



# Examples on Zero Energy Building Codes

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# Zero Energy Buildings

- On longer term new buildings should use no energy
- But what is a zero energy building ?
- It seems a simple question, but in fact the answer is more complicated.
- A first answer would be:

***A (net) zero energy building is a building that can provide a normal indoor comfort and still use no energy, meaning that over time it produces as much (renewable) energy as it needs.***

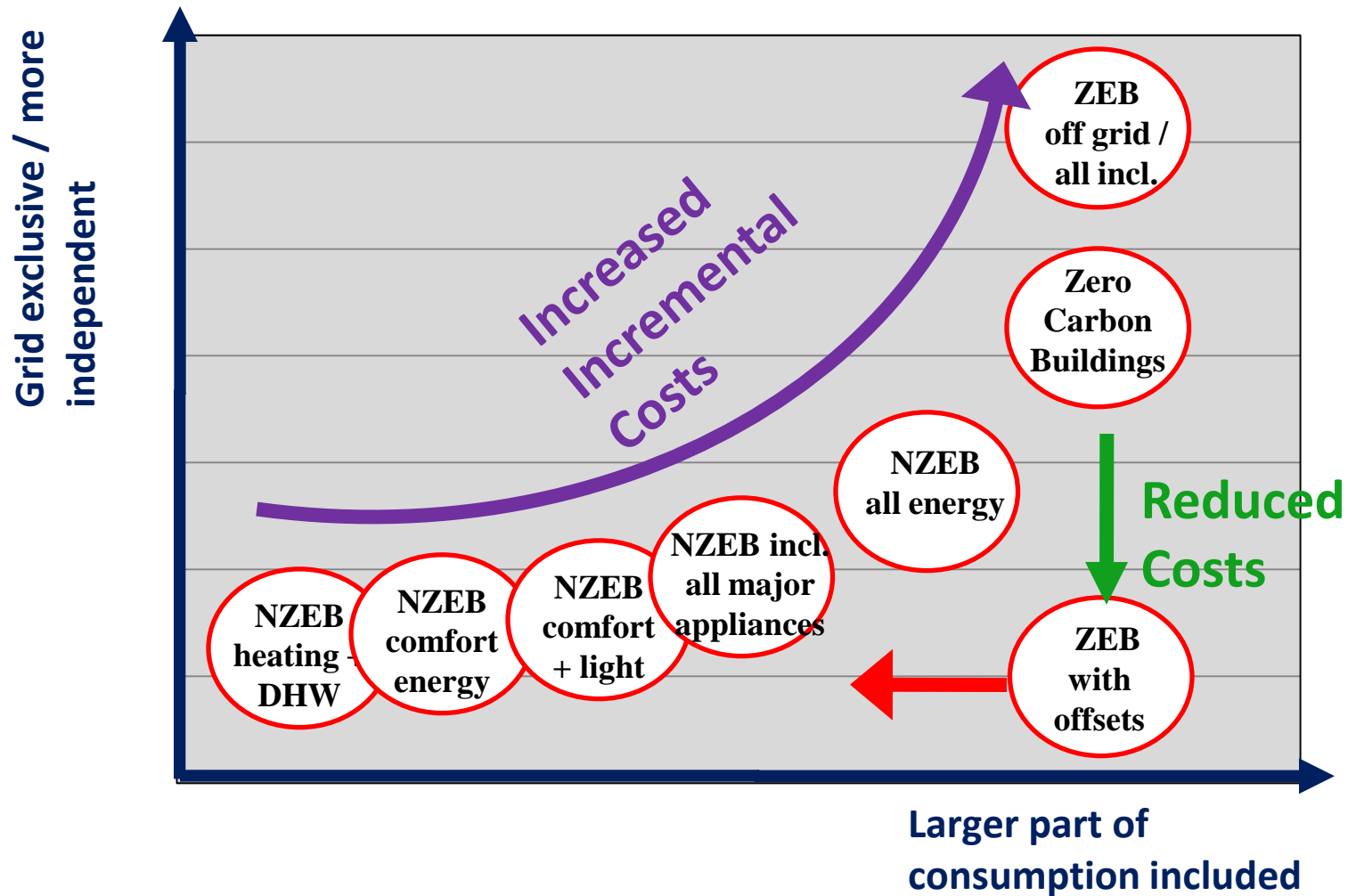


# Definition Zero Energy Buildings

Still some questions are open:

- What are the comfort criteria's ?
- What is included in consumption ?
  - Heating, cooling, ventilation, dehumidification, appliances and devices ?
- What are accepted as energy production ?
  - Renewable energy integrated in building ? On land ? On distance and what sources ?
- How much can it use grids ? Off grid ? Storage ?
- What about heat and electricity ?
  - Balance for each or factor ? Carbon or price ?
- Costs and options highly depends on these questions !
- Don't want to go in detail, but will show one graph:

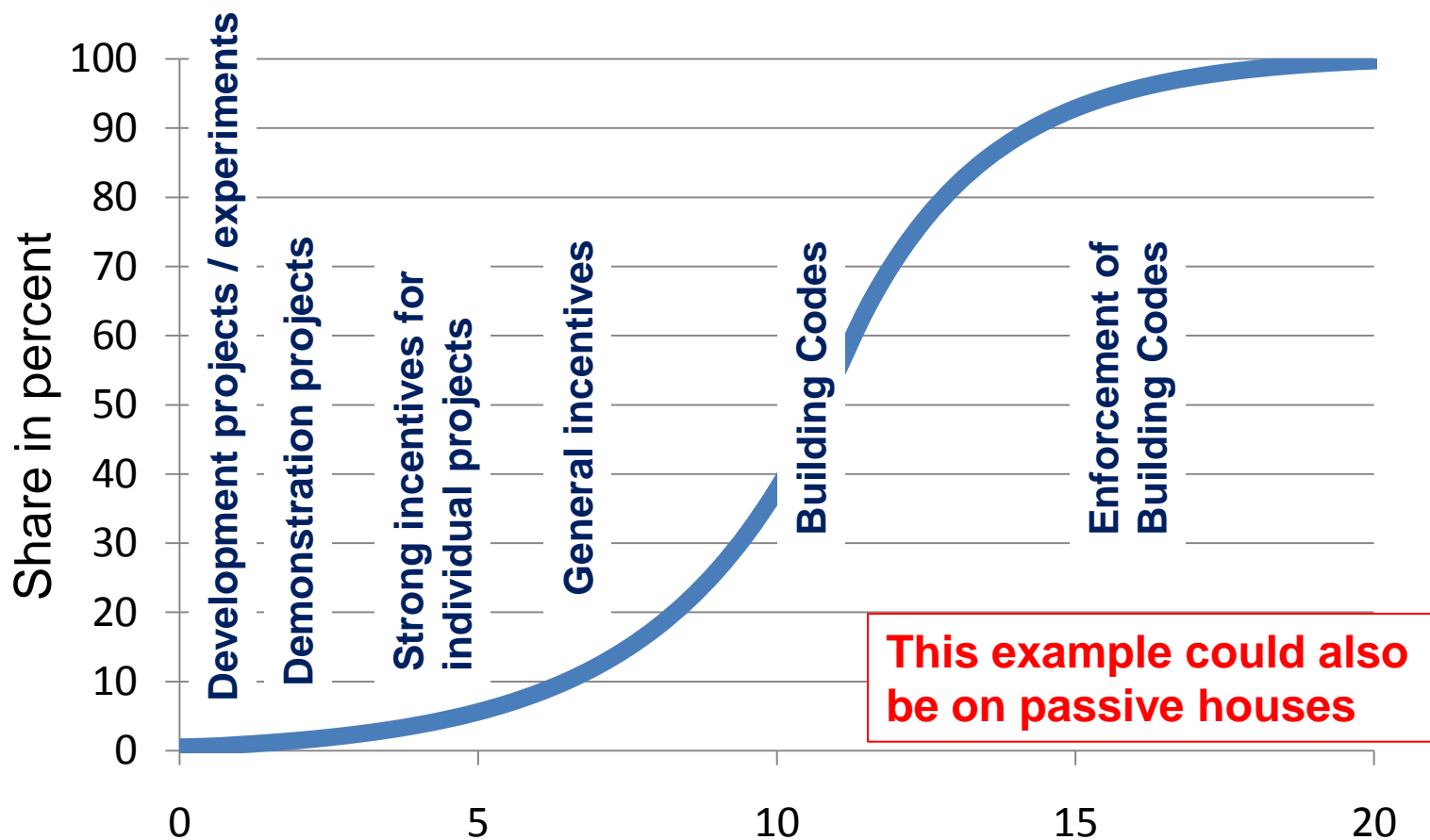
# Costs of Zero Energy Buildings



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# Market Penetration for ZEB's

## Policies to develop ZEB



*Implementation of EE in buildings takes time !*

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# Using Progressive Building Codes

## The other way to market penetration.

Some countries have set zero targets for building codes:

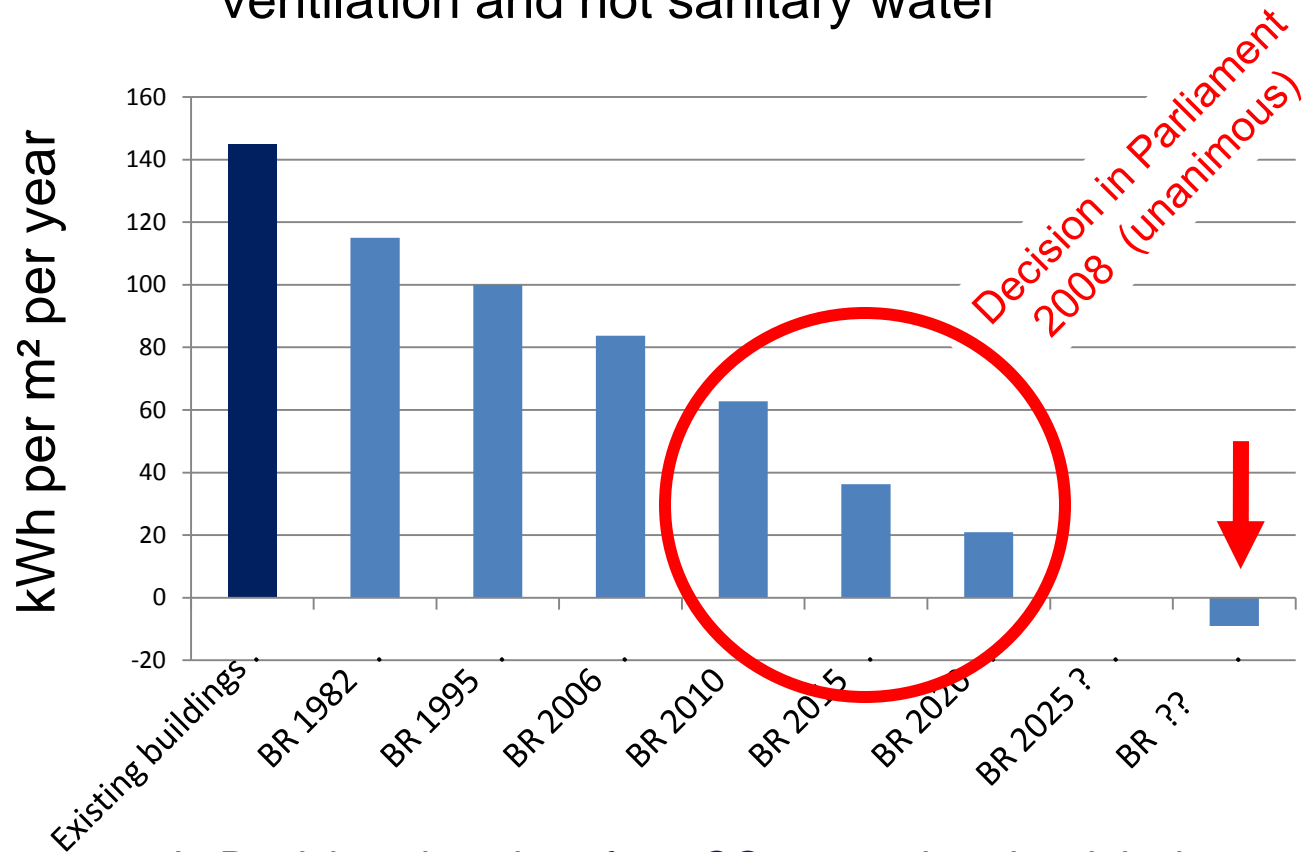
- Denmark: all new buildings must be plus energy plus strict reductions of consumption
- France: all building public buildings plus in 2020
- UK: residential buildings zero carbon in 2016 and commercial / public buildings in 2018/19
- European Union: all building codes must be close to zero in 2020 (EPBD directive)
- California energy commission: residential buildings zero in 2020 and commercial in 2030

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# Danish Building Codes

Gross energy including heating, cooling, ventilation and hot sanitary water

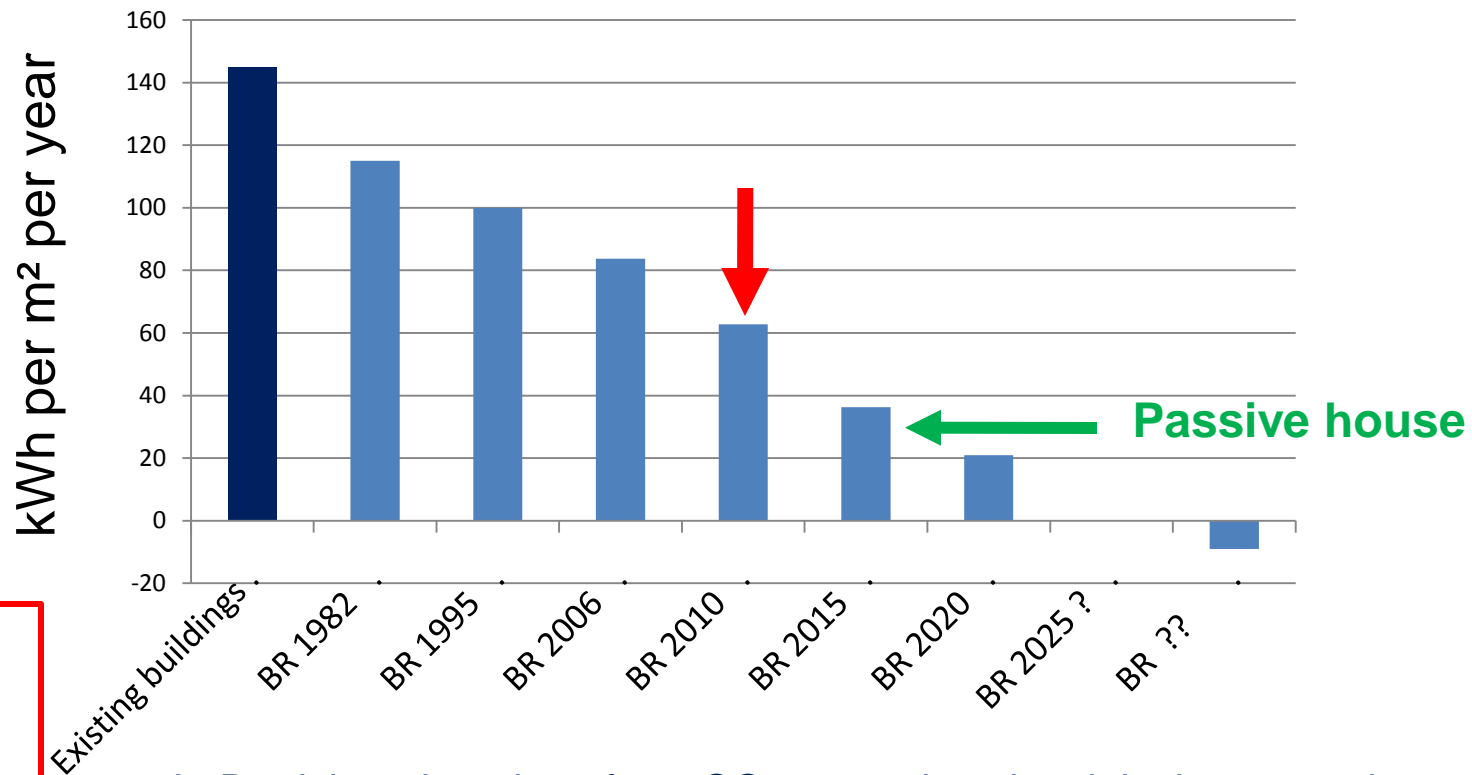


In Danish action plans for a CO<sub>2</sub> neutral society it is the target that all building will be positive in the future (year still to be decided)



# Danish Building Codes

Gross energy including heating, cooling, ventilation and hot sanitary water



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Danish Building Code 2010 - probably highest EE demands in the world

In Danish action plans for a CO<sub>2</sub> neutral society it is the target that all building will be positive in the future (year still to be decided)



# Costs for improvements of building codes

- Danish Building Research Institute calculated additional costs by reduction by 25 % in 2010 to be around 5%.
- Reduction by 50 % would have additional 10 % construction cost.
- Over few years these additional costs will drop to 3 % versus 6 %.
- Simple calculations based on these examples shows that both the improvement of building codes in 2010 and a further reduction 2015 are cost neutral for uses and owners of new buildings as such.
- These improvements have no costs or negative costs seen over 30 year lifetime – even without a basic change of design which would be natural with such strong demands.
- If design is changed costs go further down.
- Similar calculations in France show that a 50 % reduction of energy consumption in building codes can be obtained in 2013 with negative costs for owners and users if based on performance.

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# Conclusion

- There is need to work further with definitions on zero energy.
- Close to zero energy and zero energy ready.
- Passive design and zero energy buildings play central role in the work to realize the large potentials.
- In particular if we want to keep costs low.
- Such buildings must be supported by active policies.
- Innovative building code is a central policy.
- The whole European Union is on this track.
- Individual countries show the way.

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