Global Building Performance Network Webinar: Getting the Building Codes right: The importance of long-term energy targets and frequent revision cycles
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The Ireland experience – drivers, experiences, achievements

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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

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

• 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

- 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 Energy Rating
  - Grants schemes

HOUSING:

• Energy and Carbon performance targets (EPC and CPC)
• Reduction in energy consumption and CO$_2$ emissions by 60%
  – With ‘backstop’ U values
• New Renewable Energy requirement per m$^2$ – 10 kWh$_{th}$/4 kWh$_{el}$
• New measures for limiting heat loss: thermal bridging, air permeability: <7 m$^3$/m$^2$/hr @ 50 Pa
• New measures for energy efficient space and water heating systems
• Minimum efficiency requirement for oil and gas boilers: seasonal efficiency $\geq 90$
• Home owners manual
Building Regulations update 2008 and TGD L 2006: Non-Domestic

- 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 ≤ 1 and CPC ≤ 1, i.e. same as “reference building”
  - Slower pace of change than for dwellings
Format of Building Regulations

• 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

- Calculated using official method - DEAP
- BER relates to primary energy kWh/m²/y
- No minimum standard
- Linear scales – energy, CO₂
- 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 \textit{before} energy efficiency upgrading.
The path to low/zero carbon homes

Part L 2005

Part L 2007

Part L 2010 ?

Low Carbon Homes

LZC

EPC

CPC
GBPN question 1

- **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

• 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

• **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)
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?

• Growing policy coherence and consensus:
  – Green Paper on Sustainable Energy 1999

• 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

- 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?

- Building Control system
- Inspection system
- New system of ‘audit chain’ accountability
Energy consumption per household 1990 - 2011

18% reduction since 2006

- Total: 19,875 kWh (wc)
- Electricity: 5,016 kWh
- Non Electricity: 14,858 kWh

Graph shows energy consumption per dwelling per annum from 1990 to 2011, with a 18% reduction since 2006.
CO$_2$ emissions trends: Average per dwelling in total housing stock
Ireland: residential energy efficiency index (ODEX) 1995 - 2011

34% improvement: 2.5% per annum

1.3 Mtoe p.a.

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

- Building Regs
- Retrofit
- Behaviour
Next steps

- 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
Key drivers and determinants (Success factors)

- Targets
- Evidence
- Confidence
- Leadership
- Consensus
- Enforcement
- Capacity to adapt and innovate
- Skills
- Partnership
  - Policy support
  - Evidence: Data, research, analysis

Evidence:
- Data
- Research
- Analysis
Thank you