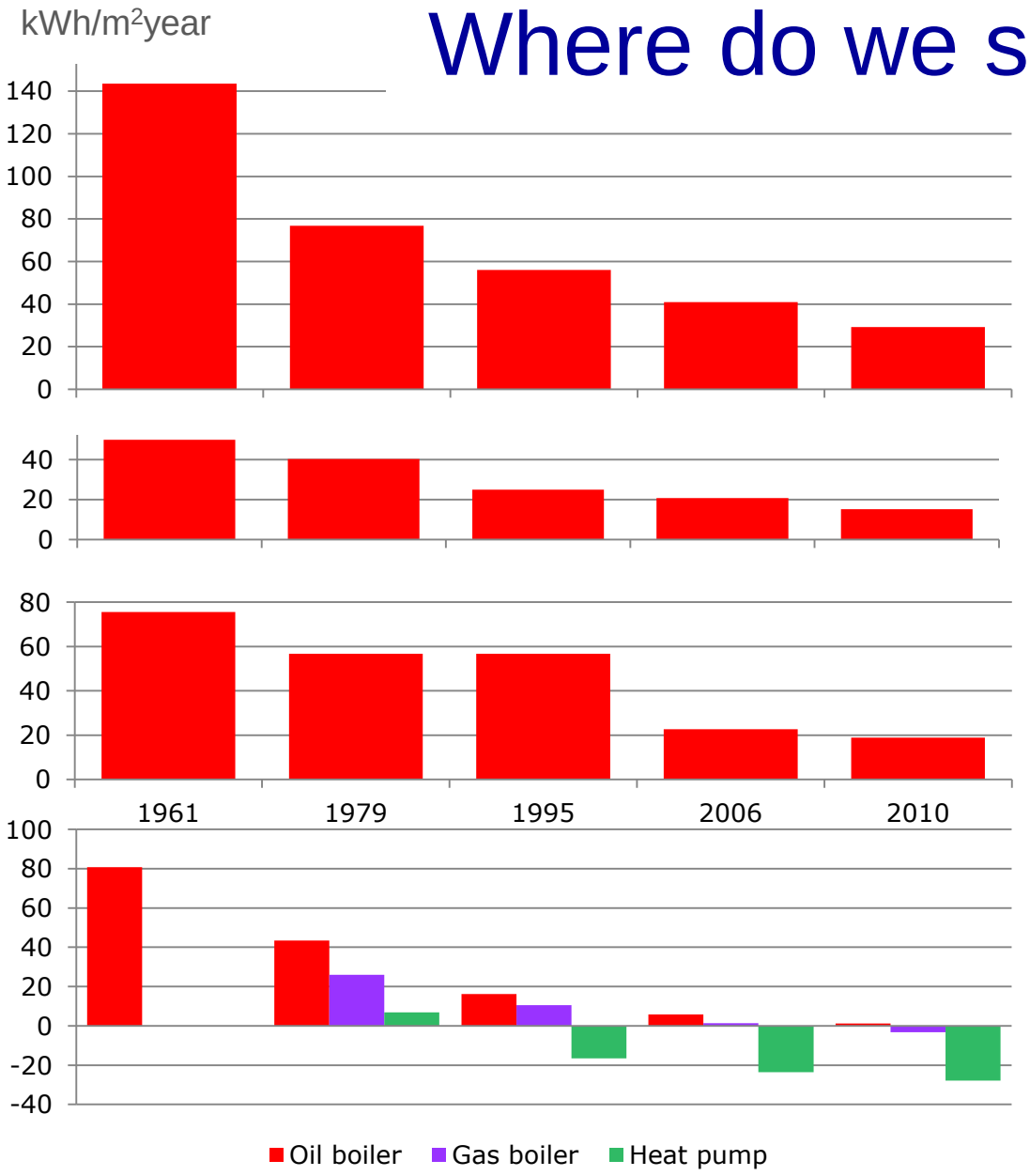
Where do we save?



Thermal insulation (building envelope)

Windows

Air-tightness & ventilation losses

Heat source

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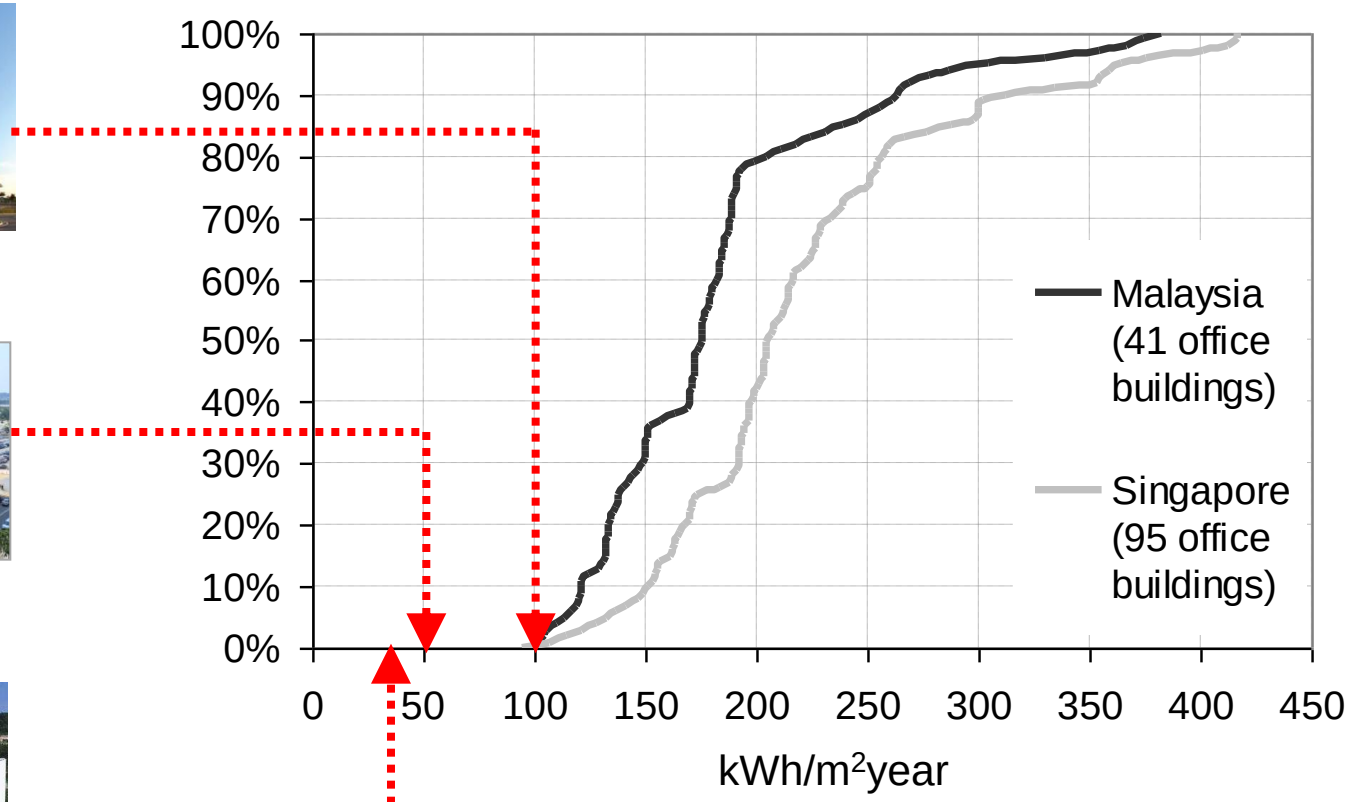
Danish experience at work in Malaysia

LEO Building

Diamond Building

GEO Building



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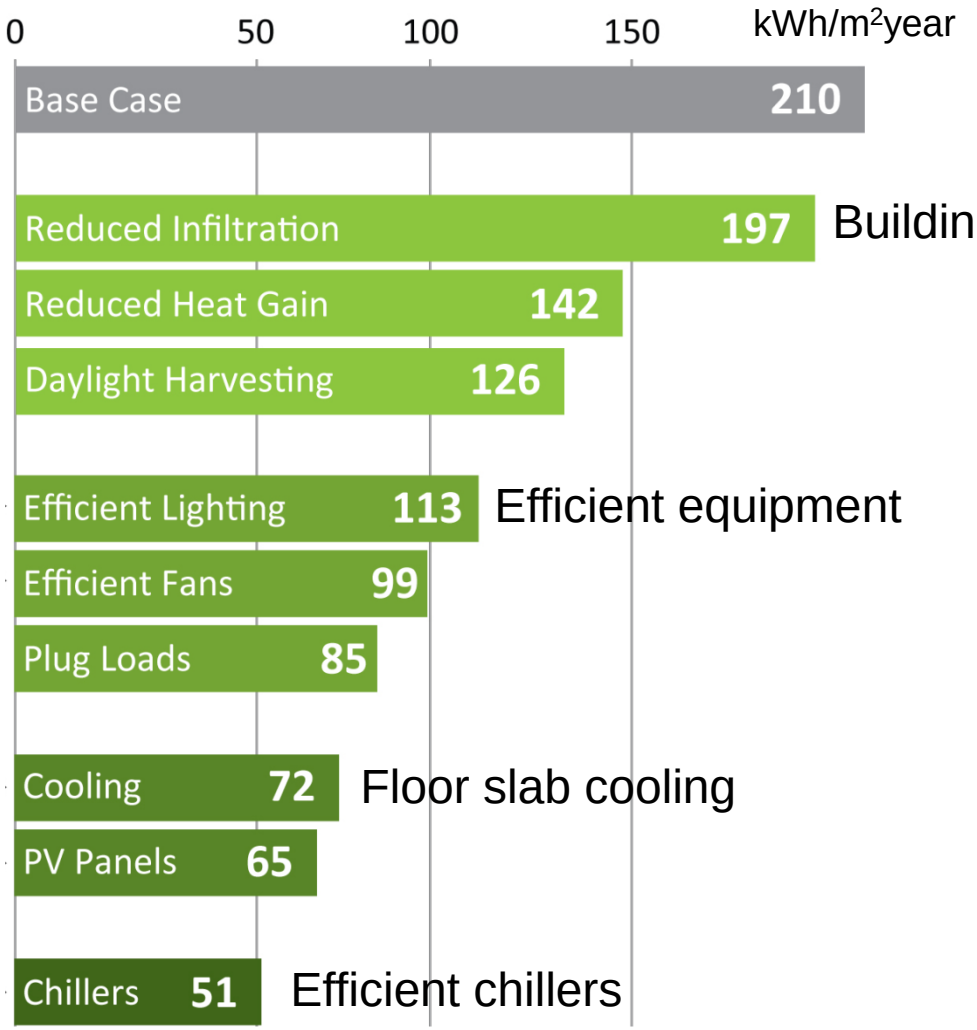
Energy efficiency, step by step

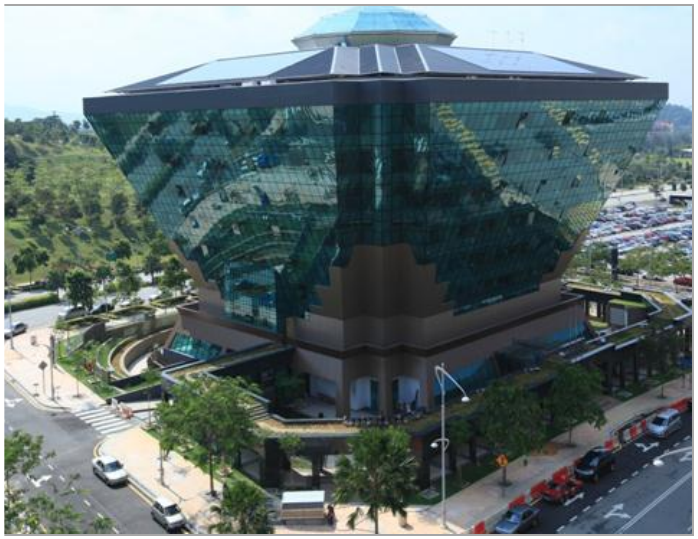


Building envelope

Efficient equipment

Floor slab cooling

Efficient chillers



75 % energy savings
5 % extra investment
Pay-back time < 5 years

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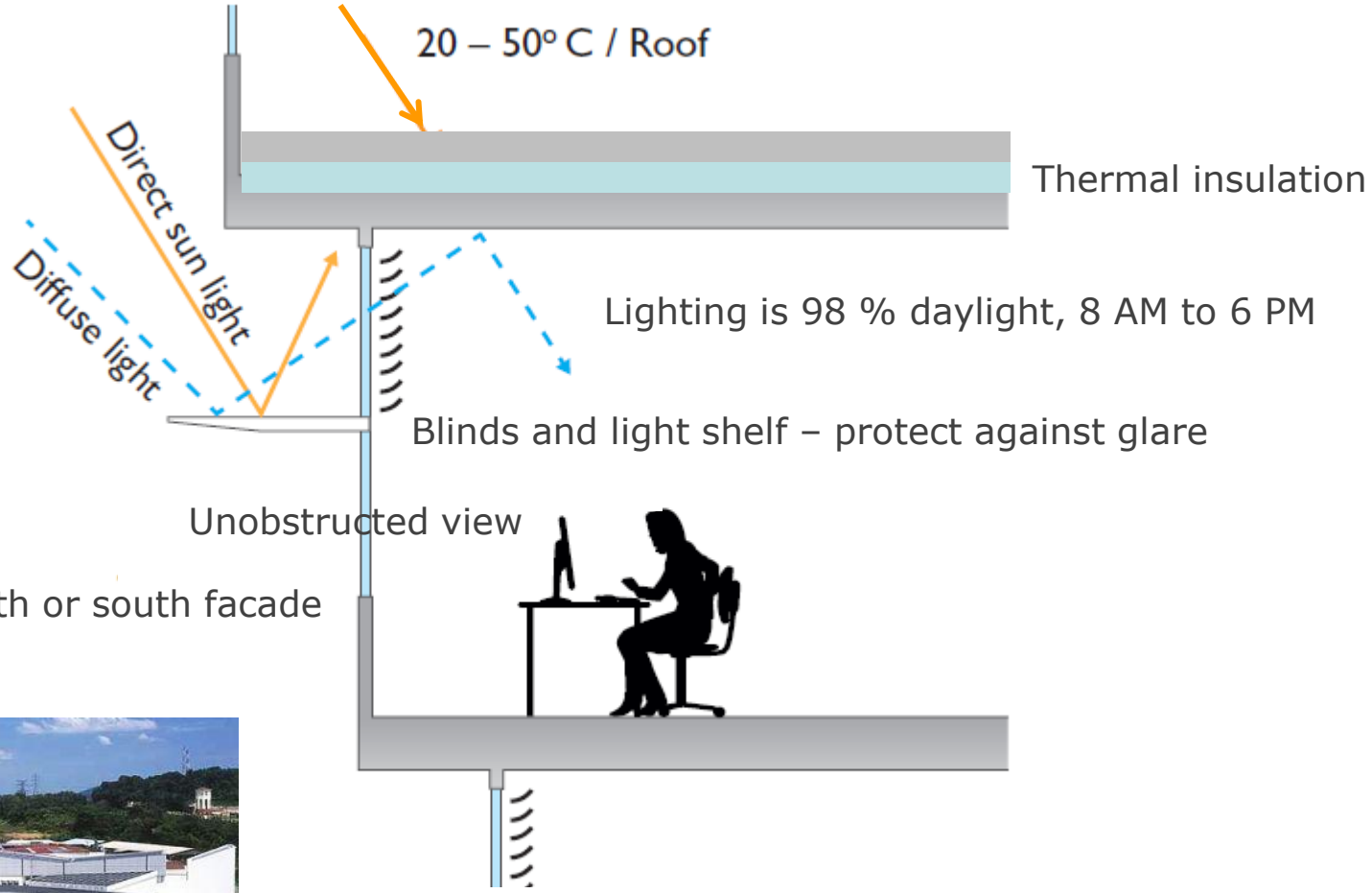
Daylight harvesting



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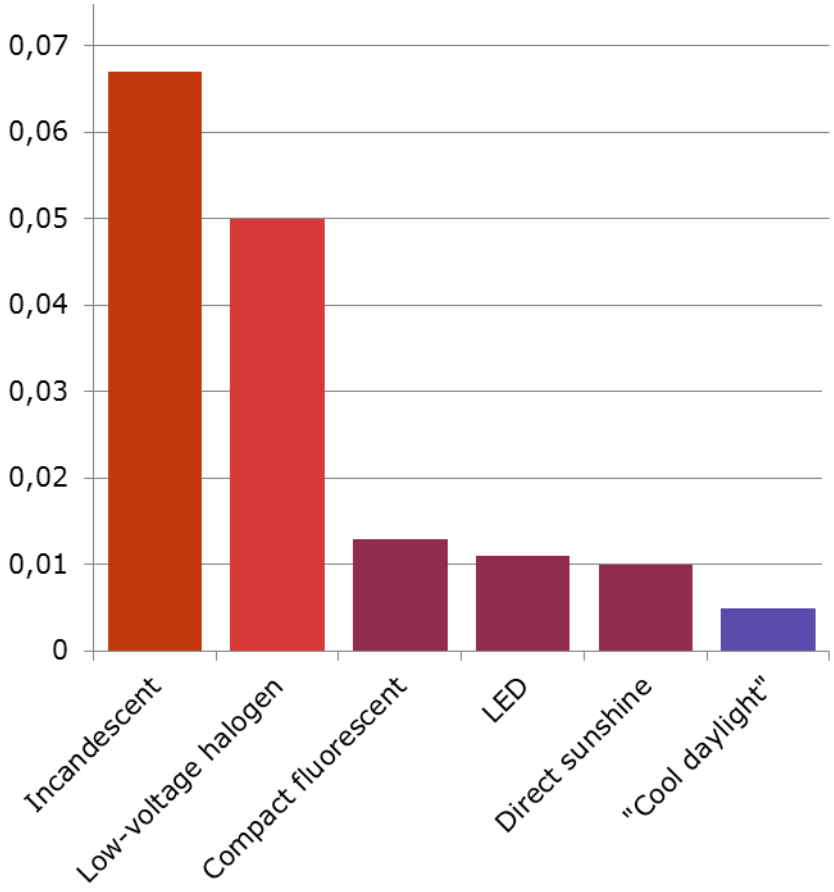
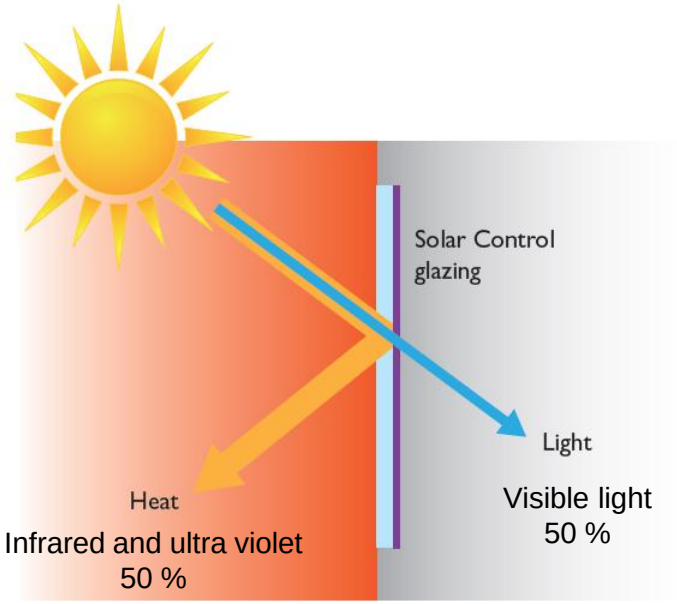
Cool daylight – saves energy twice

Heat generated by different light sources (Watt/Lumen)





Solar control glazing

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Mandatory EE-standards in Vietnam

- Partners: Ministry of Construction (Vietnam), Ministry of Climate, Energy and Building (Denmark)
- Planning & preparation: 2013
  Execution: 2014-2016

Danish contributions:

- Design advice for demonstration buildings
- Training material for practitioners (architects, engineers, construction companies)
- Government to government advice on formulation and implementation of standards
- MoC capacity building

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Implementation

- Actions speak louder than words – a few real-life buildings, which show the way, may have a profound impact on attitudes and understanding
- Explain what to do in simple, practical terms and with ample use of examples and illustrations. This may be directly in the code or in guides, which are freely available in print or on a website
- Provide training for the building industry (architects, engineers) and for those who grant construction licenses
- Enforce – make sure that non-compliance is fined and/or sanctioned in other ways

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Regulation – key issues

First things first

- First: Single-issue , basic requirements
- Next: Additional, overall performance requirement

The building envelope

- Long life-time
- Robust savings

Long-term cost-efficiency

”Premium” options

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