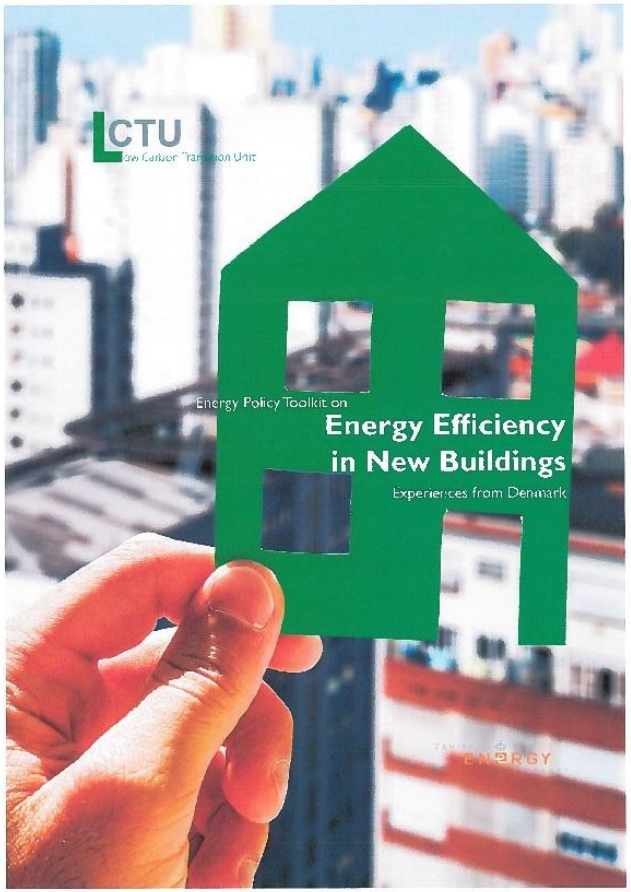
Energy Efficiency in New Buildings

Toolkit by the Low Carbon Transition Unit, Danish Energy Agency



CESC webinar
6 June 2013

Peter Larsen
Head of Section
Danish Energy Agency

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LCTU
Low Carbon Transition Unit

Our work

The Low Carbon Transition Unit (LCTU) within the Danish Ministry for Climate, Energy and Building was established in 2012 and assist growth economies and developing countries in their implementation of comprehensive, real and measurable GHG reductions and Low Emission Development Strategies.

Cross cutting analytical workstreams

Baselines

We are engaged together with the OECD and the UNEP Risø Centre through dialogue and exchange of experiences in a group of developing countries, in the promotion of transparent, robust and credible GHG emissions baselines, i.a. by discussing commonalities and lessons learned across countries.

Reduction potentials

We conduct analyses of energy systems and reduction potentials in developing countries using the Danish Energy Agency's global carbon market model, COMPARE and our specially developed Emission Reduction Tool.

Energy Policy Toolkits

We share tangible Energy Policy Toolkits to provide guidance and give recommendations to developing countries on how to design and implement GHG reduction measures as well as national and cross sector Low Emission Development Strategies (LEDS).

Financing mechanisms

We work with various financing mechanisms in our bilateral country programmes to promote low carbon emissions investments in the energy sector. We are also engaged in a number of multilateral forums that address climate financing.

Multilaterally: networks and partnerships

Systematic underpinning of GHG reduction measures and initiatives (including NAMA and MRV)

We are engaged in a number of multilateral networks and partnerships with the aim of systematically underpinning GHG reduction measures. Our engagements include: CCAP MAIN, UNEP FIRM, GGGI, The World Bank's Partnership for Market Readiness, Chile MAPS and the Nordic Pilot NAMA under the Nordic Partnership initiative.

Bilaterally

South Africa

We work together with South Africa to promote increased integration of renewable energy – particularly wind power - in the national electricity supply. We also assist South Africa in the area of energy efficiency.

Vietnam

We work together with Vietnam on low carbon transition within the energy sector, specifically targeting energy efficiency initiatives. The aim is helping small and medium-sized enterprises in Vietnam - with a focus on brickworks, ceramics and food processing industries. We also assist in implementing new requirements for energy-efficient buildings.

Mexico

We work together with Mexico to assist in their low carbon transition by addressing specific challenges in areas of climate change mitigation, renewable energy integration and planning, and energy efficiency in non-residential buildings and larger industry.

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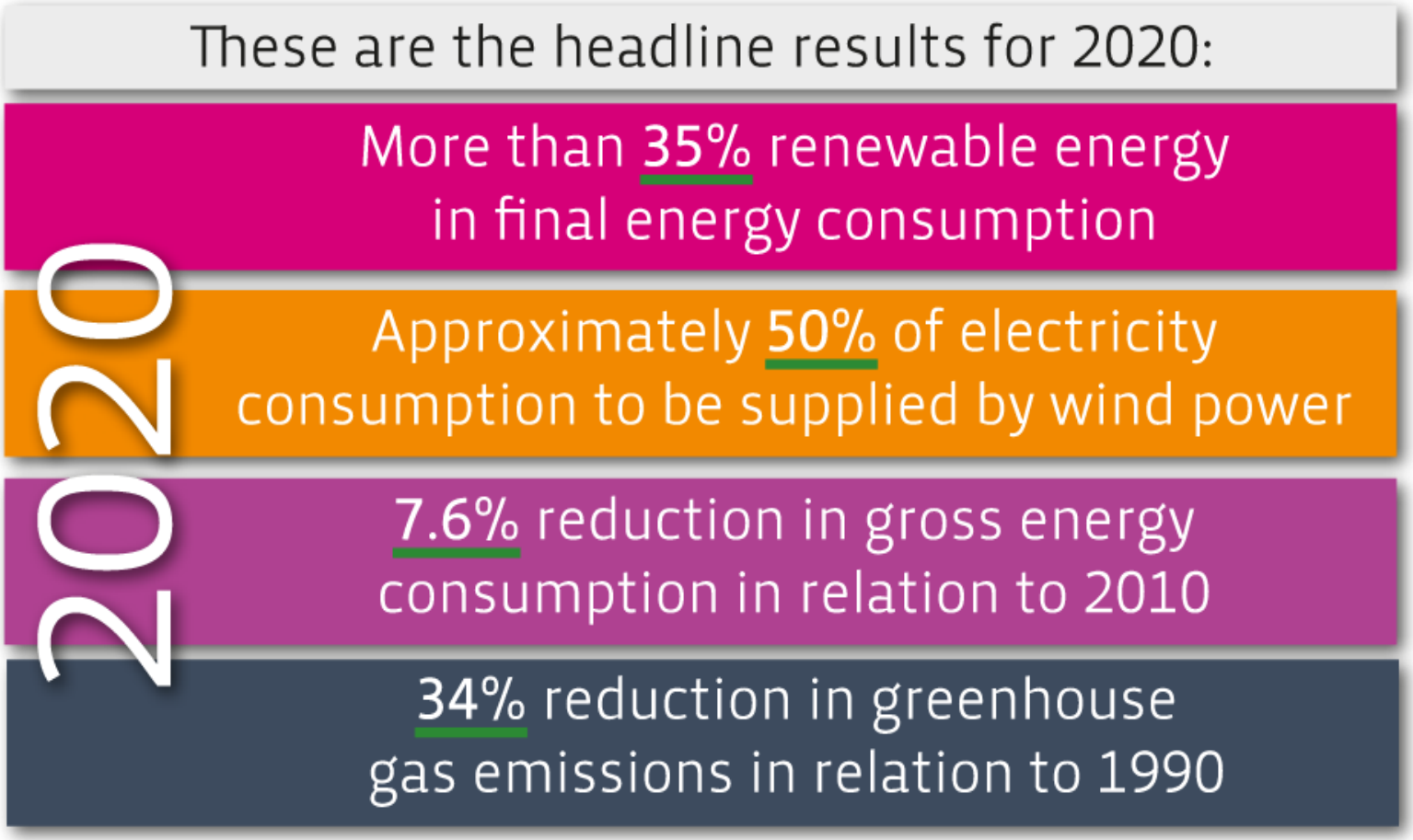
Effects in 2020 of agreed policies



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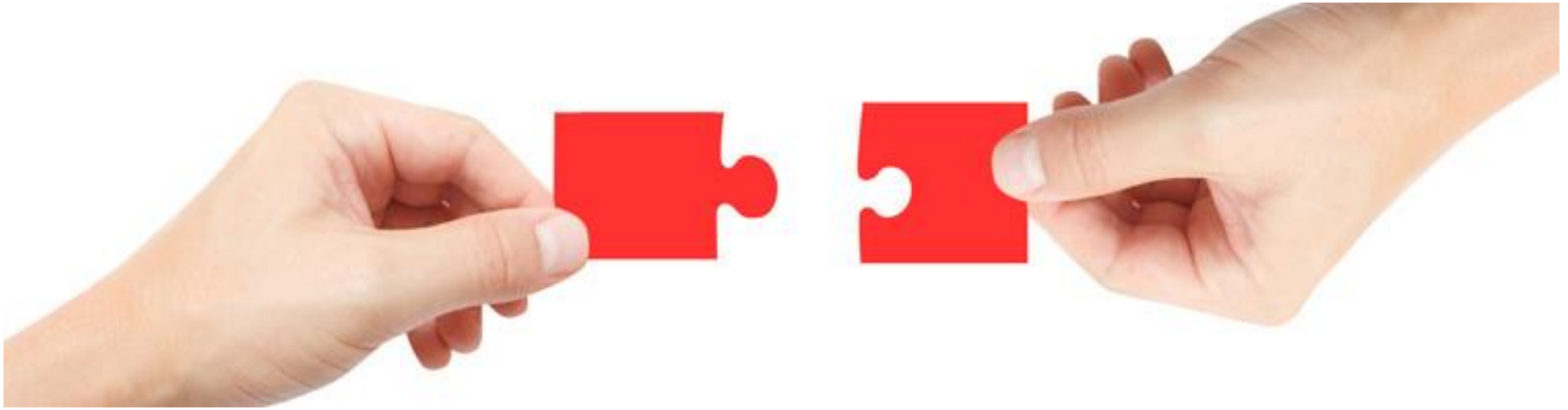
Sharing our experiences…



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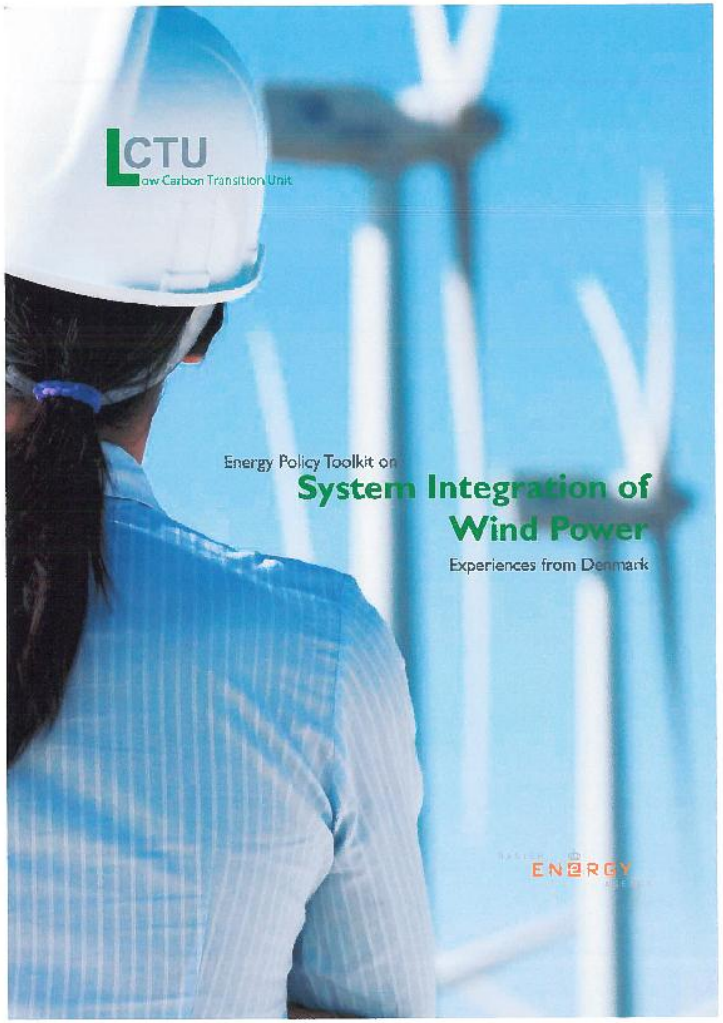
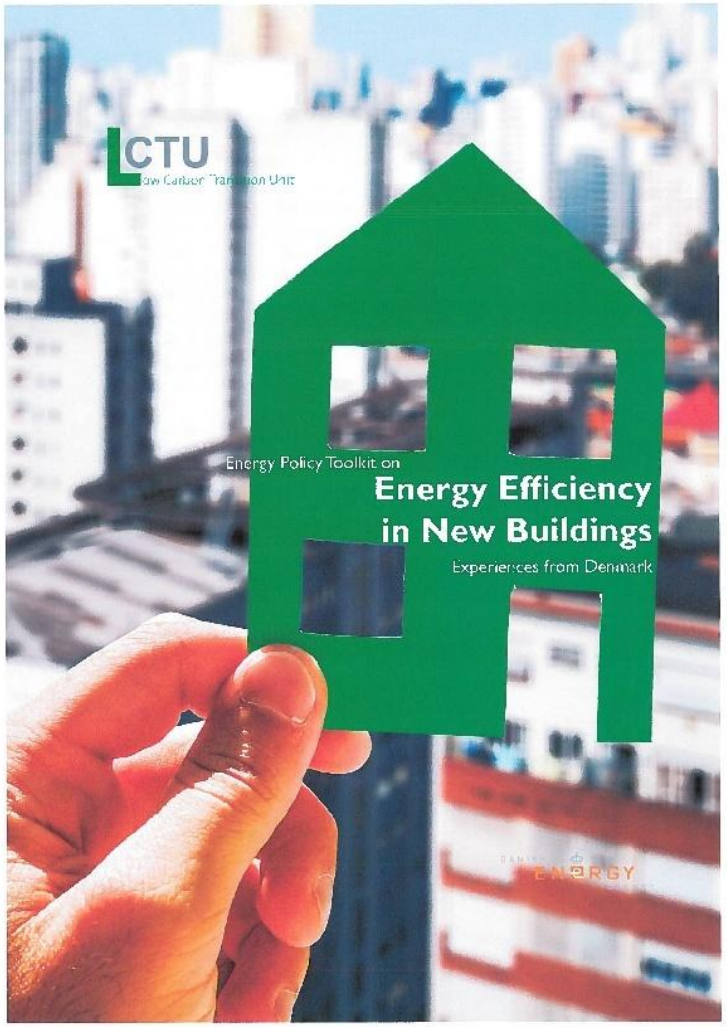
Energy policy toolkits





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- More information at:

www.ens.dk/LCTU

- Peter Larsen (pla@ENS.DK)

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Energy Efficiency in New Buildings

The Danish Experience

Webinar
6 June 2013

Jesper Ditlefsen
Head of Section
Danish Energy Agency

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Why is EE in buildings relevant?

- Up to 40 % of total consumption
- 100 % technical savings potential
- Simple, proven technology
- Much of it cost-effective
- Industry is mostly local
- Long life-time

Missing this opportunity locks in future costs and emissions.

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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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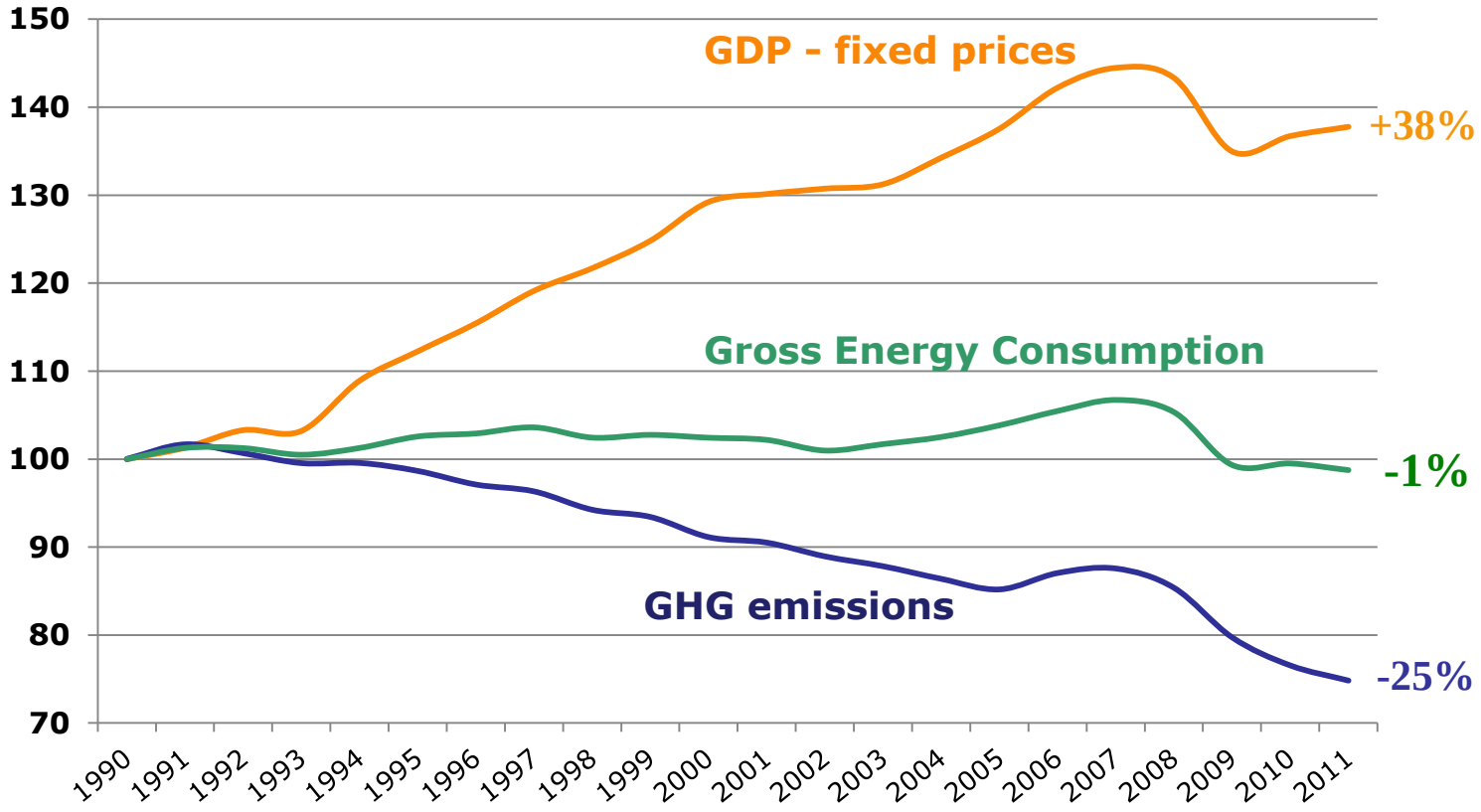
Our recent "green growth" track record



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

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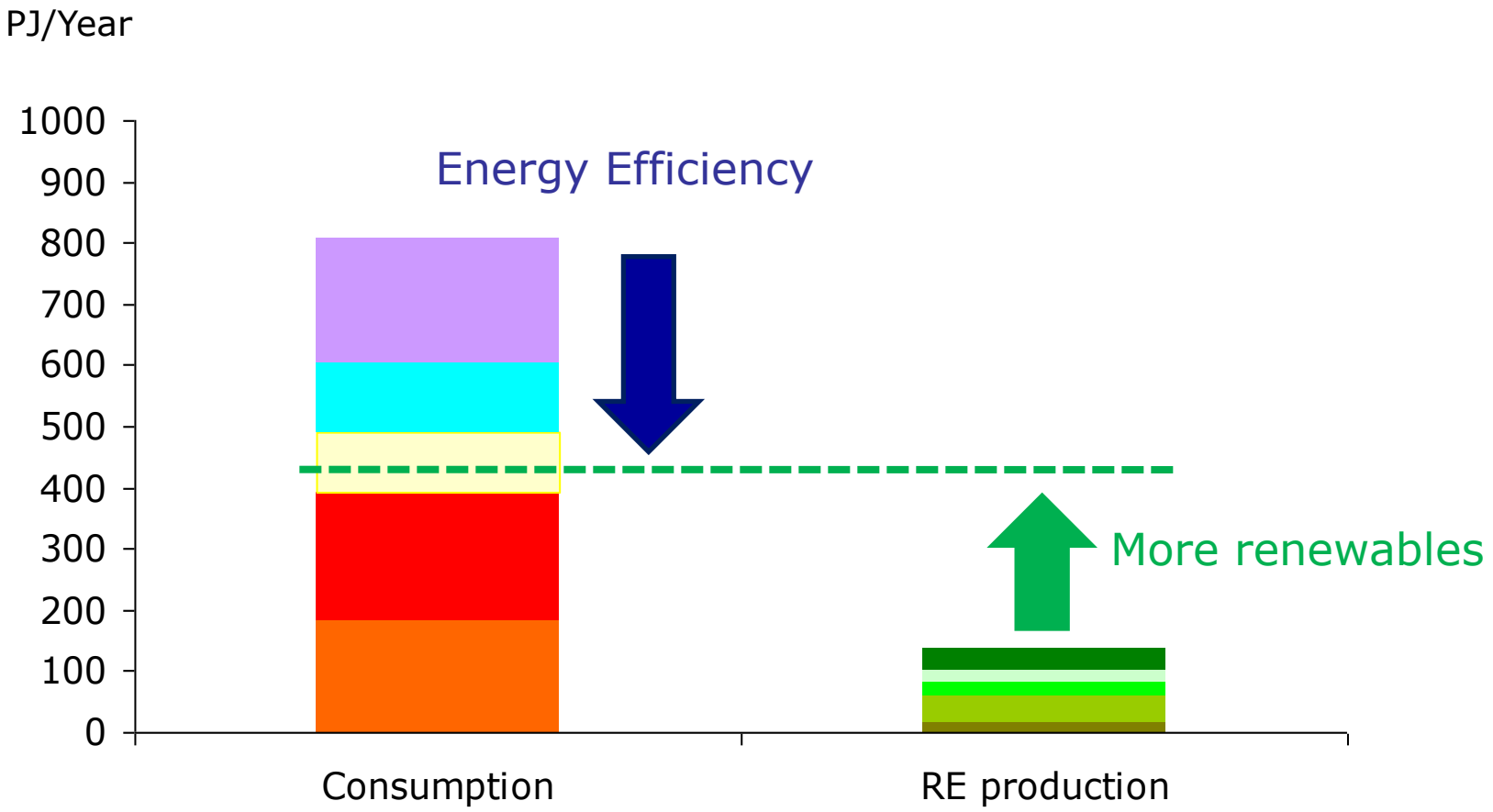
What's the trick?



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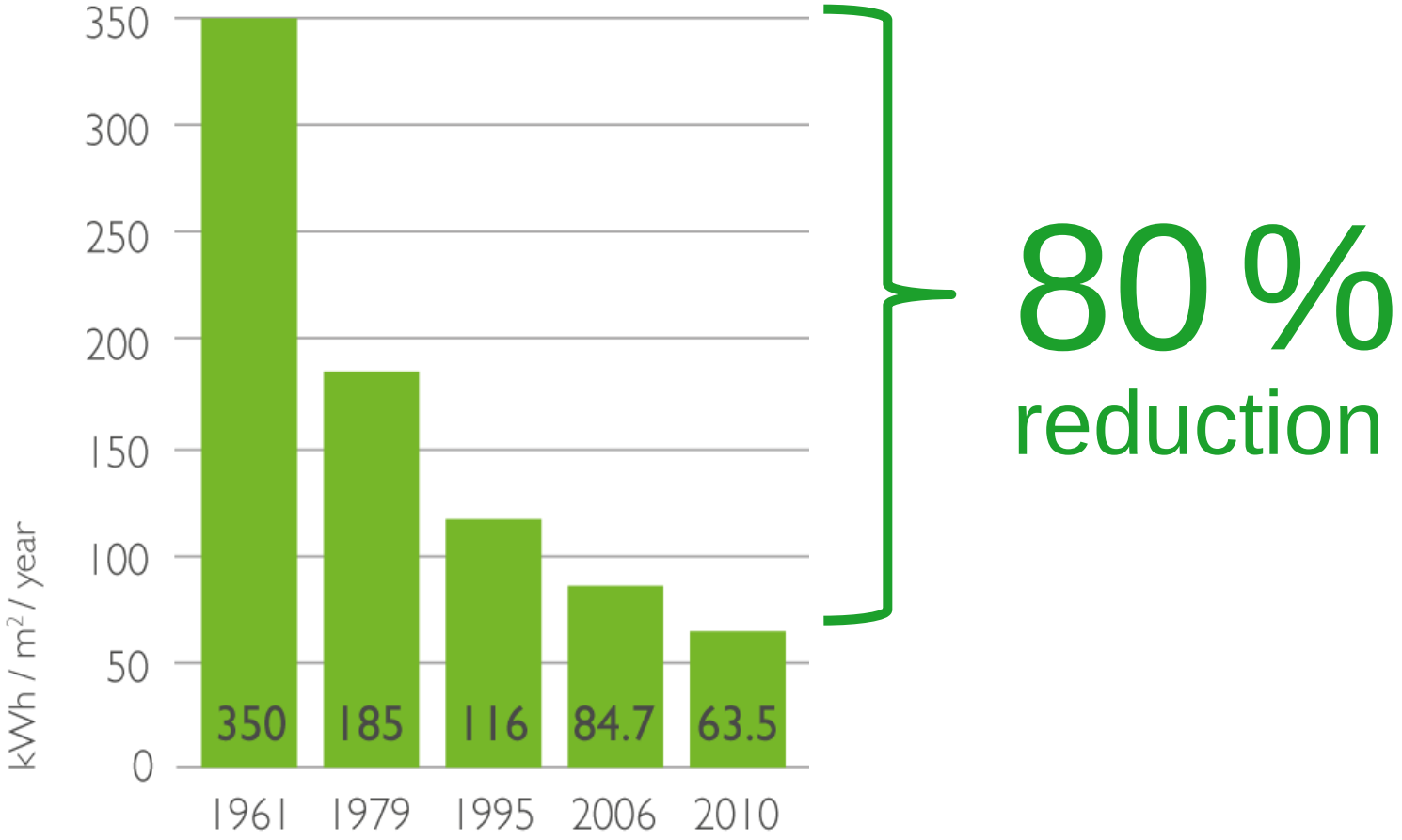
The role of EE in buildings (1)



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

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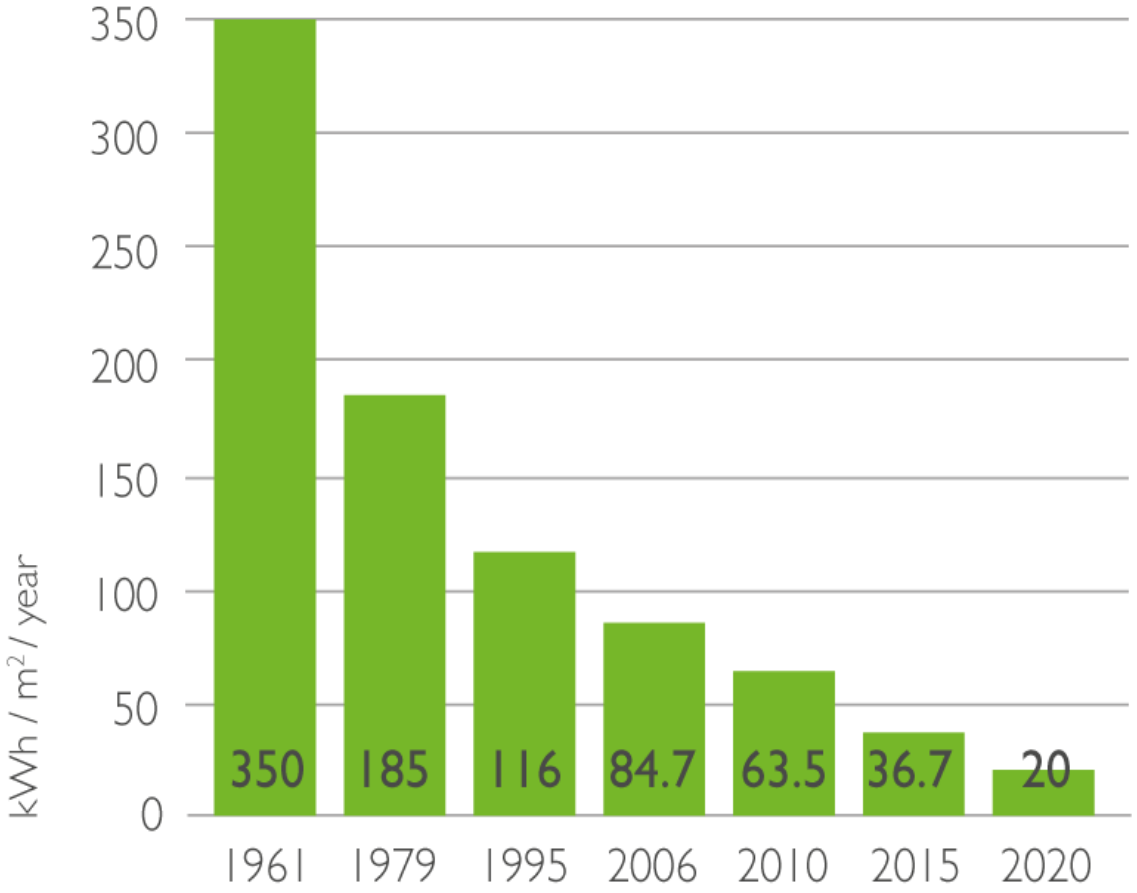
The role of EE in buildings (2)



Maximum allowed energy demand per m^2 heated floor space and per year in a new, 150 m^2 Danish home.

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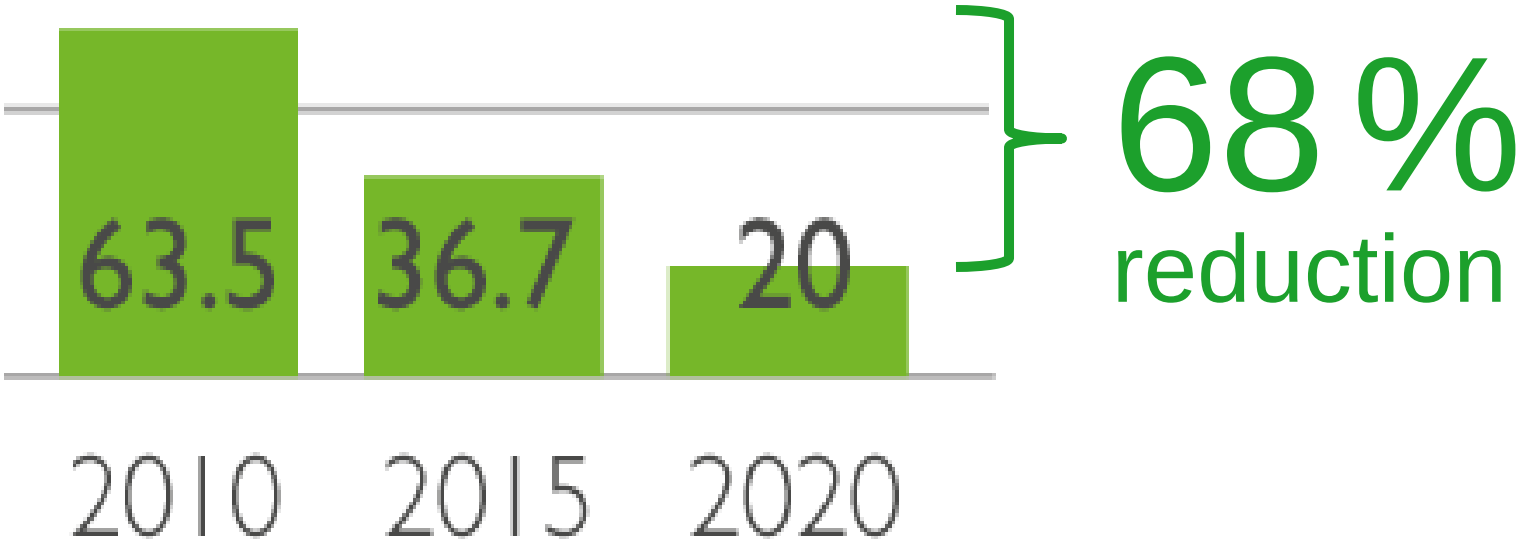
The role of EE in buildings (3)



Maximum allowed energy demand per m^2 heated floor space and per year in a new, 150 m^2 Danish home.

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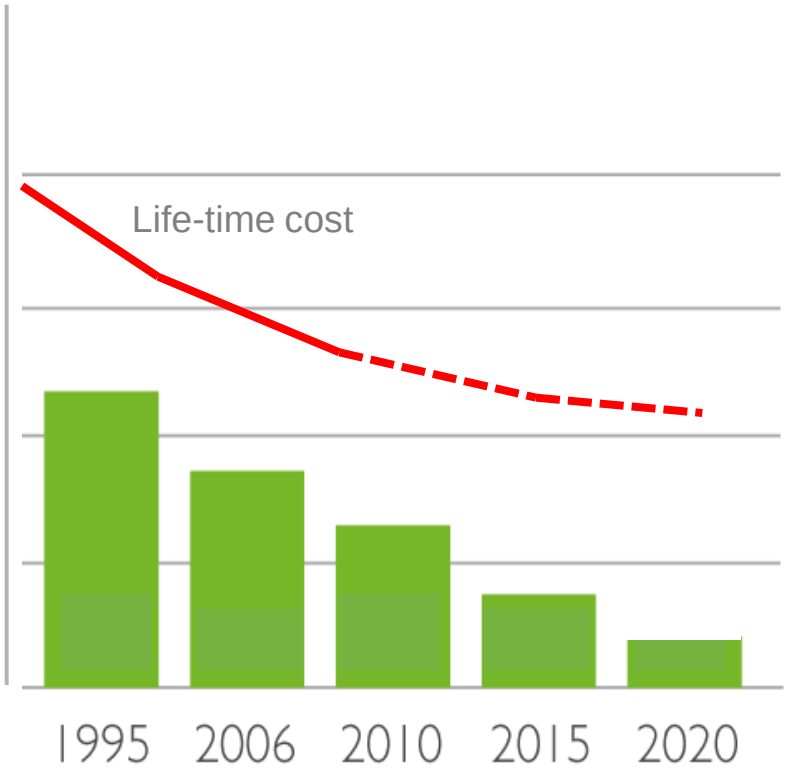
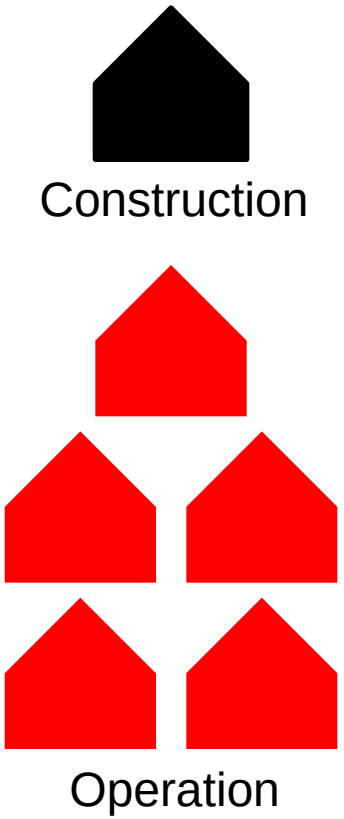
But what about the cost?





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10-20 % built to future standards

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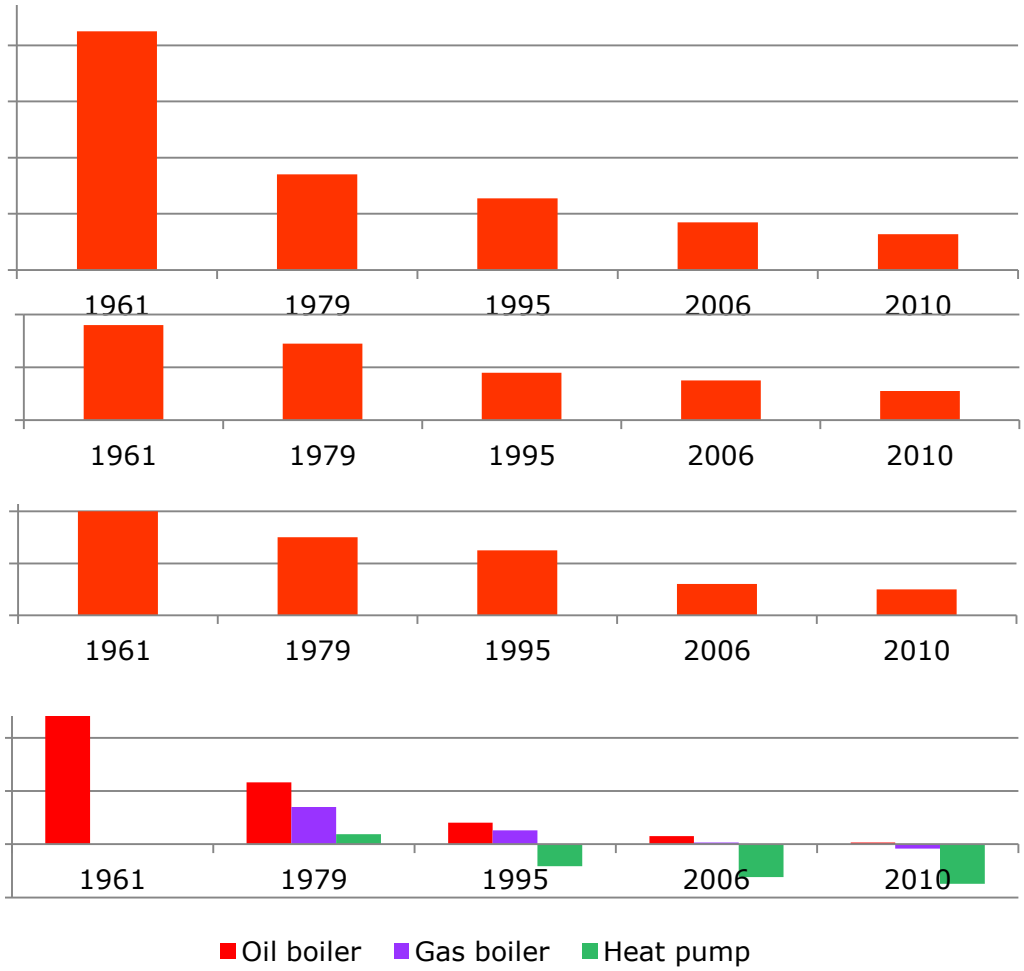
Where do we save?



Thermal insulation (building envelope)

Windows

Air-tightness & ventilation

Heat source

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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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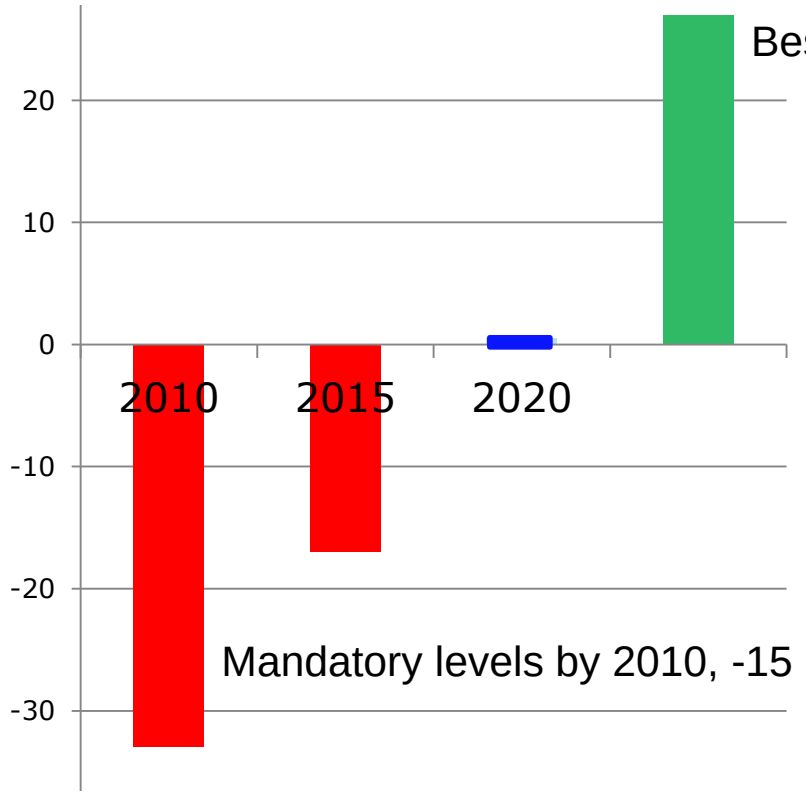
Regulation ⇨ Innovation



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

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Short history of Danish regulation

1961
Thermal insulation of building envelope (then 80 mm now 400 mm) including windows.

1979
Heating and ventilation systems.
Lighting and cooling was added later.

2006
Mandatory overall energy performance.
Air-tightness.

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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

Update regularly

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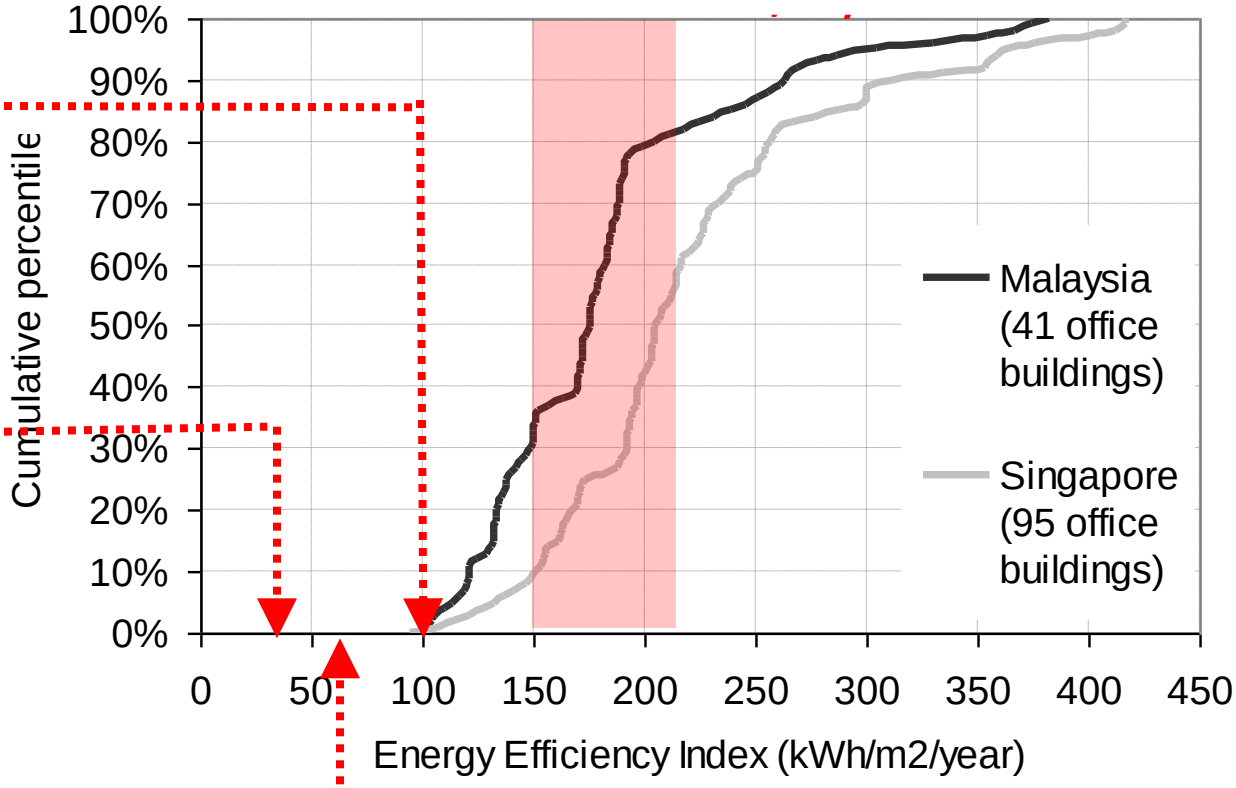
Energy Efficient Office Buildings in Malaysia – Hot and Humid

LEO Building

GEO Building

Diamond Building



Source: EAEF Project 64
Project leader: National University of Singapore, 2006

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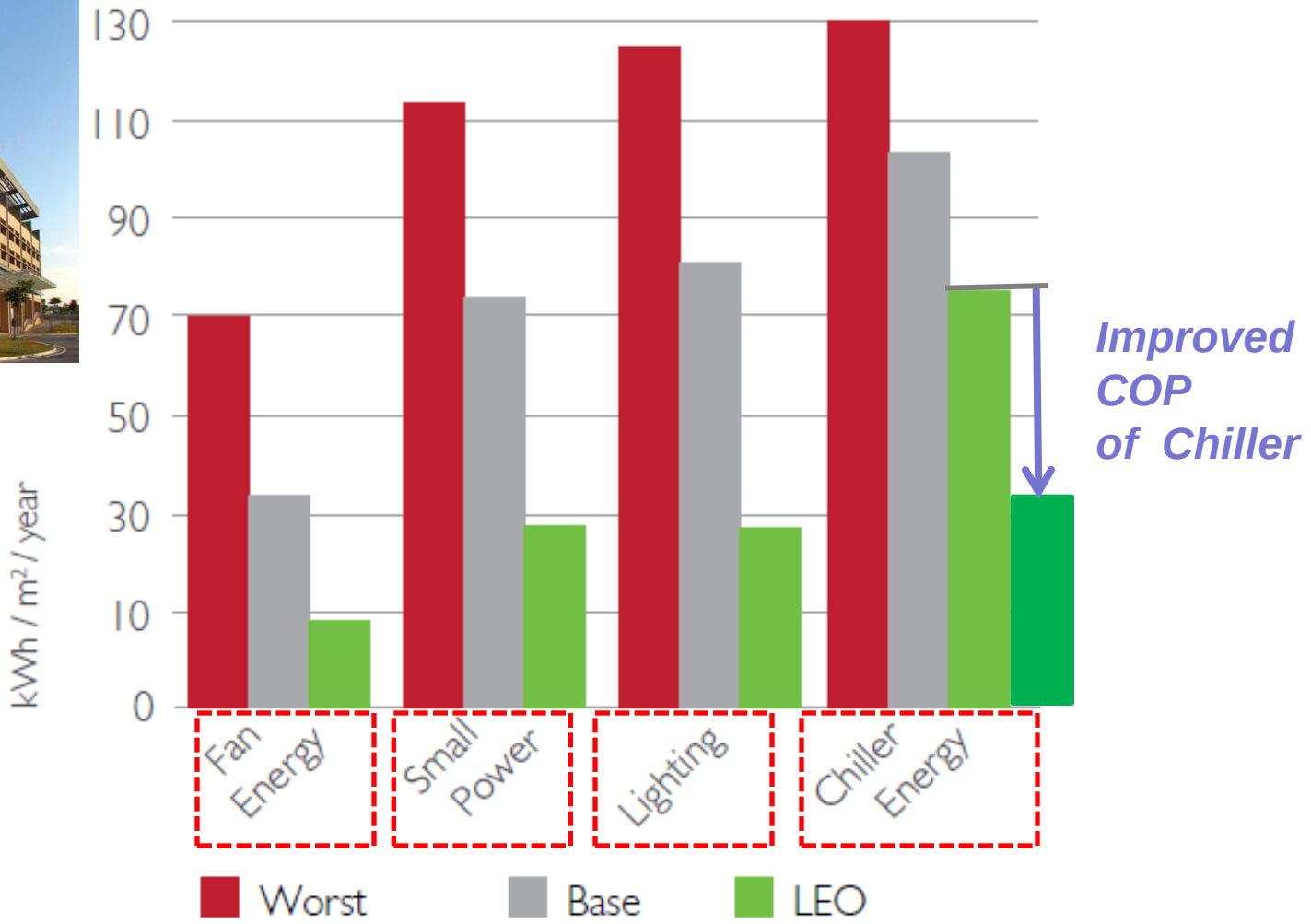
Reduce Internal Electricity Consumption
and thereby **Reduce Chiller Energy** also

LEO Building in Malaysia
District Cooling



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Energy Efficient Ventilation

Optimization of the LEO Building

70 kWh/m^{2}year : Base Case

35 kWh/m^{2}year

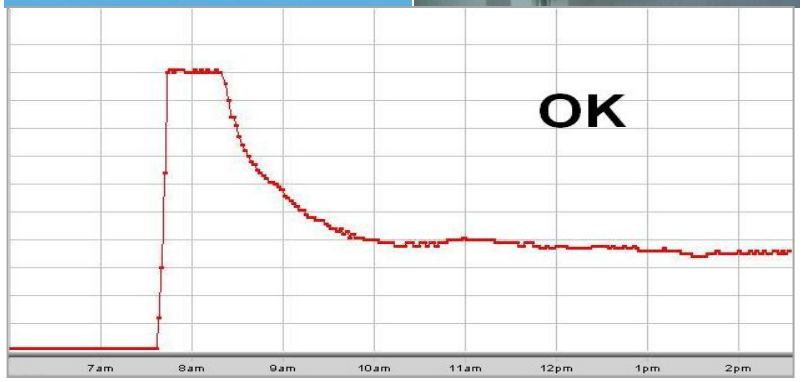
Increase of Duct size

20 kWh/m^{2}year

Energy Efficient Fans and Motors

7 kWh/m^{2}year

Variable Speed of Fan (VSD)



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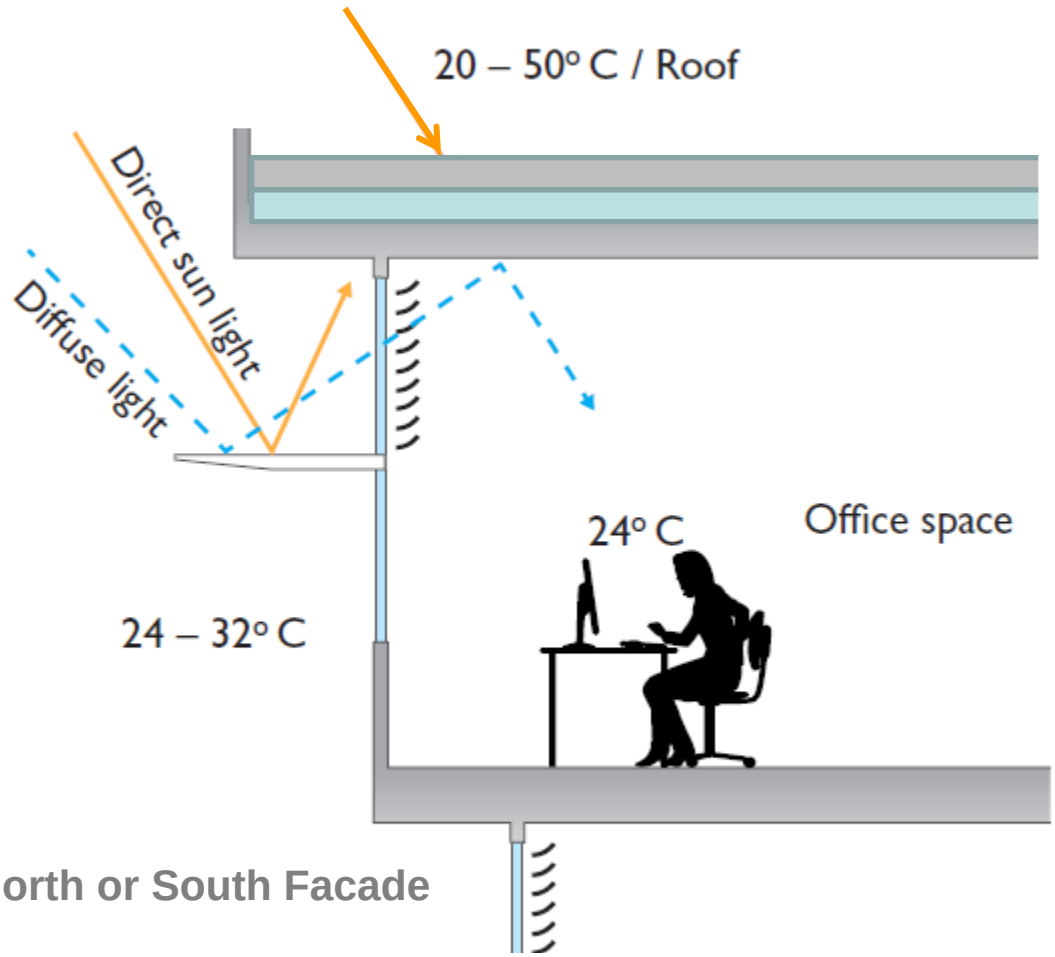
Daylight Optimized Architecture In the Tropics

(ZEO Building in Malaysia, IEN Consultants)



- **Thermal Insulation in Roof** (100mm)
- **Glare Protection** : Fixed Blinds
- **Shading and light redirection**
  Exterior Light Shelf

Offices are 98 % Daylit During Daytime 8.00 – 18.00

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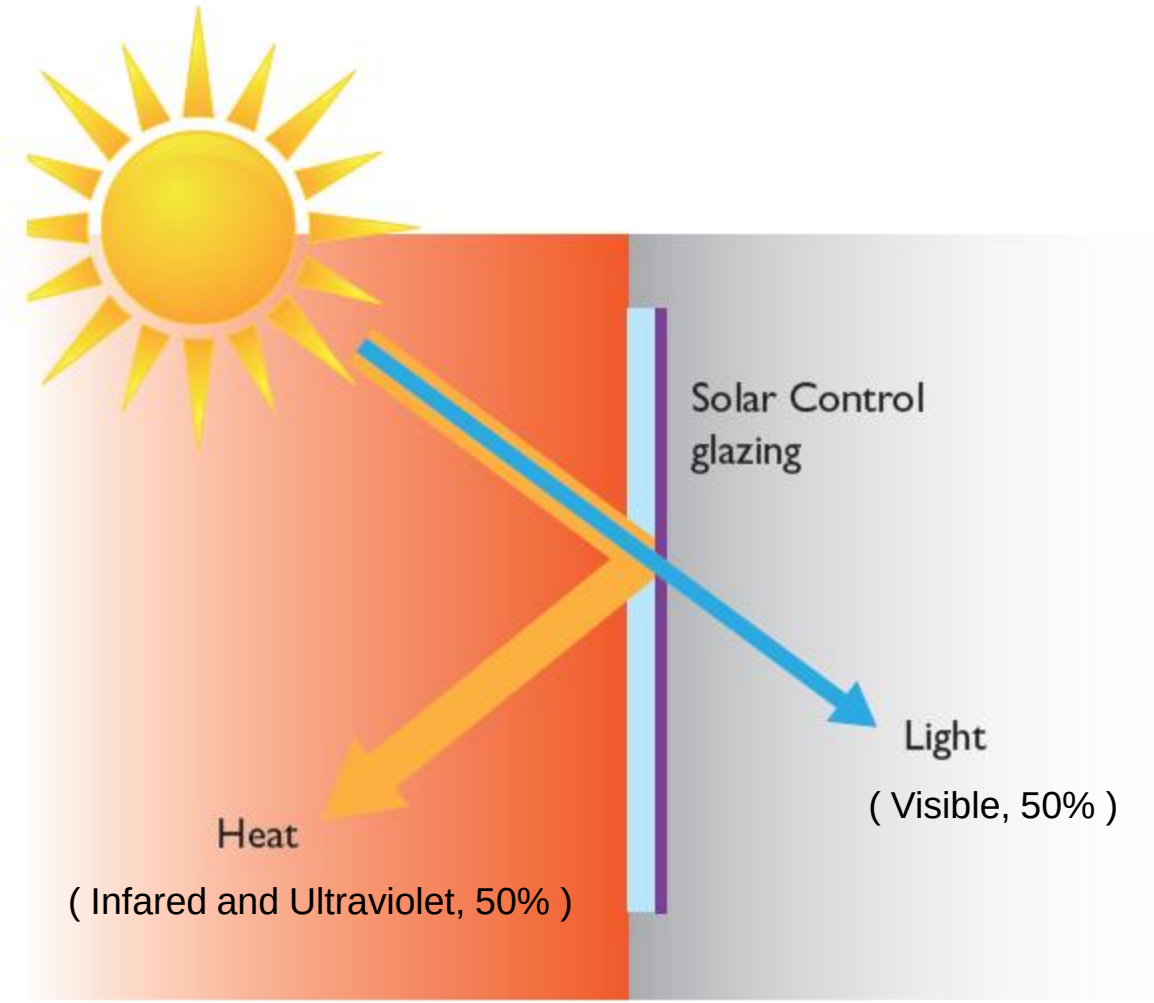
Spectrally Selective Glazing is Optimal in the Tropics



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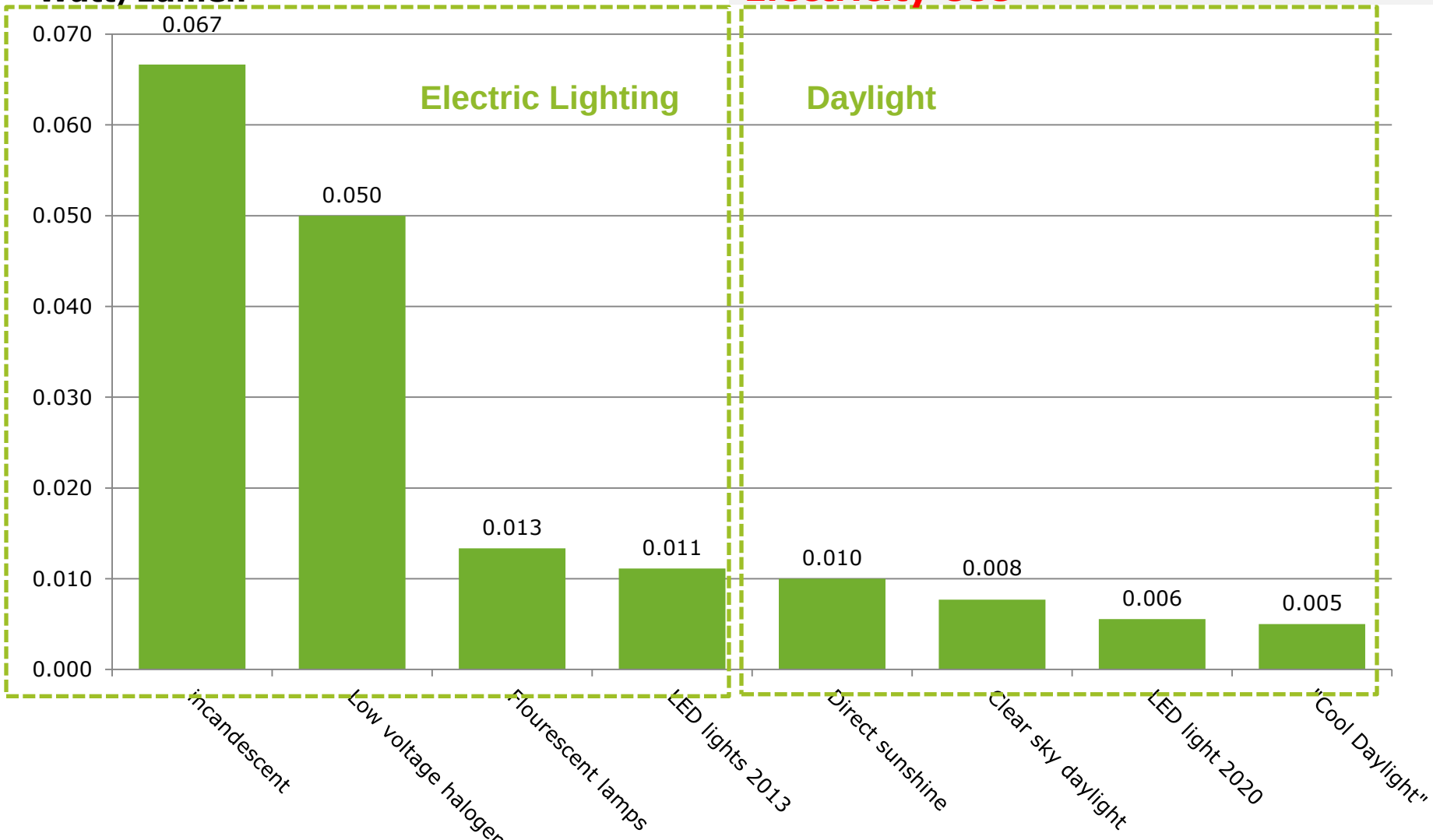
Energy Efficient Lighting

More light for Less Heat and Electricity Use



Daylight is the best and cheapest

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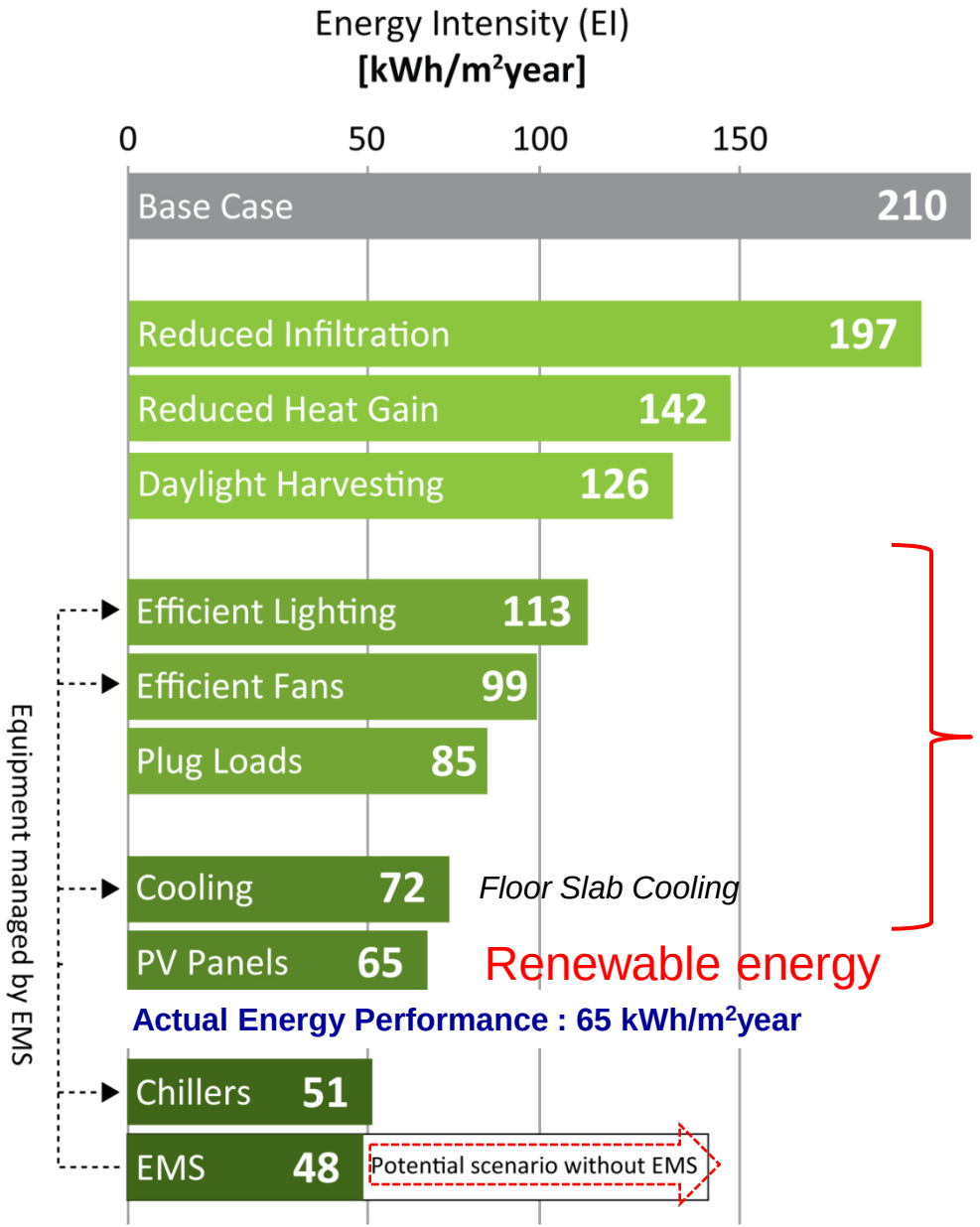
Energy Optimization of the Diamond Building in Malaysia



”Passive Design”

”Active Design”

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Economic feasibility of EE Buildings

KL Eco City in Kuala Lumpur
IEN Consultants Sdn Bhd

- LEO Building : 50% savings, 5% extra costs
- GEO Building (experimental) : 85% savings, 25% extra costs
- Diamond Building : 65% savings, 4% extra Costs,

- **KL Eco City Office Tower 3 (2013**) : 50% savings, 3% extra costs

  New, not included in the Energy Policy Toolkit

KL Eco City, Office Tower 3 for the KL City Council (DBKL)

- Energy Index : 105 kWh/m^{2}year against normal 210 kWh/m^{2}year (50% down)
- Extra Costs for Double Solar Control Glazing : 1.2 million US$
- Consequential Cost Savings on Chiller Investment : 0.58 million US$

- *Integrated Energy Design reduces extra costs and improves economic feasibility*

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Key points

- The potential for energy efficiency in new buildings is
  - *Huge* and its realisation is
  - *Cost efficient*

- However, market failures such as split incentives mean that many new buildings are built with poor energy performance…
- Therefore regulation and effective implementation and enforcement is crucial and spurs innovation.

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Thank you for your attention

Learn more at www.ens.dk/lctu

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