



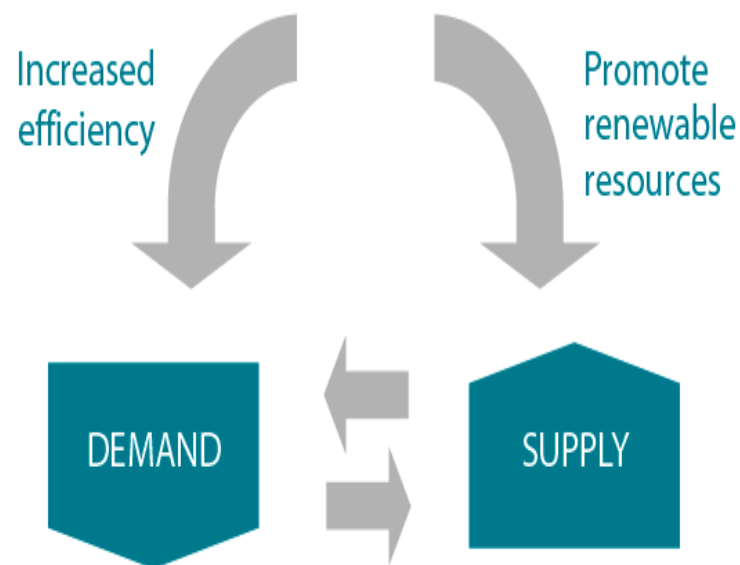
*Global Building Performance Network Webinar:  
Getting the Building Codes right: The importance of long-term  
energy targets and frequent revision cycles  
Wednesday 13<sup>th</sup> November 2013*

*The Ireland experience – drivers, experiences, achievements*

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Head of Low Carbon Technologies

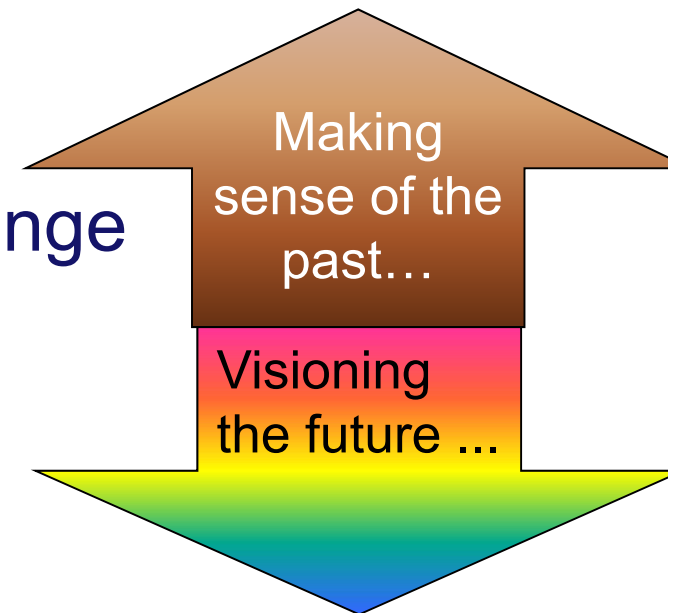
## SEAI Mission...

**...To play a leading role in transforming Ireland to a society based on sustainable energy structures, technologies and practices**



# Overview

- Evolution of Ireland's building energy performance standards
  - Process of target setting
  - Factors influencing the pace of change
  - Trends in energy use
  - Future directions?
- 
- Mainly housing sector – also need for non-domestic
  - Enforcement challenge
  - Skills challenge



# Chronology of energy & Irish buildings: Some milestones

Pre-1950s	Heavy masonry buildings. Natural ventilation. Lo glazing . Solid fuel heating.
1950s	First heavily glazed buildings, air conditioning, central heating
1960s	“System built” developments, variable insulation, hi glazing, computer suites
1973-74	First oil price crisis. Serious cost, comfort, condensation problems
1974 -76	Chimney requirement for housing. <b>Elementary insulation introduced</b>
1979-82	Second oil price crisis. <b>Modest insulation</b> . National programmes commence
1980s	Solid fuel dominates housing. Oil dominates non-housing.
1986-89	Oil price collapse. EU env. directives. Environmental (smoke, SO2) concerns
1985 +	BGE takes over natural gas supply. Major market penetration begins
1990-date	EU funded housing energy projects, appliance energy labelling directives
1992	<b>Building Regs in place (updated 1997, 2002). Insulation, ventilation, appliances</b>
1991 +	Nearly all new housing centrally heated. More EU directives
1994	Irish Energy Centre established. Timber frame construction begins growth
1995 - 2000	Local energy agencies. Kyoto Protocol. Green Paper. Climate Change Strategy
2000 - 02	CER & SEAI established. “House of Tomorrow” demo & “Warmer Homes” scher
2005	EU Emissions Trading. Full electricity market opening
2006-10	<b>EU EPBD – compulsory energy rating @sale/ rental. Grants for RE systems.</b>
2008-9	<b>Energy standards for housing up 40% (2008) and 60% (2011) with RE obligatio</b>
2006+	<b>Energy standards for all buildings. Accelerated capital allowances. EE retrofit programmes for housing and other sectors</b>

# Background: pre 1990s

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- Hierarchy: Safety > Health > Comfort > Economy
- Pre 1970s:
  - By laws – fire, light, sanitation
- 1970s
  - 1976 First Draft Building Regulations published
  - 1976 First thermal insulation standards for social housing
  - 1978 Brown paper on energy policy – limited reference to ‘conservation’
  - 1979 First thermal insulation standards for almost all housing
- 1980s
  - 1981 study recommended a performance target approach
  - 1982 Thermal insulation standards strengthened for housing
  - 1980s Thermal insulation standards for non-domestic buildings
  - 1980s Public authorities set thermal insulation standards for schools etc.

# 40 years of evolution

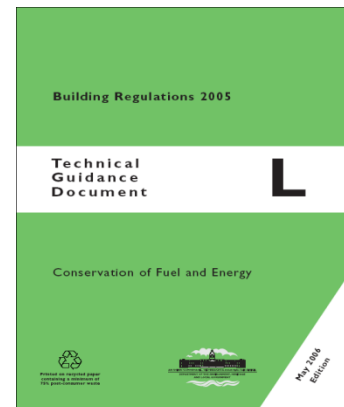
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- 1960s- 70s: Building boom, Culture and awareness, solid fuel, chimneys
  - First energy policy paper, first Minister for Energy
- 1980s: initial flurry, grants schemes, recession, activity and awareness receded
  - Smoke control legislation, natural gas infrastructure
- 1990s:
  - Building Regulations 1992, revised 1997 (energy rating optional method): first **TARGET** based approach
  - NCCS, Green Paper on Sustainable Energy, new agency
  - Fuel poverty starting to be addressed
- 2000s: Impetus
  - Building Regs revisions 2002, 2006 (EPBD), 2008, 2011
  - Building Energy Rating
  - Grants schemes

# Building Regulations & TGD L 2008 and 2011: Conservation of Fuel and Energy

## HOUSING:

- Energy and Carbon performance targets (EPC and CPC)
- Reduction in energy consumption and CO<sub>2</sub> emissions by 60%
  - With 'backstop' U values
- New Renewable Energy requirement per m<sup>2</sup> – 10 kWh<sub>th</sub> / 4 kWh<sub>el</sub>
- New measures for limiting heat loss: thermal bridging, air permeability: <7 m<sup>3</sup>/m<sup>2</sup>/hr @ 50 Pa
- New measures for energy efficient space and water heating systems
- Minimum efficiency requirement for oil and gas boilers: seasonal efficiency ≥ 90%
- Home owners manual



# Building Regulations update 2008 and TGD L 2006: Non-Domestic

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- Standards broadly as per dwellings for:
  - Fabric heat loss (U values)
  - Thermal bridging
  - Air infiltration (but no mandatory air leakage testing)
  - Insulation of pipes, ducts & storage vessels
  - Boiler efficiency (but condensing not mandatory)
  - No mandatory RE contribution
- Specific additional provisions for non-domestic:
  - Avoiding solar overheating
  - Air conditioning and mechanical ventilation
  - Artificial lighting
- Update 2008 introduces NEAP calculation as new requirement:
  - **TARGETS**:  $EPC \leq 1$  and  $CPC \leq 1$ , i.e. same as “reference building”
  - Slower pace of change than for dwellings



# Format of Building Regulations

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- Performance targets:
  - Energy
  - Carbon
- ‘Backstop’ limits on aspects such as:
  - Elemental U values – F, R, W, G
  - Boiler efficiency
  - Air leakage
- Other aspects:
  - Hot water heating
  - Heating controls
  - Pipe and duct insulation
  - Lighting

# Building Energy Rating (BER): dwellings

**Building Energy Rating (BER)** DEAP Version X.Y

BER for the building detailed below is:

Name of House, Street Name One, Street Name Two, Town name One, Town Name Two, County name One, County name Two,

BER Number: XXXXXXXXX  
Date of Issue: Day Month Year  
Valid Until: Day Month Year  
BER Assessor No.: XXXX  
Assessor Company No.: XXXX

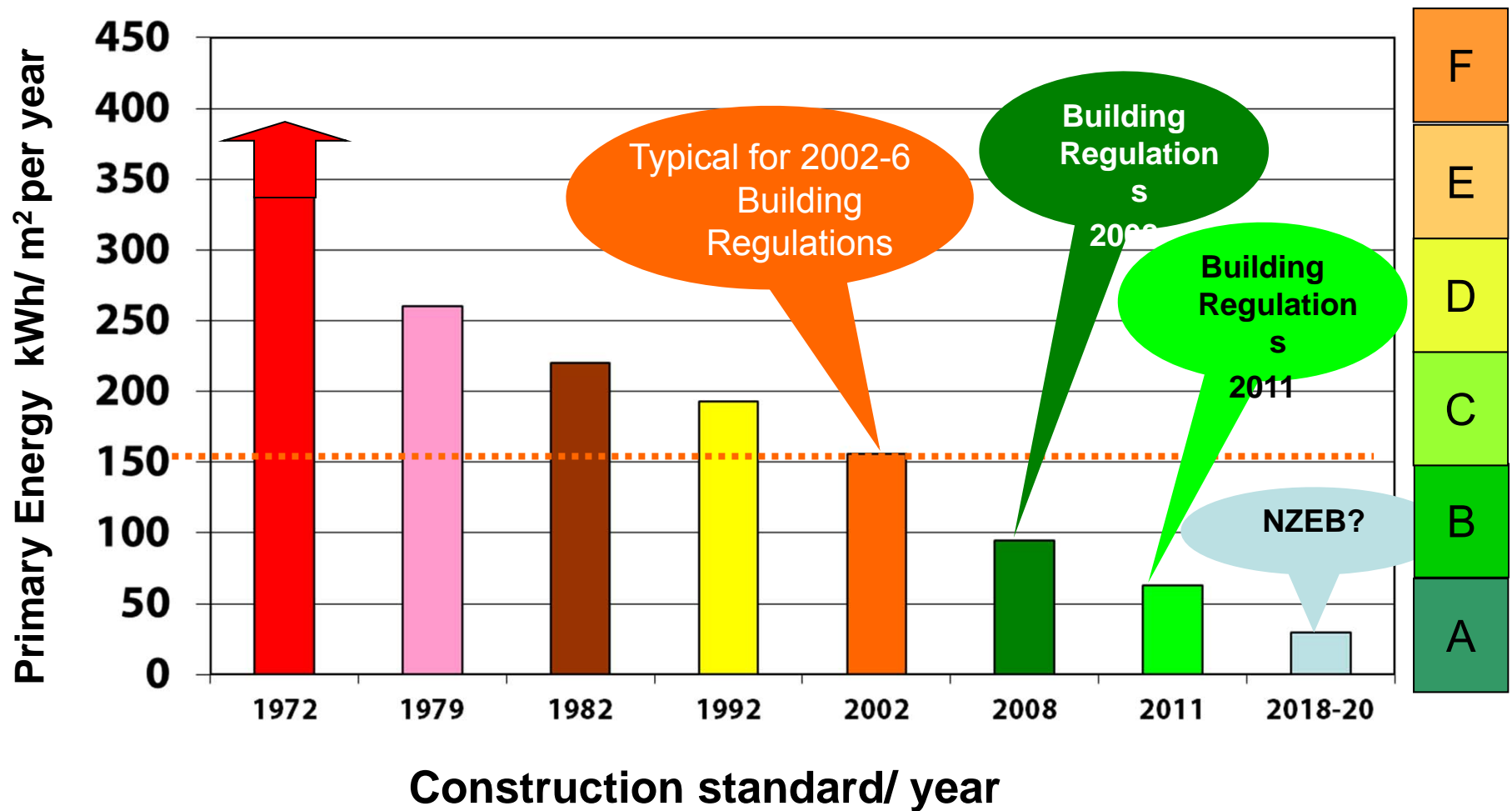
The Building Energy Rating (BER) is an indication of the energy performance of this dwelling. It covers energy use for space heating, water heating, ventilation and lighting, calculated on the basis of standard occupancy. It is expressed as primary energy use per unit floor area per year (kWh/m<sup>2</sup>/yr). 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

Building Energy Rating kWh/m <sup>2</sup> /yr	Carbon Dioxide (CO <sub>2</sub> ) Emissions Indicator kgCO <sub>2</sub> /m <sup>2</sup> /yr
<25 A1	BEST 0
>25 A2	
>50 A3	
>75 B1	
>100 B2	
>125 B3	
>150 C1	
>175 C2	
>200 C3	
>225 D1	
>260 D2	
>300 E1	
>340 E2	
>380 F	
>450 G	WORST >120

**IMPORTANT:** This BER is calculated on the basis of data provided to and by the BER Assessor, and using the version of the assessment software quoted above. A future BER assigned to this dwelling may be different, as a result of changes to the dwelling or to the assessment software.

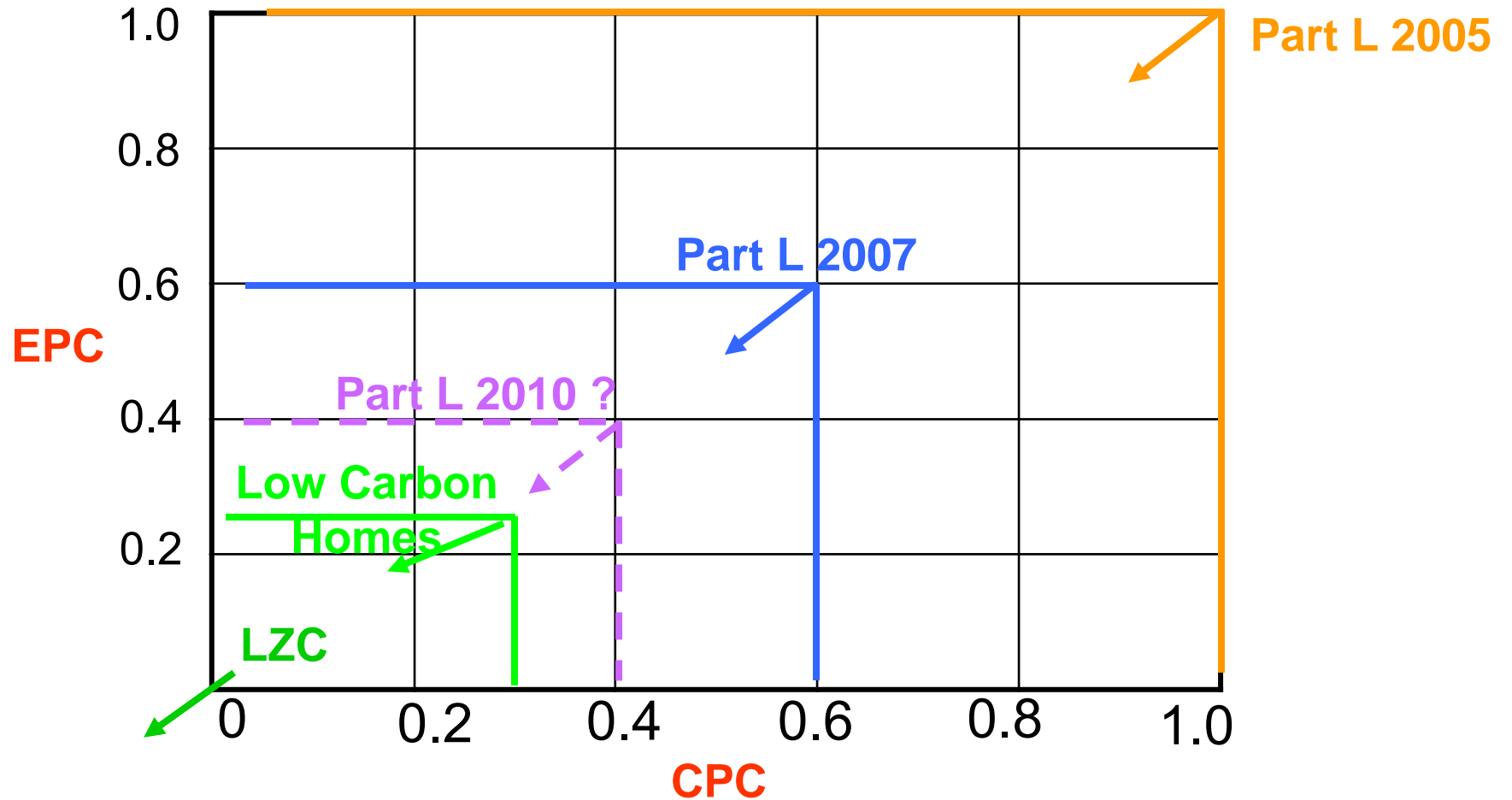
- Calculated using official method - DEAP
- BER relates to primary energy kWh/m<sup>2</sup>/y
- No minimum standard
- Linear scales – energy, CO<sub>2</sub>
- Must be produced by Registered BER Assessor
- Valid 10 years unless changes are made to building

# Nominal “energy rating” of newbuild Irish housing: indicative trends over four decades



NOTE: Based on original specification before energy efficiency upgrading

# The path to low/ zero carbon homes



# GBPN question 1

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- **What were the market conditions** at the time that targets were set and revisions were introduced?
  - Buoyant construction market conditions since mid 1990s
  - Industry innovation and confidence
  - Competition between masonry and timber frame systems on basis of energy performance differentiation – some industry players campaigning for higher standards
  - Internationalisation and technology change
  - Receptiveness to (rapid) change

## GBPN question 2

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- **Was it a struggle to get support from the market?**  
If so, how did you manage to get them on board?:
  - Much less struggle than in earlier decades
  - ‘Greening’ of societal attitudes
  - Demonstrating evidence for the market:
    - ‘House of Tomorrow’ scheme had 40% target
    - Commissioned studies on cost effectiveness
  - Competitive factions within the industry (timber frame vs masonry)
  - Receptiveness/ appetite for higher standards in building codes
    - Facilitated and motivated by introduction of Building Energy Rating
      - marketing benefit for newbuild (‘eco’ homes)
  - Consultation process
  - Roadshow events for builders/ developers
  - Growing debate on enforcement .....

## GPBN question 3

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- **What was the political context at the time?:**
  - Climate change and energy policy consensus
  - General ‘greening’ of societal attitudes
  - Growing confidence:
    - Within enterprise
    - Internationalisation influences
    - Within society in general
  - Willingness to lead (change from tradition of lagging)
  - National Development Plan 2006-12 and 2007-13 had significant sustainable energy elements
  - EU EPBD implementation – beyond compliance, seeking opportunity:
    - In standards in building codes
    - Building Energy Rating
  - Top down targets
  - Green Party in government 2007-11 (and wider cross-party consensus)

## GBPN question 4

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Was there **technical capacity** when the revisions were made or was significant upskilling required?

- Change was largely incremental, but still significant
- A degree of ‘learning by doing’ through House of Tomorrow (3000 homes) and Greener Homes RE grants schemes(30000 homes)
- Capacity of specifiers - hence courses and tools for architects and engineers
  - DEAP calculation methodology training courses – specifiers and BER Assessors
  - New tools – accredited construction details, air leakage testing
  - Product database – Heating Appliances Register of Performance (HARP)
- Capacity of builders – hence courses for builders – roadshows by Homebond (building insurance company)
- Capacity of trades/ installers – courses on RE installation
- Accredited courses by FETAC and FAS
- BUT still: Doubts about quality of site practice .....
- Demands for ongoing skills development
  - BUILDUP SKILLS initiative.....



# What else has driven rapid change in regulatory standards since 2000?

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- Growing policy coherence and consensus:
  - Green Paper on Sustainable Energy 1999
  - National Climate Change Strategy 2000 and 2007
  - EU Energy Performance in Buildings Directive – formalised 5 year review cycle
  - White Paper on Energy Policy 2007 – Energy **TARGETS**
- Political consensus
- Institutional trust and collaboration:
  - DECLG (construction policy), DCENR (energy policy), SEAI (new agency with remit to drive change)
- Evidence generation system:
  - Commissioned research
  - ‘House of Tomorrow’ programme
  - Regulatory Impact Assessment methodology

# Technologies being driven by new regulations

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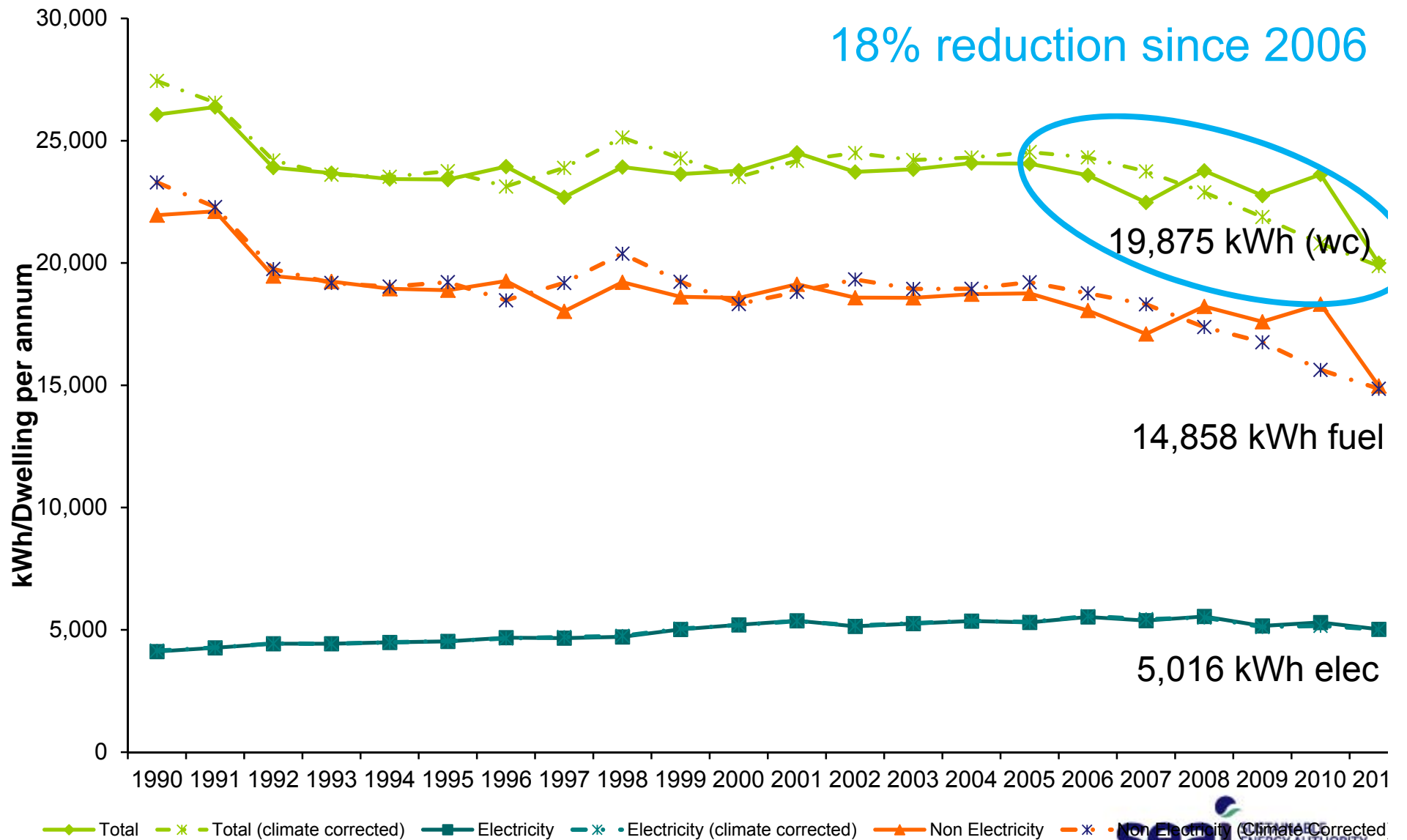
- Higher performance insulation materials
- Vapour barriers, draught sealing
- High performance windows
- Passive ventilation products, mechanical ventilation heat recovery, hybrid ventilation systems
- Smarter heating controls
- DHW insulated storage, heat exchangers
- Condensing boilers
- Solar water heating
- Biomass boilers
- Heat pumps
- Group heating for apartments, heat metering, heat exchangers
- Energy efficient lighting: lamps, luminaires, controls
- Comprehensive building systems/ offsite construction

## But: Enforcement?

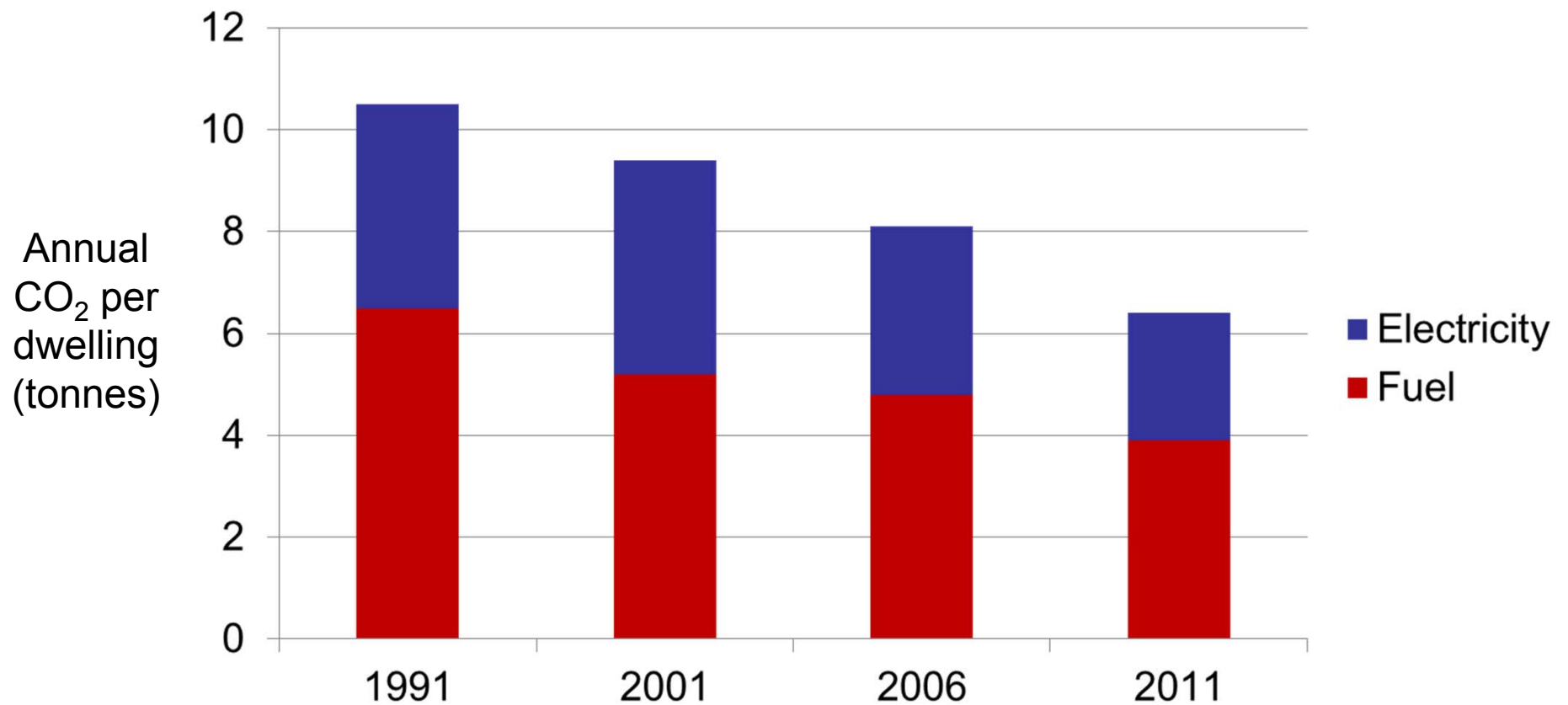
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- Building Control system
- Inspection system
- New system of 'audit chain' accountability

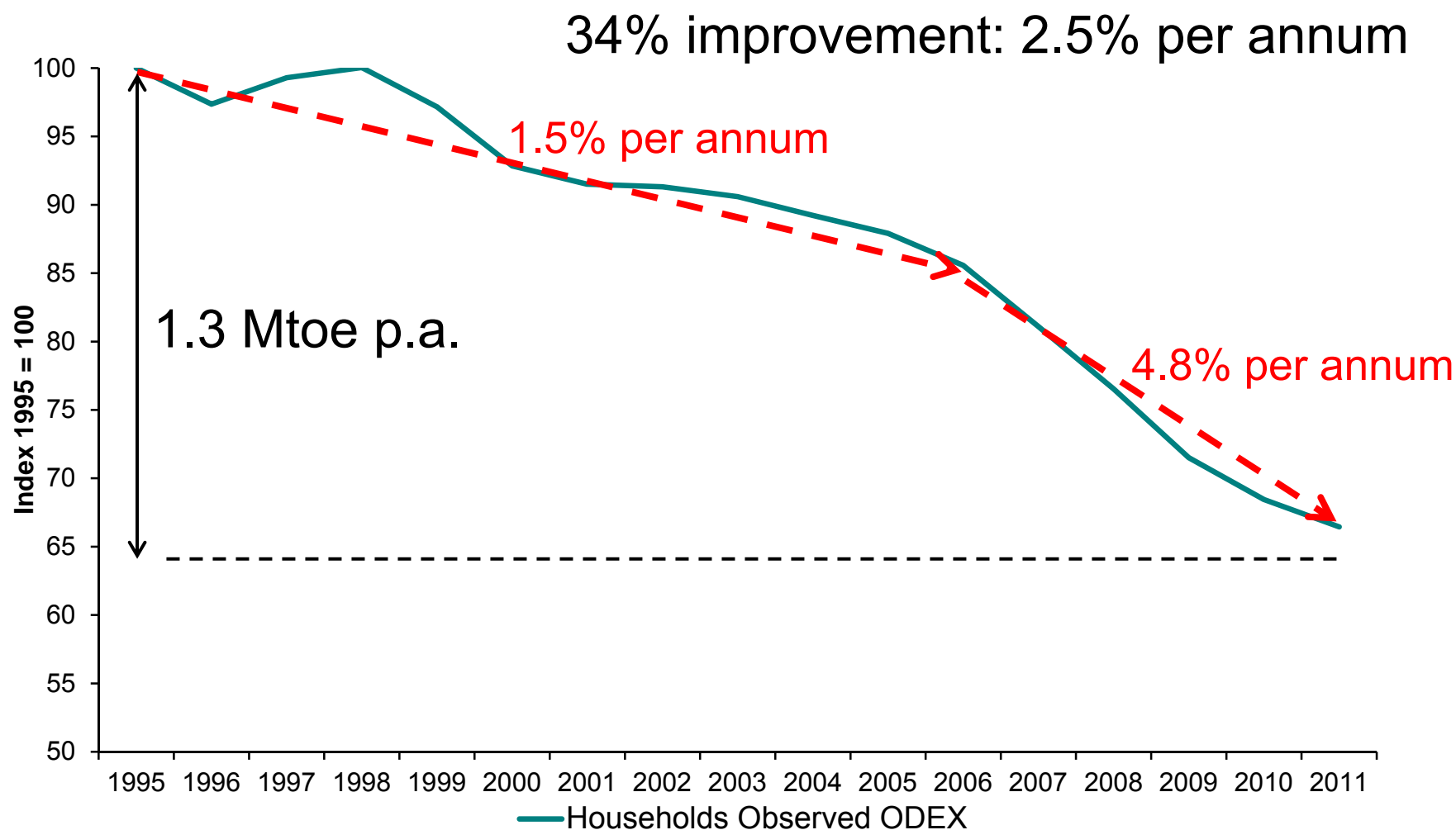
# Energy consumption per household 1990 - 2011



# CO<sub>2</sub> emissions trends: Average per dwelling in total housing stock

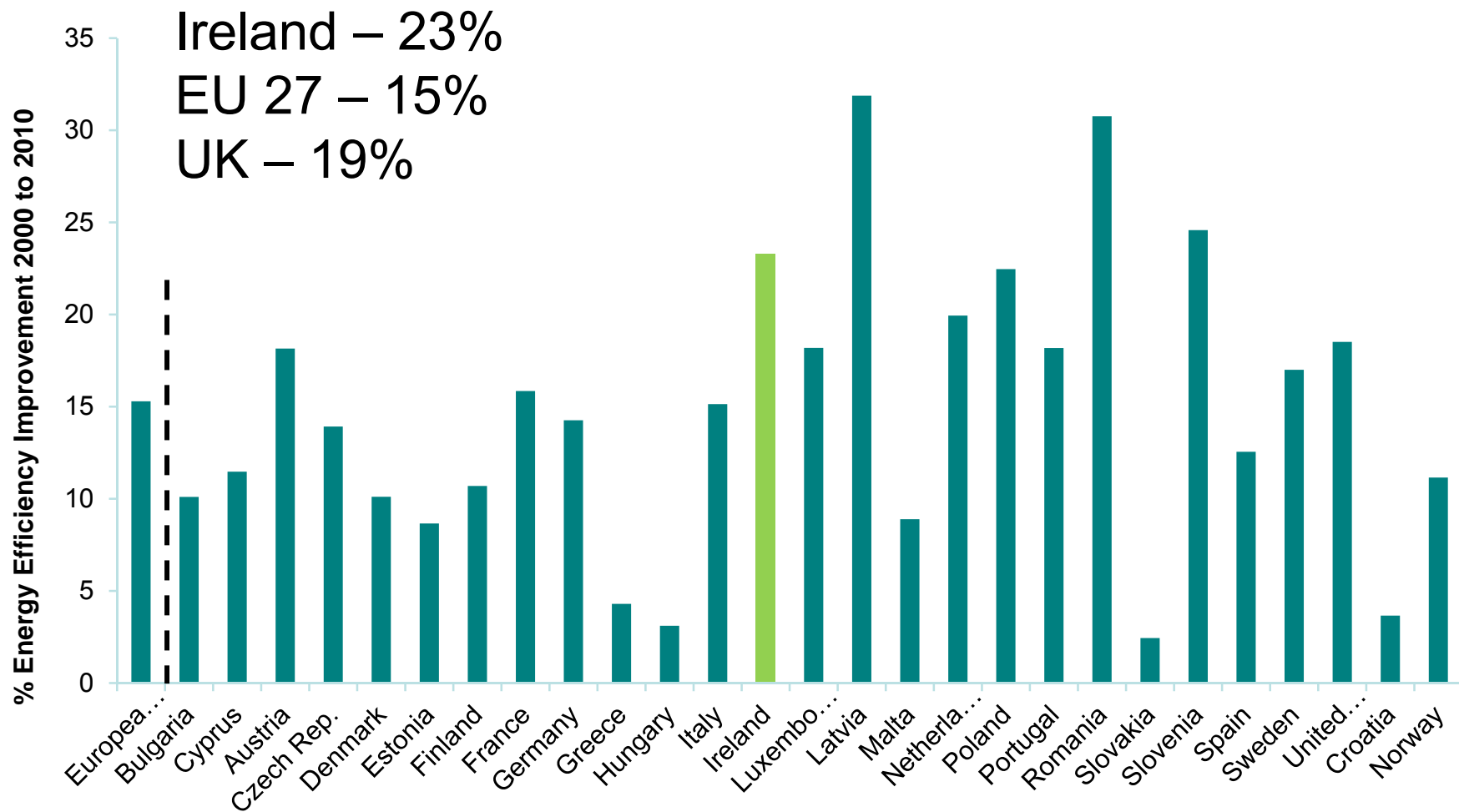


# Ireland: residential energy efficiency index (ODEX) 1995 - 2011



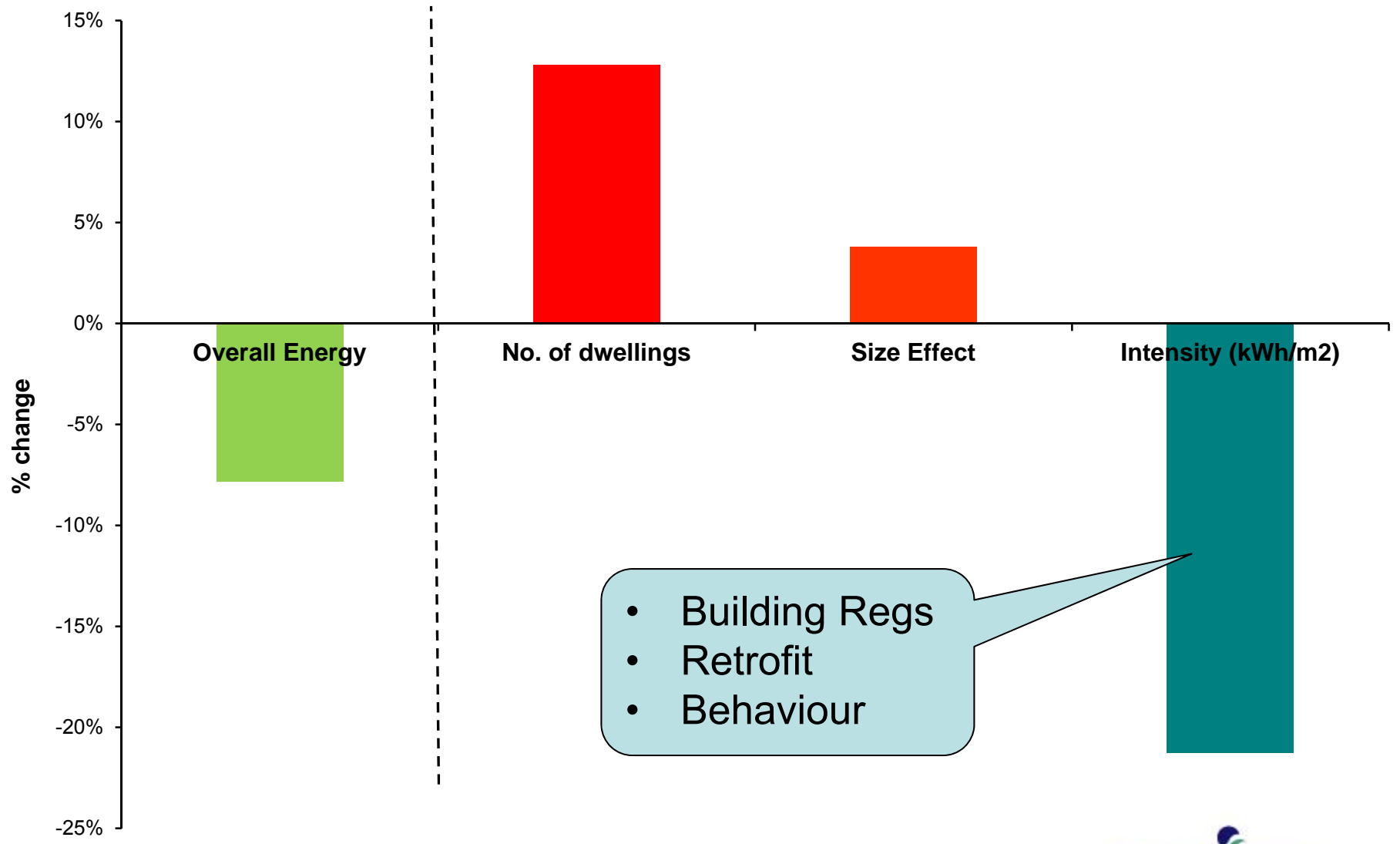
Using EU Odyssee methodology

# Improving residential sector energy efficiency 2000 – 2010: international comparison



Using EU Odyssee methodology

# Energy in Irish housing: Breakdown of change elements 2006 - 2011



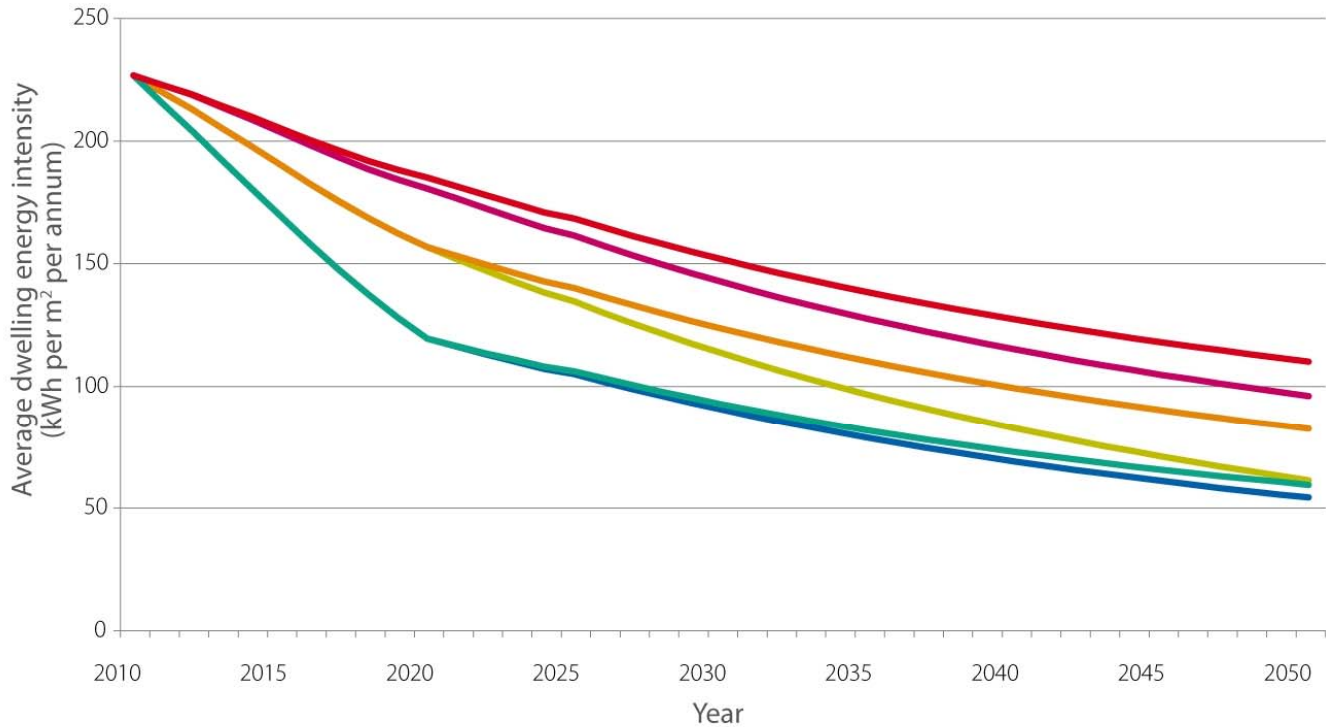


## Next steps

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- Major emphasis on retrofit
  - Code of Practice
  - Inspection/ QA regime
- New compliance and enforcement system
- Cost optimal methodology 2013 completed:
  - informing direction to NZEB
- Approaches to RE integration
- The skills challenge (EU Buildup Skills study)
- Need for more attention to non-domestic buildings
  - Review process

# A roadmap to 2050: Average dwelling energy intensity



- Baseline measures
- Improved building regulations
- Low
- Medium
- High E
- High F

D  
C  
B  
A

BER Rating

**Building Energy Rating (BER)**

BER for the building detailed below is: **B1**

**Address:** The Road, Co. Wicklow

**BER Number:** 12345678

**Date of Issue:** 01-January-2020

**BER Assessor Number:** 12345

**Assessor Company No.:** 123456

**Building Energy Rating:** B1

**Carbon Dioxide (CO<sub>2</sub>) Emissions Indicator:** 0 kgCO<sub>2</sub>/m<sup>2</sup>/yr

**IMPORTANT:** This BER is calculated on the basis of data supplied to and by the BER Assessor, and using version of the assessment software current at issue. A future BER assigned to the dwelling may be different as a result of changes to the dwelling or to the assessment software.

# Key drivers and determinants (Success factors)





Thank you