

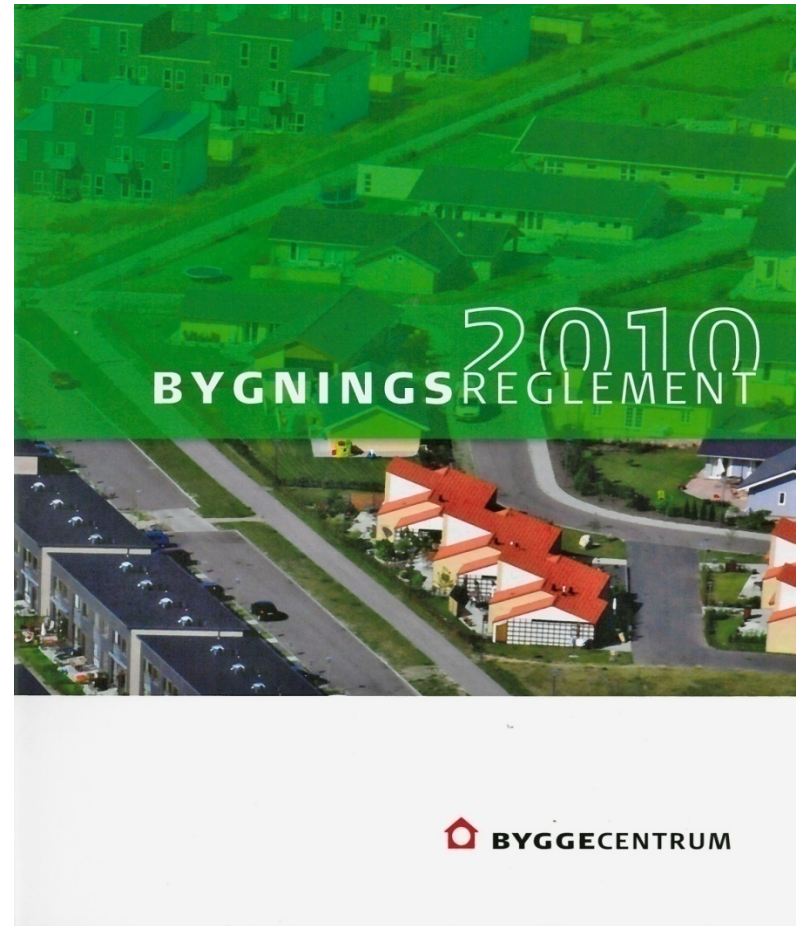
Energy requirements Building regulations



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Energy requirements for buildings

- Implemented through Danish Building Code



EPBD
Dir. 2010/31

- Method
- Requirements for energy performance of buildings
- Cost-optimal
- New buildings
- Existing buildings
- Technical systems
- NZEB



Building Regulations

- Energy Frames for new buildings
- Change of use and extensions
- Conversion and other alterations to the building and replacement of boilers etc
- Holiday Homes
- Minimum thermal insulation
- Minimum requirements to individual services

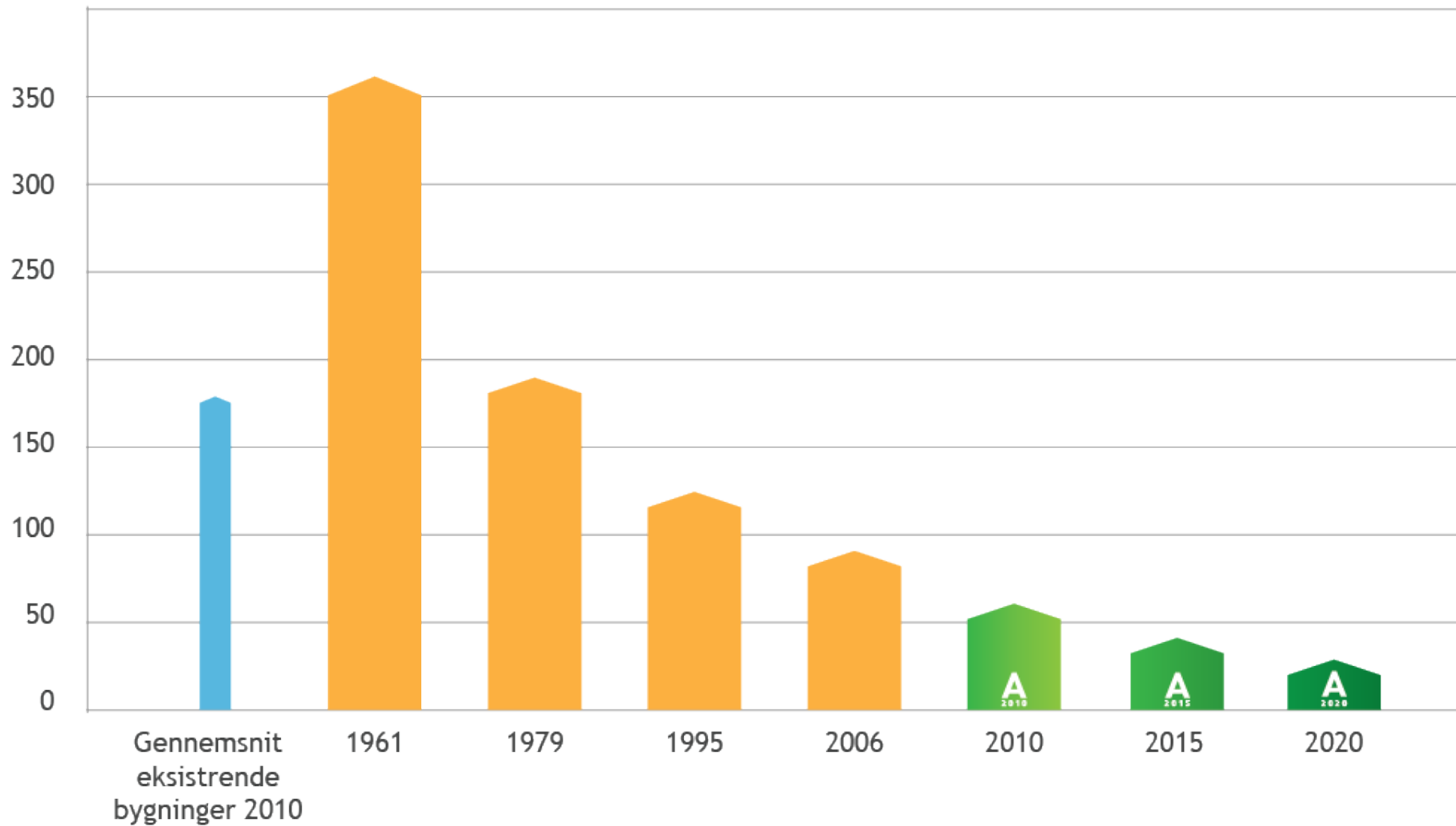
Building code contains future requirements

- LowEnergy Class 2015 has been part of Building Code since 2006
- Building Class 2020 since 2011

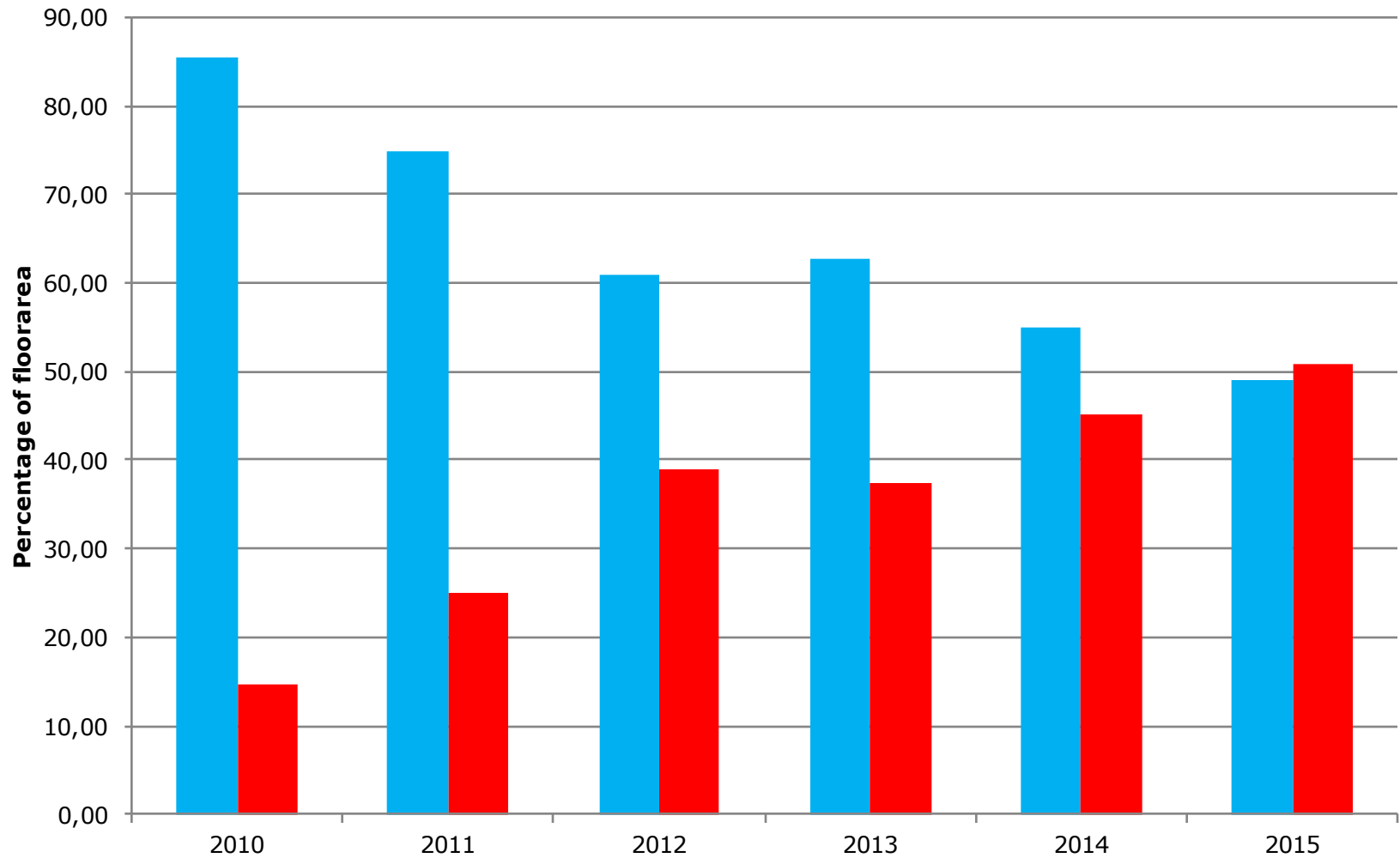
- Spurs innovation
- Gives companies an opportunity to build according to future requirements
- Lowers price of the future requirements

Bygningsreglementets krav til enfamiliehuse, 1961-2020

kWh pr. m²
boligareal



Lowenergy buildings (red) vs normal buildings (blue)



Energy Frames – General rules

- Air tightness – Blower Door
- Transmission losses
- Primary Energy Factors
- Thermal indoor climate

Energy calculation in BE10

The screenshot shows the BE10 software interface for energy calculation. The window title is "Green Lighthouse - Hovedprojekt - As build _ COP 1_32.xml - Be10". The menu bar includes File, Edit, View, and Help. The toolbar contains various icons for file operations and calculation settings. The main window is divided into several sections:

- Left Panel:** A tree view showing the project structure: Green Lighthouse, Building envelope, Ventilation, Internal heat supply, Lighting, Other el. consumption, Mechanical cooling, Heat distribution plant, Domestic hot water, Supply, and Results.
- Building Section:**
 - Name: Green Lighthouse
 - Other (dropdown): Detached house (detached single-family house), Semi-detached and nondetached houses, Multi-storey house, Store etc or Other (non-residential)
 - 1 Number of residential units, 0 Rotation, deg.
 - 950 Heated floor area, m², 0 Other, m²
 - 120 Heat capacity, Wh/K m², Start at, End at (time)
 - 45 Normal usage time, hours/week, 8, 17
- Heat supply Section:**
 - District (dropdown): Basis: Boiler, District heating, Block heating or Electricity
 - Heat distribution plant (if electric heating)
 - Contribution from (in order of priority):
 - 1. Electric panels 2. Wood stoves, gas radiators etc.
 - 3. Solar heat 4. Heat pump 5. Solar cells 6. Wind mills
- Total heat loss Section:**
 - Transmission loss 9,1 kW 9,5 W/m²
 - Ventilation loss without HRV 23,2 kW 24,4 W/m² (in winter)
 - Total 32,3 kW 34,0 W/m²
 - Ventilation loss with HRV 3,5 kW 3,7 W/m² (in winter)
 - Total 12,5 kW 13,2 W/m²
- Calculation rules Section:**
 - BR: Actual (dropdown) See calculation guide
 - Supplement to energy frame for special conditions, kWh/m² year: 0
 - (Only possible for other than residential buildings and calculation rules: BR: Actual conditions)
- Mechanical cooling Section:**
 - 0 Share of floor area, -
 - Description (button)
 - Comments (button)
- Transmission loss Section:**
 - For building envelope excl. windows and doors
 - 2,9 W/m²

At the bottom, a status bar displays the following error message: "STEP error: C:\Users\NVG\Desktop\Green Lighthouse - Hovedp Energy requirement 40,7 kWh/m² year. Energy frame BR 2010: 73,0 Low energy 2015: 42,1 Buildings 20; NUM

Key numbers

Be10 Green Lighthouse - Hovedprojekt - As build _ COP 1_32.xml - Be10

File Edit View Help

SBI Direction 213: Energy demand of buildings, Be10

Green Lighthouse

- Building envelope
- Ventilation
- Internal heat supply
- Lighting
- Other el. consumption
- Mechanical cooling
- Heat distribution plant
- Domestic hot water
- Supply
- Results
 - Key numbers
 - Heating requirement

Key numbers, kWh/m² year

Energy frame in BR 2010

Without supplement	Supplement for special conditions	Total energy frame
73,0	0,0	73,0
Total energy requirement		40,7

Energy frame low energy buildings 2015

Without supplement	Supplement for special conditions	Total energy frame
42,1	0,0	42,1
Total energy requirement		40,6

Energy frame Buildings 2020

Without supplement	Supplement for special conditions	Total energy frame
25,0	0,0	25,0
Total energy requirement		29,6

Contribution to energy requirement

Heat	0,3
El. for operation of building	15,6
Excessive in rooms	1,3

Net requirement

Room heating	14,3
Domestic hot water	4,3
Cooling	0,0

Selected electricity requirements

Lighting	2,9
Heating of rooms	0,0
Heating of DHW	0,0
Heat pump	10,7
Ventilators	1,2
Pumps	0,8
Cooling	0,0
Total el. consumption	24,3

Heat loss from installations

Room heating	0,0
Domestic hot water	1,6

Output from special sources

Solar heat	4,5
Heat pump	14,0
Solar cells	0,0
Wind mills	0,0

STEP error: C:\Users\NVG\Desktop\Green Lighthouse - Hovedp Energy requirement 40,7 kWh/m² year. Energy frame BR 2010: 73,0 Low energy 2015: 42,1 Buildings 2020: 29,6

NUM

Energy Frame for homes, dorms, hotels etc

- $(52,5 + 1650/A)$ kWh/m² per year

Energy Frame for offices, schools, institutions

- $(71,3 + 1650/A)$ kWh/m² per year
- For building with high demand for lighting, ventilation or similar, the energy frame is augmented

Low Energy Class 2015

- For dwellings: $(30+1000/A)$ kWh/m² per year
- For other buildings: $(41+1000/A)$ kWh/m² per year
- Stricter demands for air tightness, thermal comfort

Building Class 2020

- For dwellings: 20 kWh/m² per year
- For other buildings: 25 kWh/m² per year
- Stricter demands for air tightness, thermal comfort, CO₂ in some rooms, windows, daylight, heat recovery

Change of use and extensions

- "Change of use" means use for a different purpose that involves significantly higher energy consumption. Examples are:
 - conversion of an unheated building for accommodation.
 - conversion of useable roof space for accommodation
- List of U-values to be followed
- 22% rule – heat loss framework

Conversion and other alterations to the building and replacement of boilers etc.

- Cost-efficient measures should be applied
- List of measures that normally is cost-efficient is included in an appendix
- If building components are replaced completely, they should live up to the demands for new construction

Minimum thermal insulation

- A list of minimum acceptable constructions

Table of U values	U value W/m ² K
External walls and basement walls in contact with the soil.	0.30
Suspended upper floors and partitions to rooms/spaces that are unheated or heated to a temperature more than 8 K lower than the temperature in the room/space concerned.	0.40
Ground slabs, basement floors in contact with the soil and suspended upper floors above open air or a ventilated crawl space.	0.20
Suspended floors below floors with underfloor heating adjoining heated rooms/spaces.	0.50
Ceiling and roof structures, including jamb walls, flat roofs and sloping walls directly adjoining the roof.	0.20
External doors, rooflights, doors and hatches to the outside or to rooms/spaces that are unheated and these as well as glass walls and windows to rooms that are heated to a temperature more than 5 K below the temperature in the room concerned.	1.80

Windows

- Eref (energy balance of reference window)
- Energy balance contains information on U_w -value and g_w -value

New Building Regulations 2015

- Low Energy Class 2015 will be minimum requirements
- Energy frames for existing buildings
- Ecodesign will replace certain danish requirements
- Remove requirements for surface temperature of windows
- Tightening of energy requirements for windows
- Renewable energy in energy frame