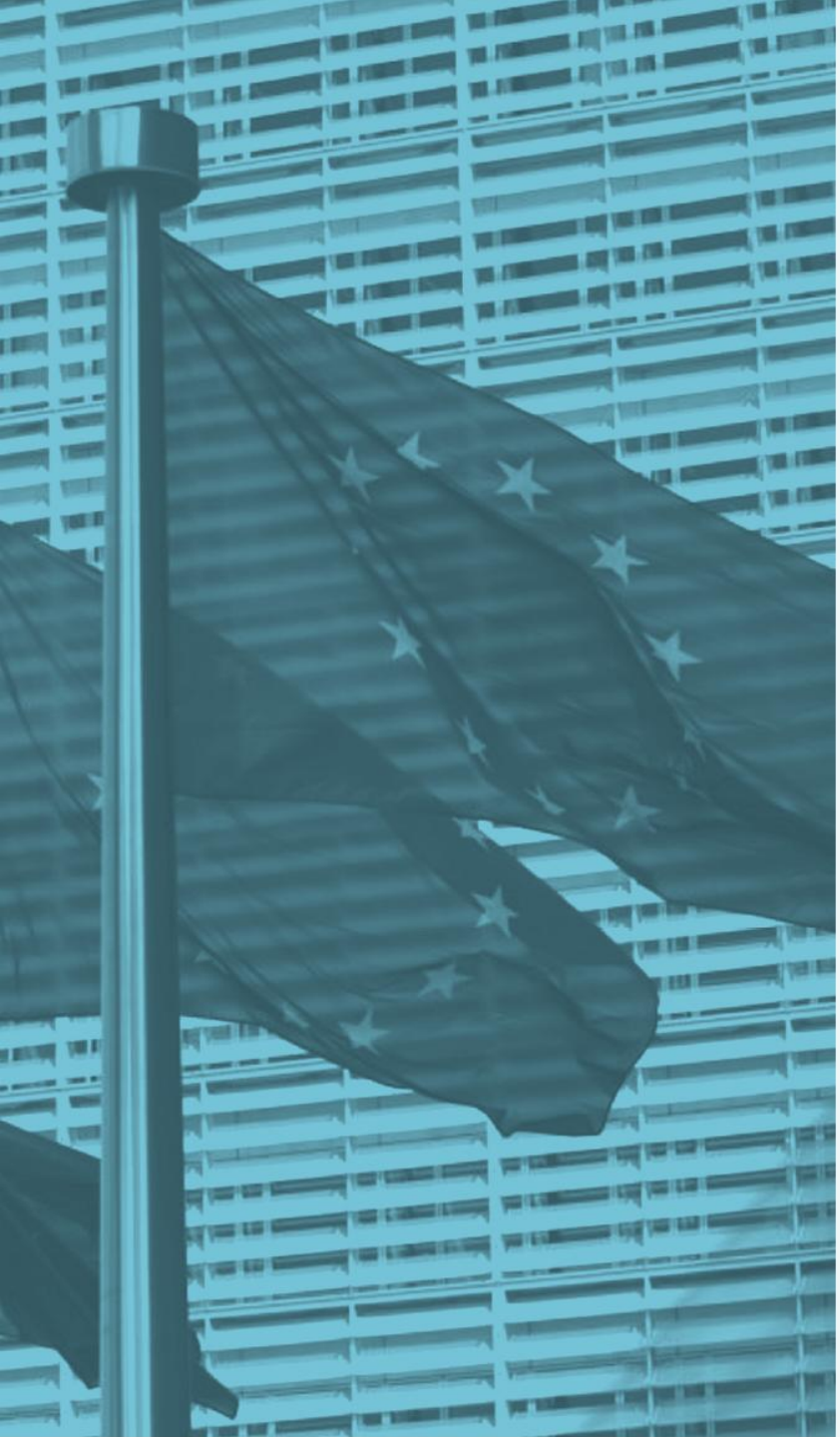


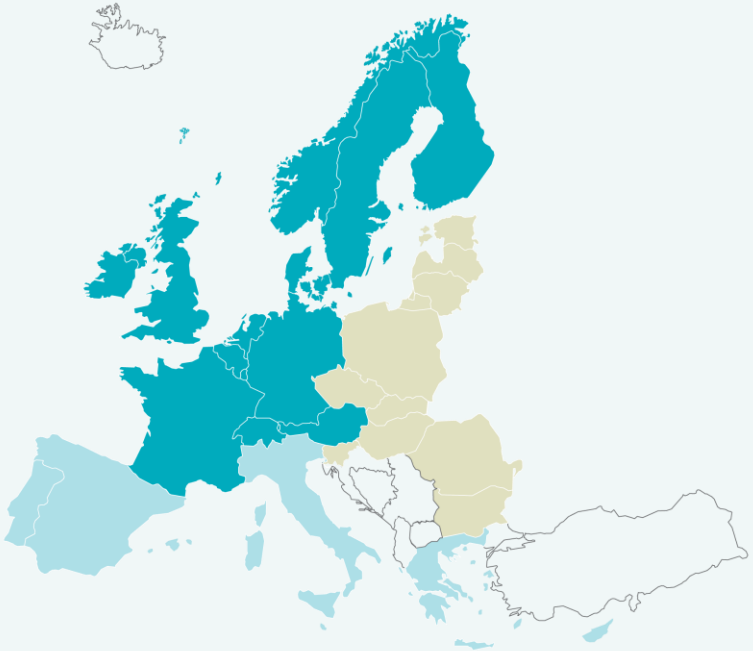
Ready for action? Energy saving opportunities in the European building stock

Oliver Rapf
Executive Director
Brussels, 24 November 2011

BPIE

The microscope study?

- Survey template covering legal, financial and technical information on the energy performance of buildings sent out to countries
- Countries covered: EU27, Norway and Switzerland
- Buildings covered: single and multi-family houses, offices, educational buildings, hospitals, hotels and restaurants, sports facilites and wholesale and retail trade buildings
- Picture of European building stock, Policies and Financial programmes, Renovation Scenarios
- 3 regions considered for data analysis and scenario modelling



North & West	AT, BE, CH, DE, DK, FI, FR, IE, LU, NL, NO, SE, UK	Population: 281 mil
Central & East	BG, CZ, EE, HU, LT, LV, PL, RO, SI, SK	Population: 102 mil
South	CY, EL, ES, IT, MT, PT	Population: 129 mil

Countries and regions considered and equivalent population

PART 1

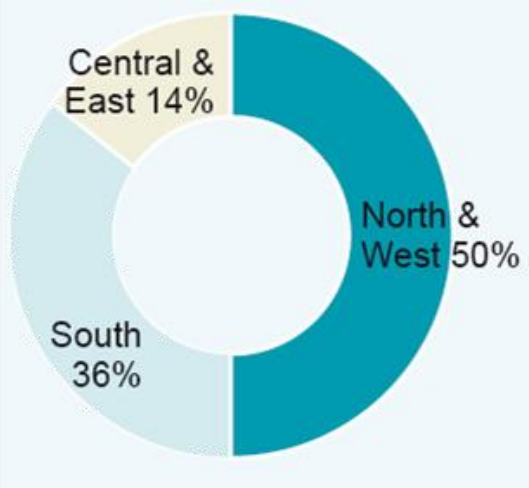
Europe's buildings today

Total floor area of buildings

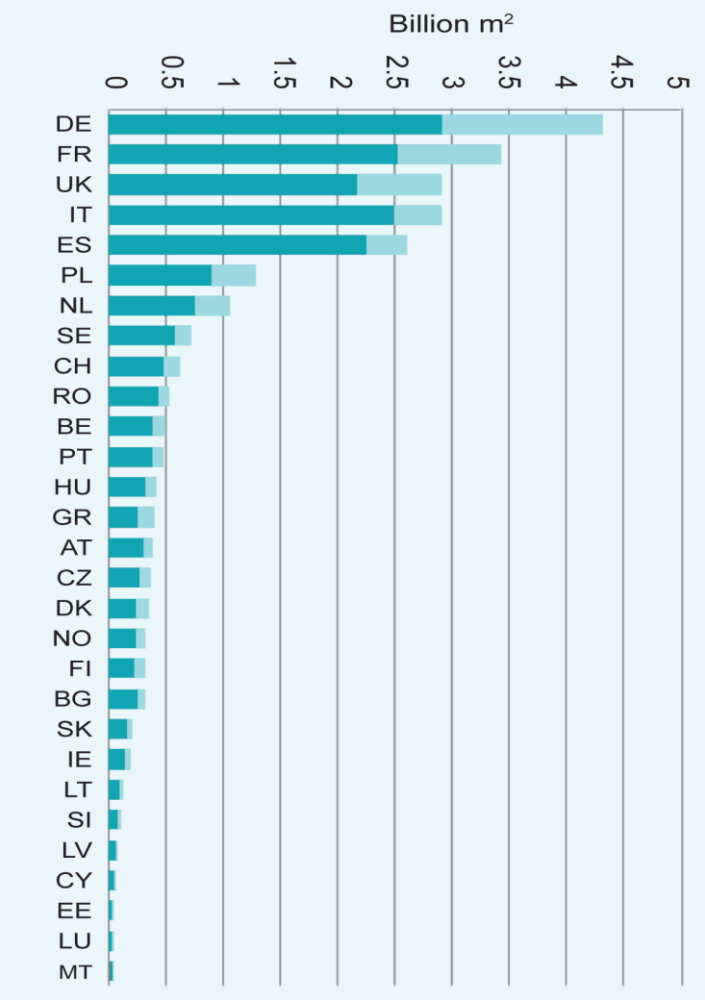
Total useful floor area:

- 24 billion m^2 for EU 27
- 25 billion m^2 with Norway and Switzerland added.

The 5 most populated countries (DE, FR, UK, IT and ES) account for 65% of total floor space.



Floor space distribution per region



Floor space distribution per country

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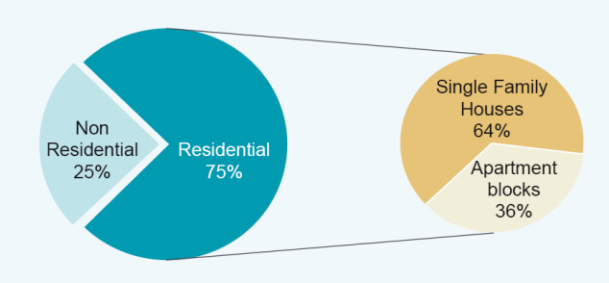
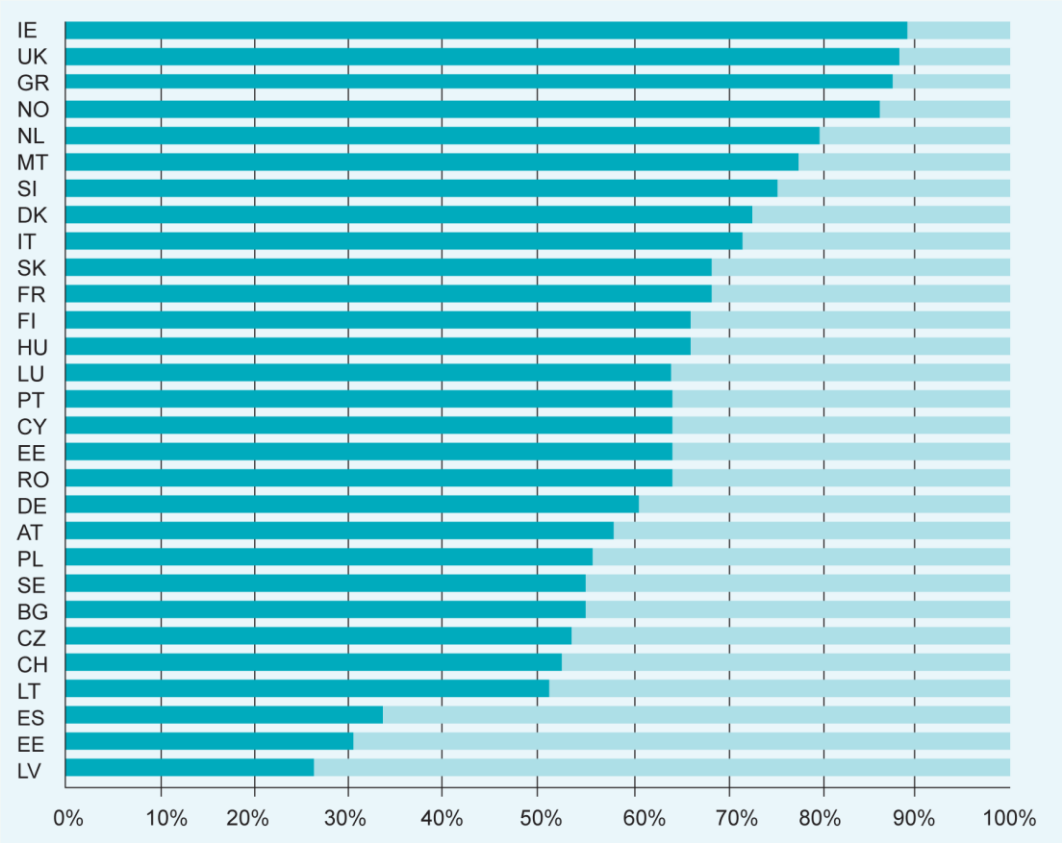
Residential floor area distribution

- Wide range of floor area contributions from single and multi family houses
- Proportion of floor areas for **single family houses** is highest in Greece, Ireland, Norway and the UK
- Proportion of floor areas for **apartments** is highest in Estonia, Latvia and Spain



Floor areas share for the covered countries



Floor area share for residential buildings

Single Family Houses
Apartments

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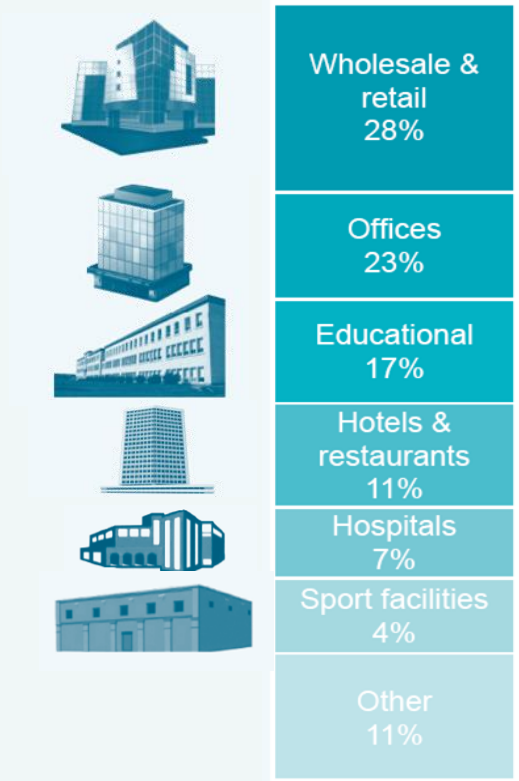
Non-residential floor area distribution

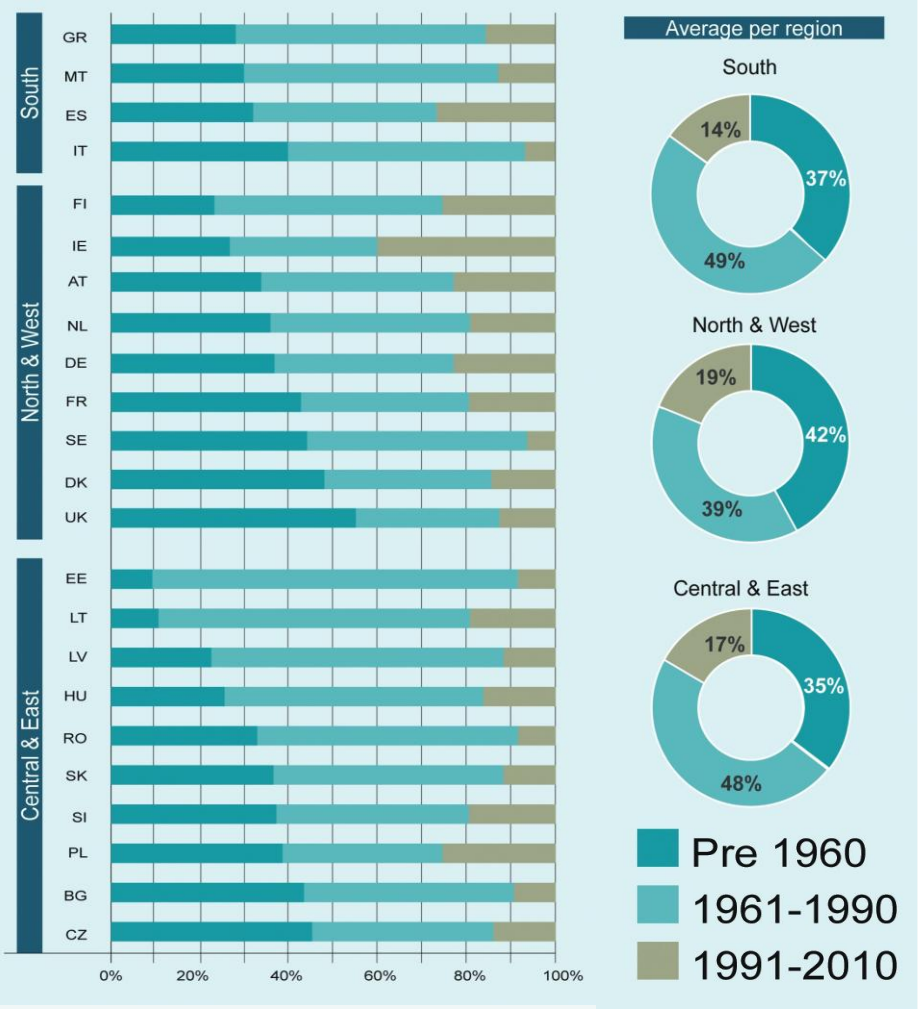
- Wholesale & retail buildings heating and cooling conditions may differ substantially from other categories due to large areas of wholesale buildings often being used only for storage purposes.
- Offices and educational buildings together account for 40% of the entire non-residential floor space. These buildings have similar heating and cooling conditions to residential buildings (although they are of shorter use)
- Hospitals (7% of total non-residential floor space) have continuous usage patterns, where energy demand can vary substantially depending on the services provided (from consultation rooms to surgery rooms).



Non-residential buildings by floor area

Residential age profile

- Variations in the age profile between the 3 regions are relatively small. Nonetheless, older buildings (before 1960) have the biggest share in the North & West region
- It is evident that all countries experienced a large boom in construction between 1961 and 1990 (with a few exceptions, the housing stock more than doubled in this period)
- Countries with the biggest share of recently constructed buildings (1990-2010) appear to be Ireland, Spain, Poland and Finland.
- Countries with the biggest share of residential stock dating from 1961 to 1990 seem to be Estonia, Hungary, Latvia and Finland.



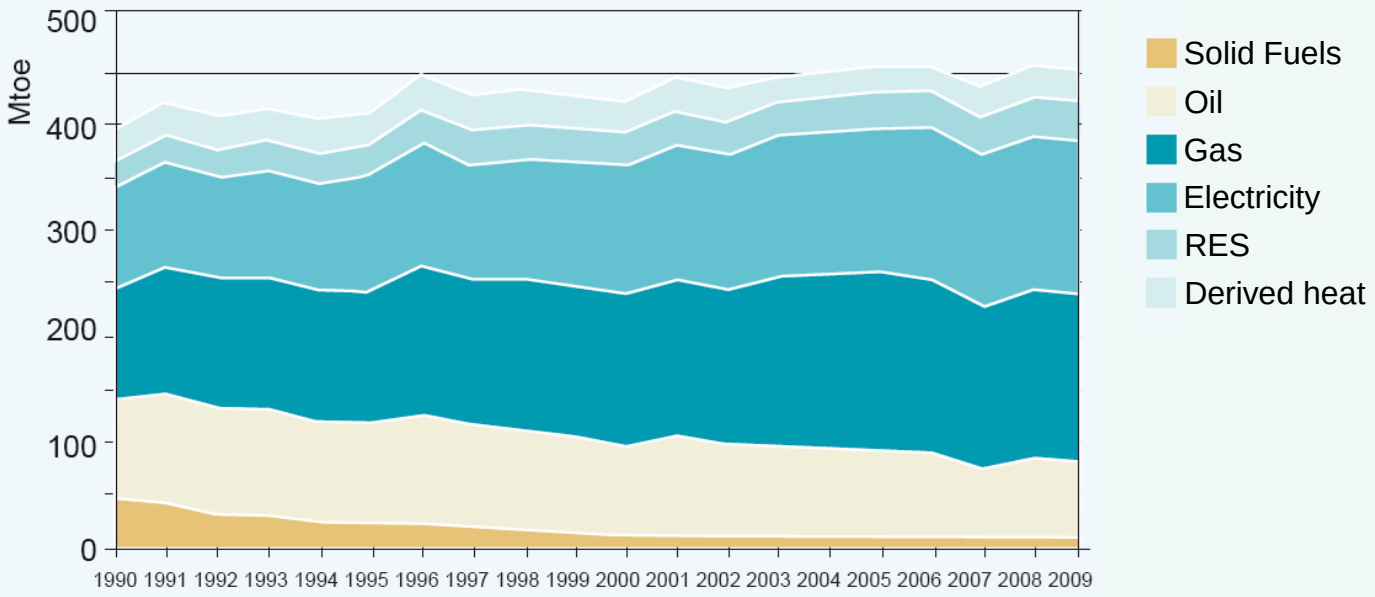
Age profile of residential floor space

EE: Data only from 1951 onwards.
IT: Data excludes heritage buildings before 1950.
LT: Data only from 1941 onwards.
ES: Data excludes secondary houses
SE: Data only from 1921

Final energy consumption in buildings

The final energy consumption has had a 50% increase in electricity and gas use and a decrease in use of oil and solid fuels by 27% and 75%, respectively.
Overall, the energy use in buildings has a rising trend with an increase from around 400 Mtoe to 450 Mtoe over the last 20 years. This is likely to continue if insufficient action is taken to improve the performance buildings.

Historical final energy consumption in the building sector since 1990 for the EU27, Switzerland and Norway



Source: Eurostat

PART 2

Policies and programmes for improving energy efficiency in buildings

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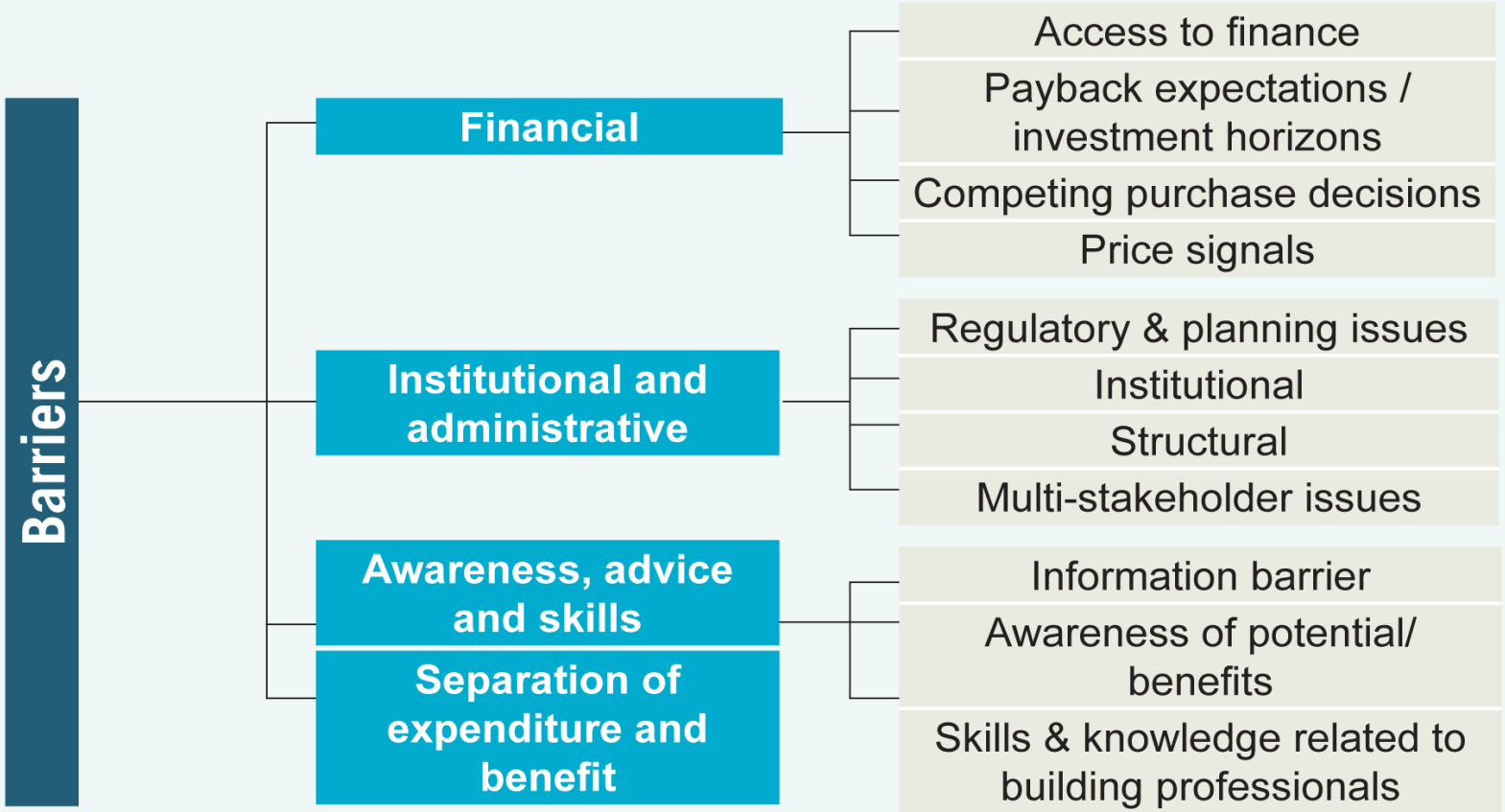
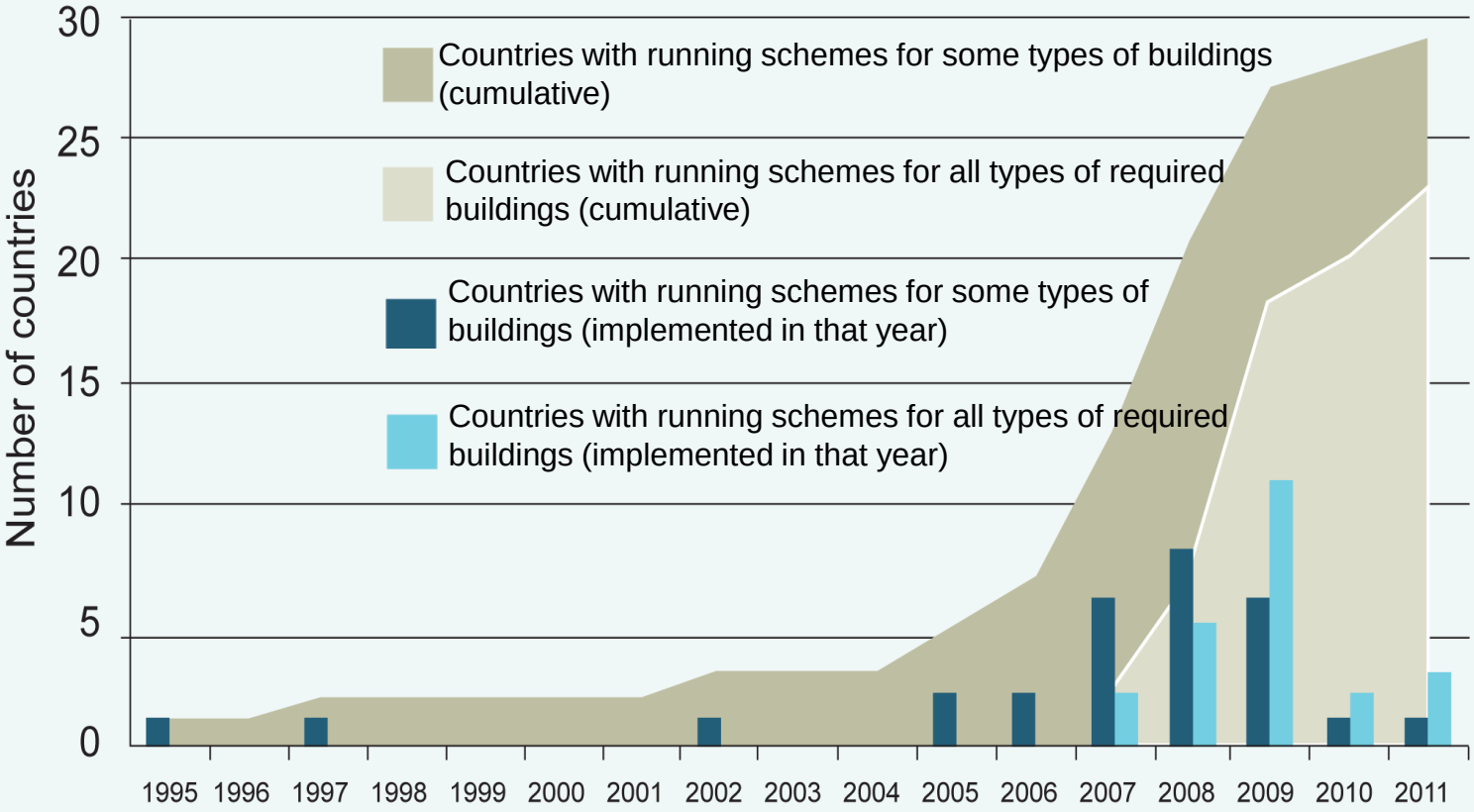
Identified barriers



EPBD implementation

EPC schemes

Number of countries that have started and completed the full implementation of the EPBD EPC requirements

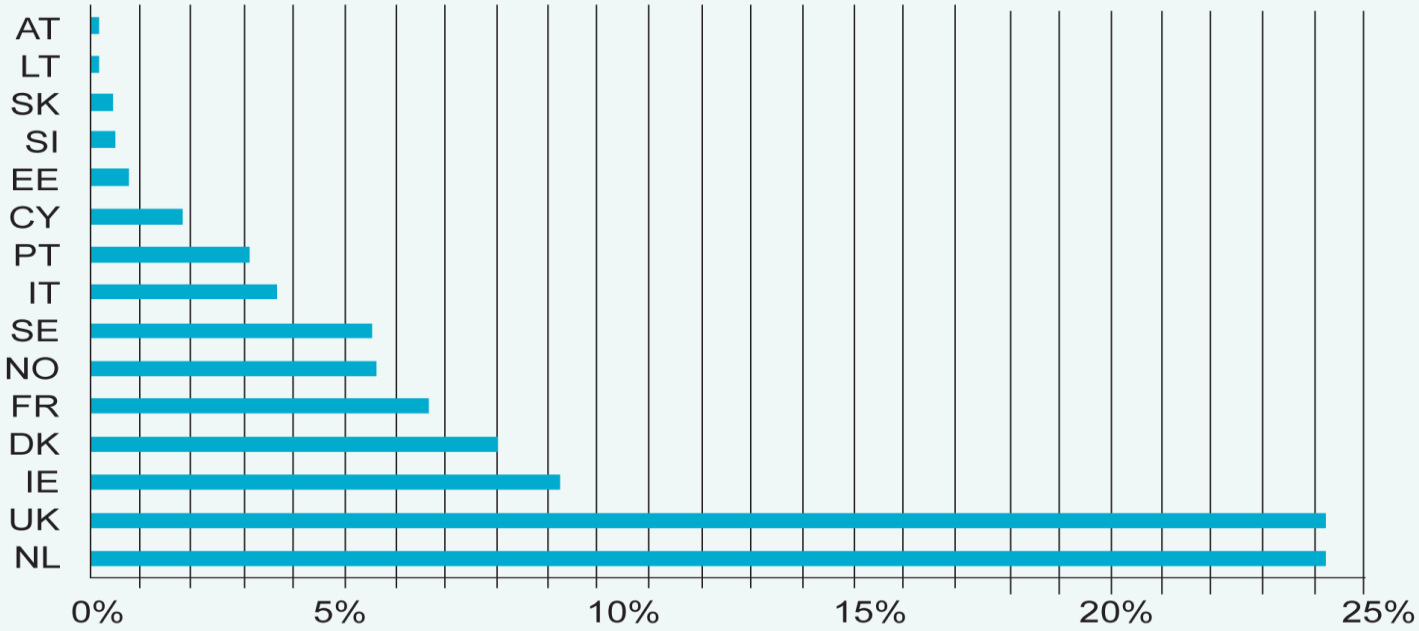


EPBD implementation

Residential EPCs

Although the certification schemes have been working for only a couple of years, the proportion of dwellings not yet certified remain above 90% for all countries with the exception of The Netherlands and the United Kingdom.

Share of dwellings with a registered EPC



EPBD implementation

EPC costs

- Residential EPCs typically cost between €100 and €300 in most Member States, the full cost range is from under €50 to as much as €2,000.
- Information on costs for non-residential buildings was relatively limited. Where quoted, the values range from €0.5 to 3/m2.
- A total of 18 countries (out of 29) foresee penalties in the event of non-compliance with the certification process.

	Single family	Multi-family	Non-residential	Penalties foreseen for EPC's non-compliance
AT	€300-420	About 1€/m²	Office buildings about 1€/m².	No
BE				Yes
BG	€0,5-1,5/m² (cost for the energy audit needed to issue a certificate)			Yes
CY				Yes
CZ	€200-500	€1000-5000	Others: €1000-5000	Yes
DK	Up to €730 for 100m² dwellings, up to €875 for 300m² dwellings		€1-3/m²	Yes
EE	130-300		200-3000	No
FI	150-500	600-1000		No
FR	250	80/dwelling	300-1000	Yes
DE	150-300 (considerably lower in case the EPC is online-based)	250-600 (considerably lower in case the EPC is online-based)		Yes
GR	1,5€/m² (€200 minimum)	1-2€/m² (150 minimum)	300-2500 (up to 1000m²) From 2500€ (for buildings above 1000m²)	No
HU	€40-100/dwelling			No
IE				Yes
IT	300-10000 (all buildings)			Yes
LV		€300-500		No
LT	From 70		Up to €2500	Yes
LU	500-1300	125-250/dwelling		Yes
MT	250-750			Yes
NL	€100-250		€0,5-1/m²	Yes
PL	€50-150		Up to €750	No
PT	45 for EPC registration + 1-3/m² (charged by the inspection expert)		50 for registration of an EPC + €1-3/m² (charged by the inspection expert)	Yes
RO				No
SK	About 250€		Up to thousand/s euros	Yes
SI	300-500			No
ES	From 100		Up to 4000	Yes
SE	About €400	€1000-1500 for an average sized buildings	About 1€/m² for uncomplicated/simple buildings	Yes
UK	£30-100		From £200	Yes
NO				Yes
CH	400-600CHF	500-800CHF	700-1200CHF (up to 1000m²)	No

EPC costs (€ unless otherwise stated) and existence of penalties in the event of EPC non-compliance

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EPC certifiers – Background information

Training courses

- Two qualification options usually: 1. residential and 2. non-residential
- Non-residential training requires more experience from the expert
- Non-residential is sometimes divided between tertiary and public/more complex buildings (e.g. Ireland, Belgium, Estonia)

Accreditation

- Typically this is done at the individual level (courses are offered to individual experts) or individual & company level.
- Denmark moved from personal to company accreditation scheme in 2008. The accredited companies must implement an ISO 9001 quality assurance standard for the EPC system.

Costs to experts

- Course /examination fee
- Typical course fees are of the order of 1000 €
- Free training in few countries (e.g. Spain, Cyprus, Czech Republic)
- Grants are sometimes available (e.g. Austria)
- Organised by: training institutes / universities/ energy agencies

Expert background

- Usually engineering/architecture background
- Sometimes, prerequisite of previous work experience in the field
- In few occassions, no specific diploma is required (e.g. EPB certifier in Brussels region, Belgium)

Expert database

- Some countries have searchable online databases of experts (e.g. Austria, Belgium, Cyprus, Hungary etc.). Others such as Germany don't due to personal infringement issues
- Number of accredited experts is currently low (order of a few thousands in big countries). E.g. in Czech republic there are about 1000 EPC certifiers/auditors (10 000 persons could be accredited).

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Key issues of EPC implementation

QUALITY CONTROL

- Insufficient/non-reliable control mechanisms for most Member states
- In some cases, control occurs through random checks, in other cases, through the building permit requirements
- Poor control means questionable quality of EPCs

Some examples

FRANCE: Even if the performance of a building has been proven to be wrongly evaluated in the EPC, certificate cannot be a source of dispute between vendor/buyer.

AUSTRIA: No requirement for the expert to provide qualification evidence, e.g. on training completion. Trainings are offered but participation is voluntary. Soe organisations request qualification evidence to accept experts but not always.

CYPRUS: 332 EPCs were checked by the end of 2010 (accounting for 16% of all issued EPCs), out of which 103 were cancelled.

PENALTY SCHEMES

- Lack of sound penalty schemes
- 10 Member states do not have any foreseen penalties for non-compliance
- Not always clear how responsibility is split between vendor/buyer/certifier etc.
- Effectiveness of current schemes is low

Some examples

GERMANY: Without legally & administratively binding control mechanism, non-compliance is difficult to be identified and subsiequently impose penalties where necessary.

HUNGARY: A large share of EPCs are never submitted to the responsible government agency which makes it difficult to check compliance and therefore impose penalties if necessary.

ESTONIA: For existing buildings there are no penalties for non compliance (for new buildings, building permit is not given in non-compliance cases).

SWEDEN: When a building is sold, there is no penalty if an EPC is not made available but the buyer can request an EPC at the seller's expense.

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PART 3

Renovating with purpose- Finding a roadmap towards 2050

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Model basic assumptions

Practical limit by 2050:

- Demolition rate considered (0,2% / yr.)
- Recent renovations excluded (only few, up to 1%)
- New buildings between 2011-2020 considered (0,5% / yr.)
- Additional adjustment

Building stock energy performance:

- By age bands
- By building types
- Residential; old buildings to be renovated first
- Non-residential

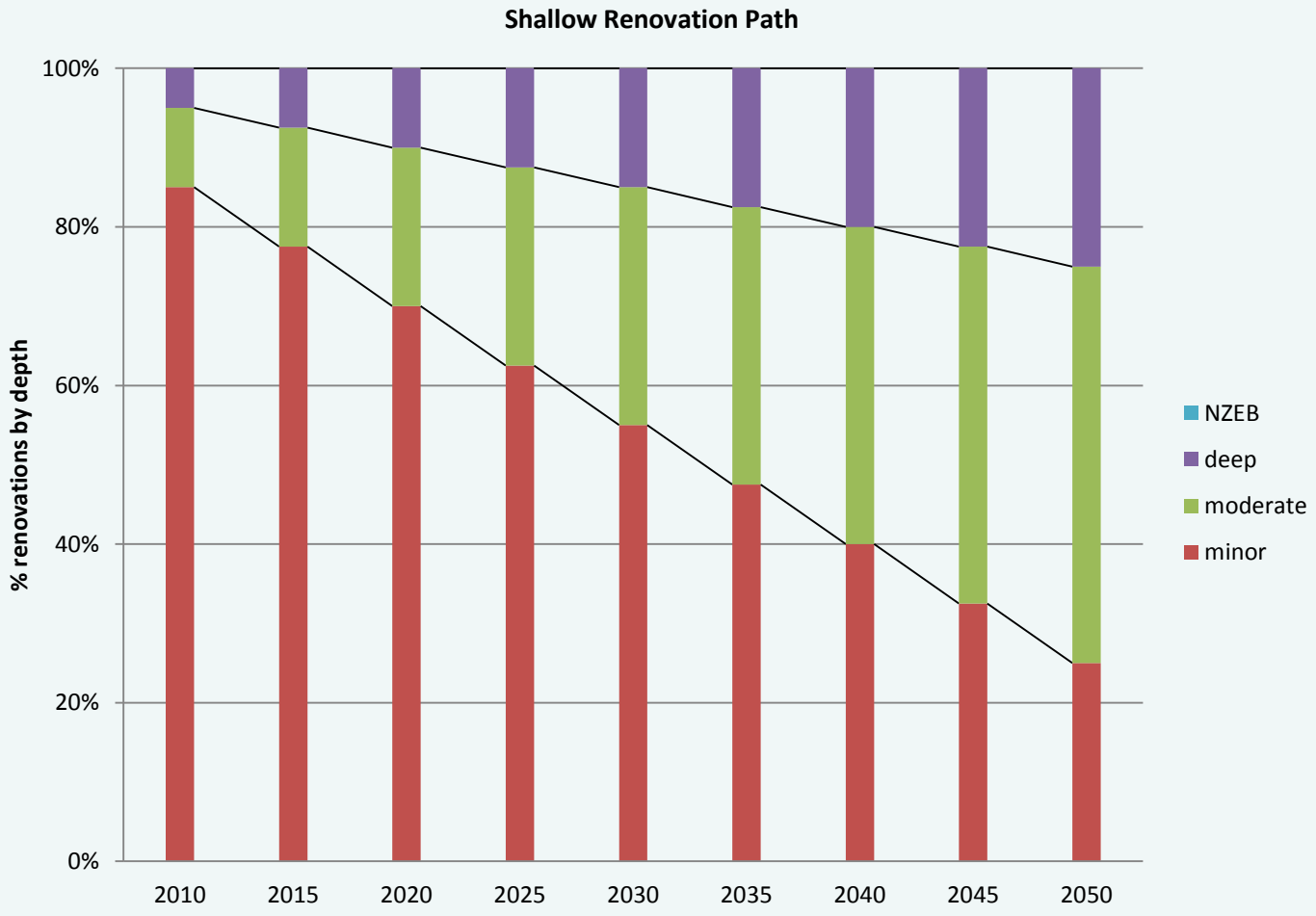
Cost assumptions:

- Discount rates: societal (3%), private (10%), public sector (5%)
- Learning curves
- Energy prices: Eurostat, PRIMES forecasts

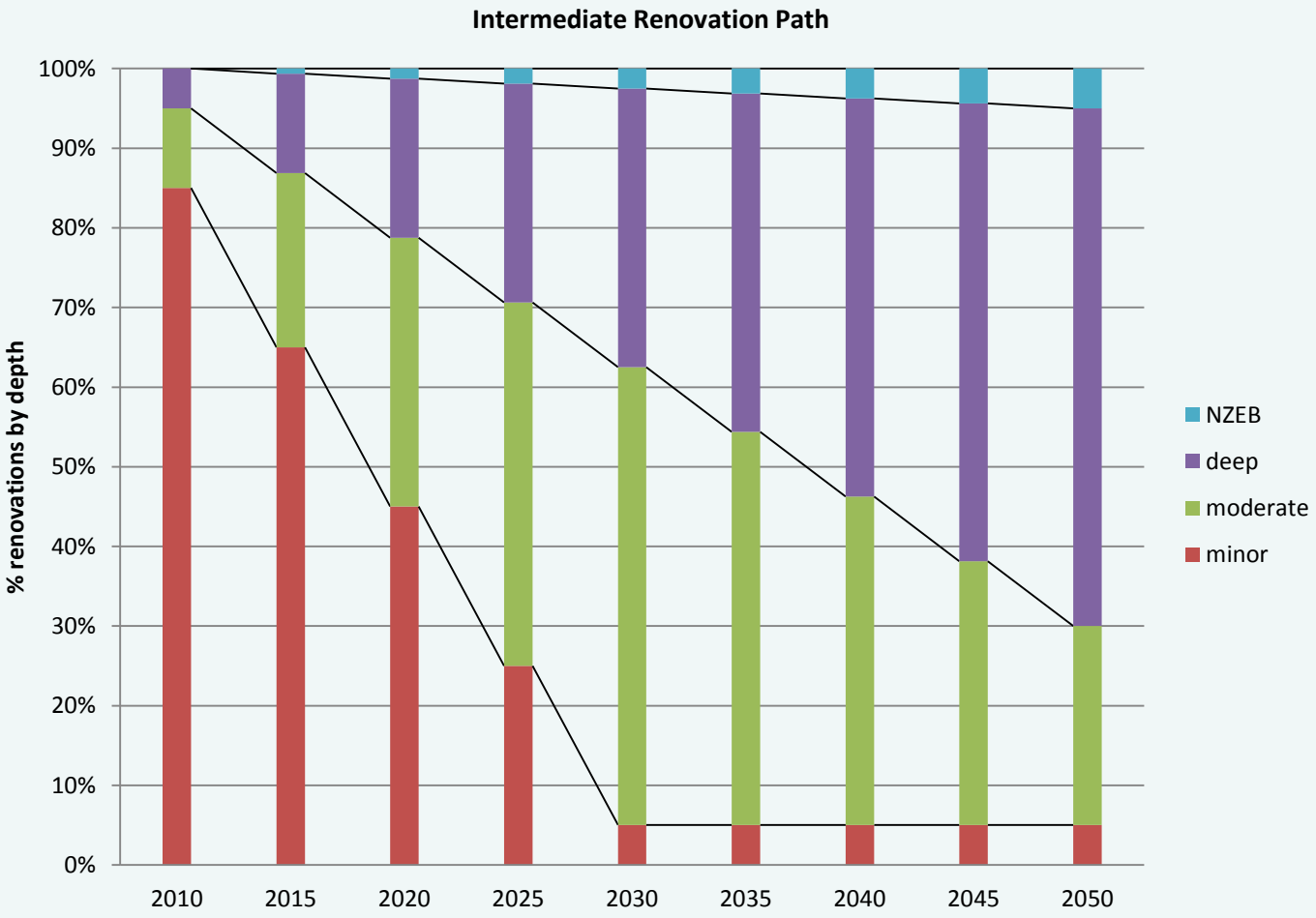
Decarbonisation of the power sector- 2 pathways:

- BaU (approx. 0,5% / yr.)
- As requested by the Low-carbon economy Roadmap 2050 (approx. 5% p.a. for electricity and 2% for other fuels)

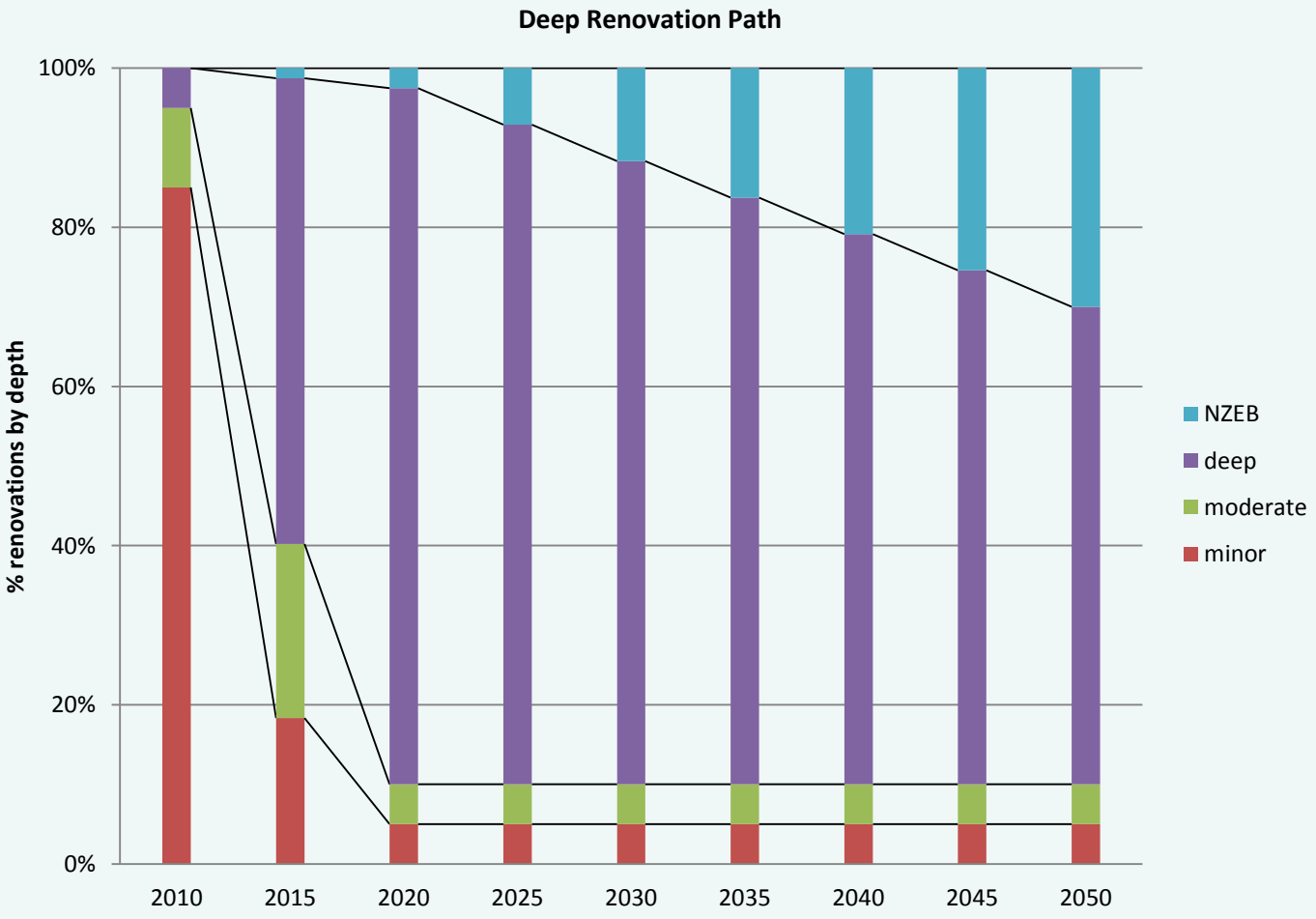
Renovation depths



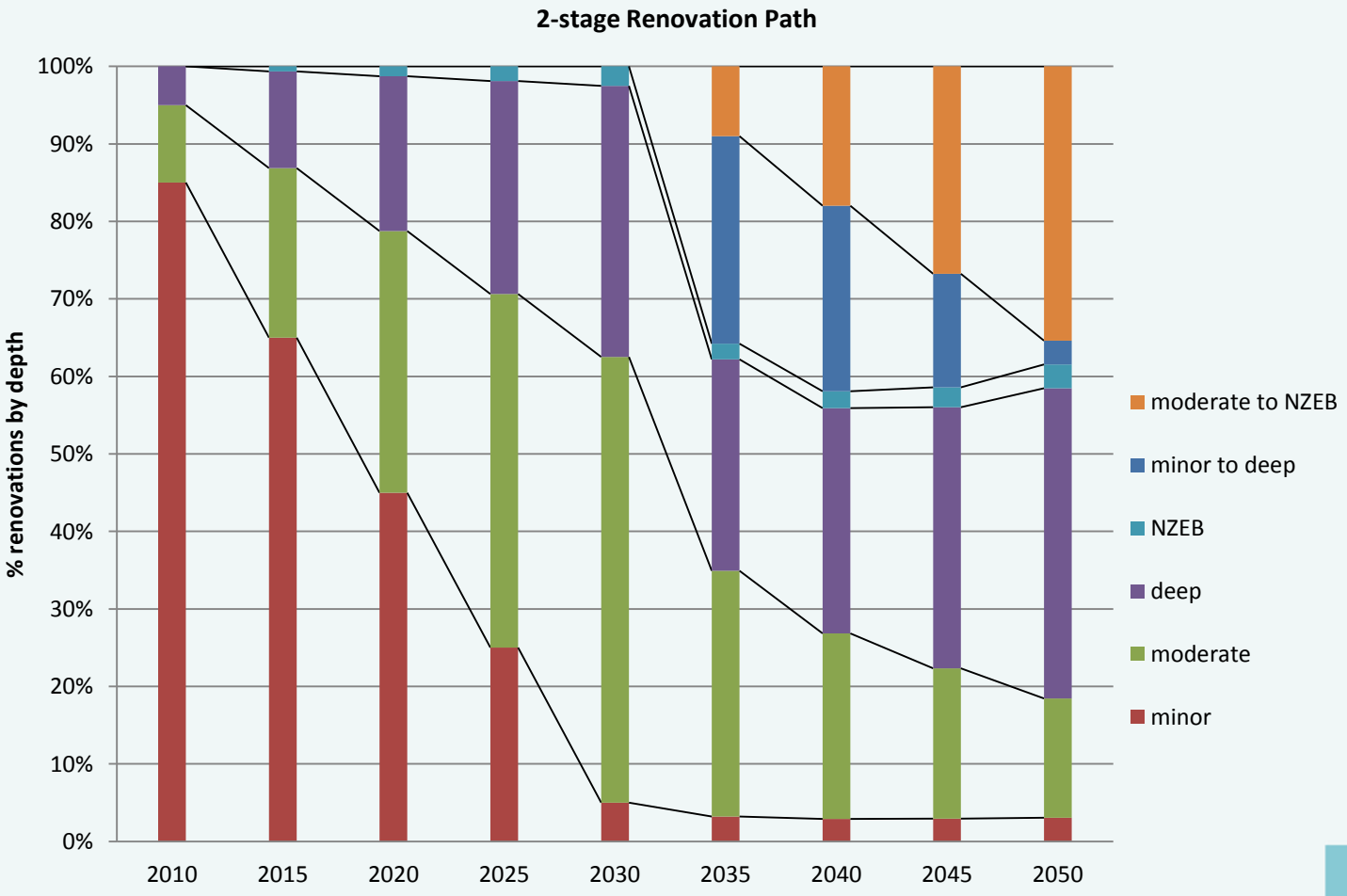
Renovation depths



Renovation depths

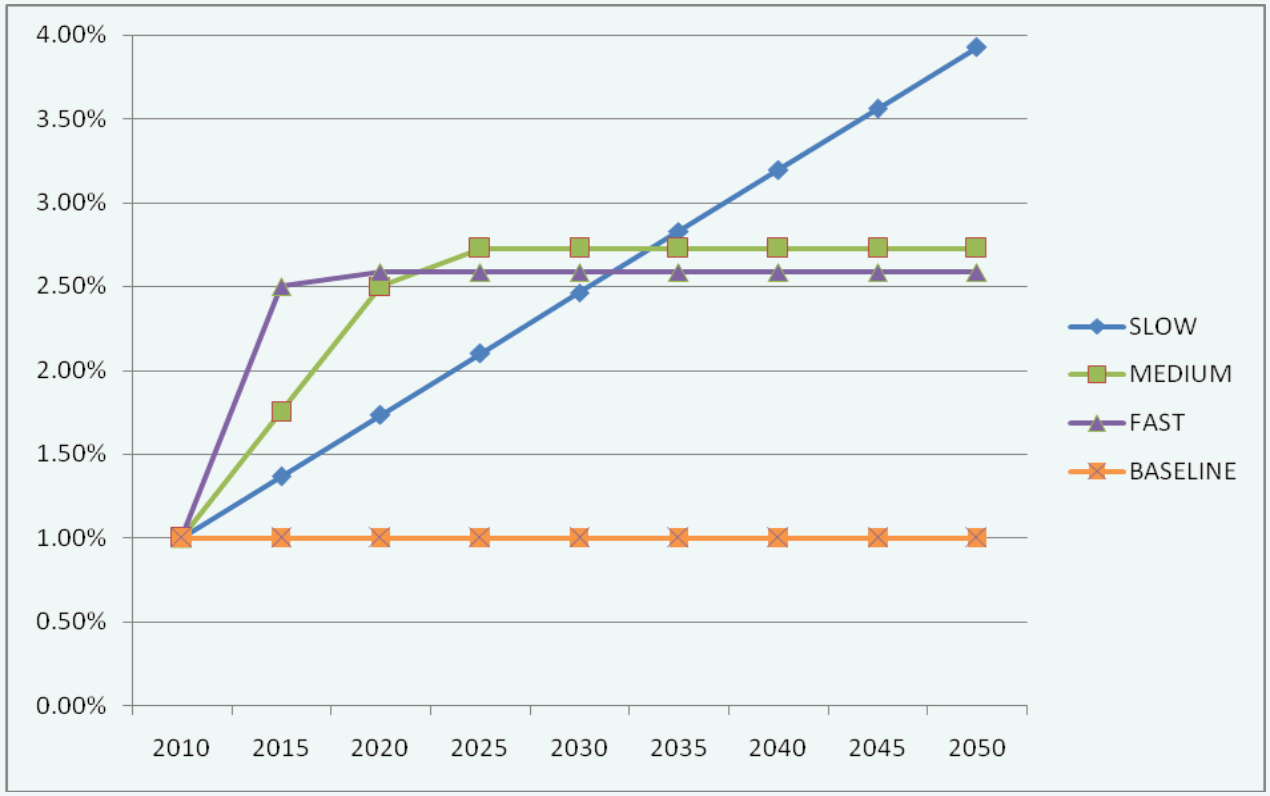


Renovation depths



Renovation speeds

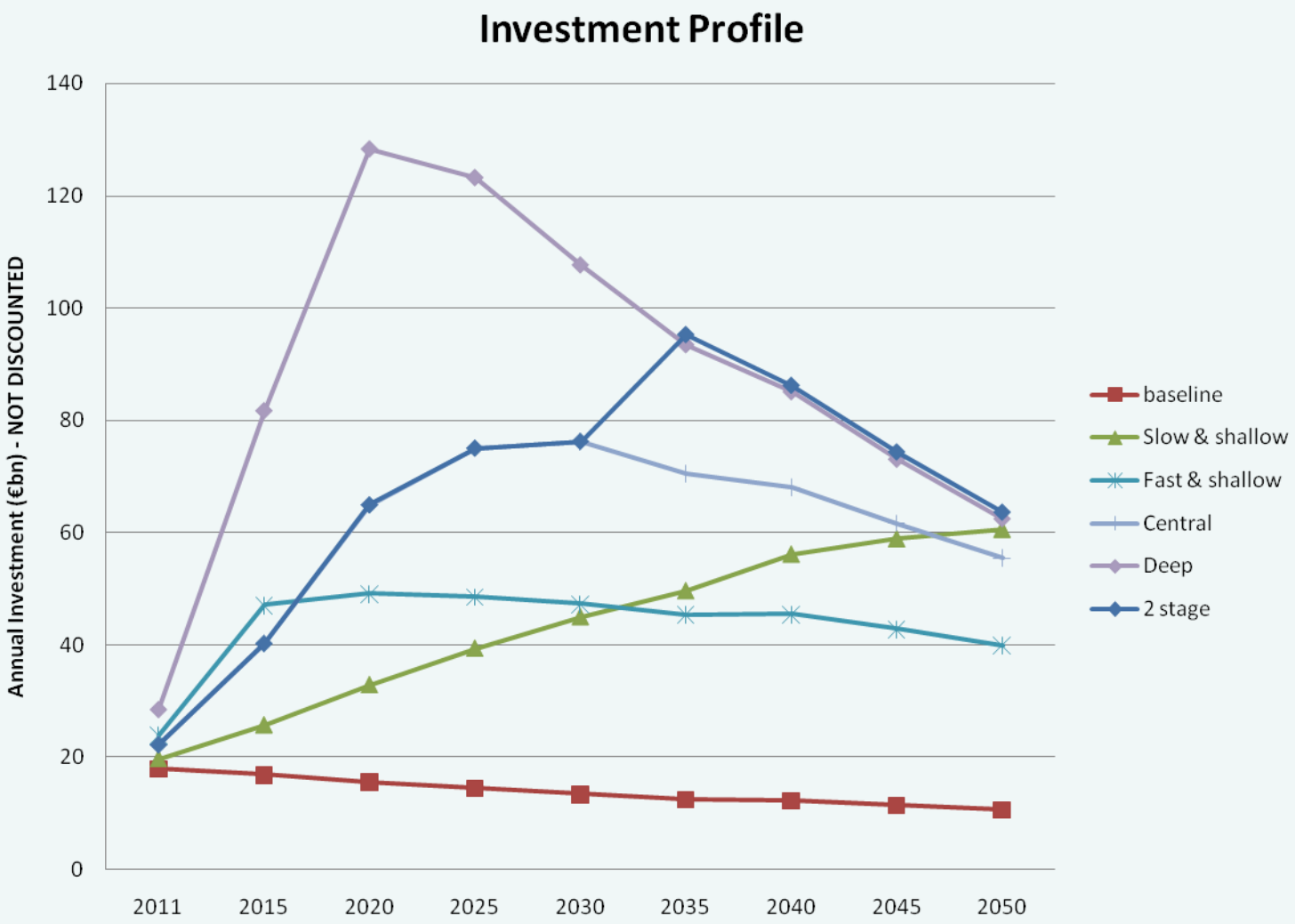
Renovation rates profiles considered over time



Results 2050

Energy Savings compared to today

	Annual energy savings	Net savings: investments	Net savings: Energy cost savings	Net savings: consumer	Net savings: society	Decarbonisation pathway Fast: savings	Decarbonisation pathway Fast: abatement cost	Decarbonisation pathway Slow: savings	Decarbonisation pathway Slow: abatement cost	Jobs
Baseline	-9% 365	164	187	23	1226	-72% 742	-20	-18% 182	-89	0,2
Slow & Shallow	-34% 1373	343	530	187	4884	-80% 821	-74	-40% 410	-196	0,5
Medium	-48% 1975	551	851	300	7015	-84% 868	-103	-53% 547	-221	0,70
Deep	-68% 2795	937	1.318	381	9767	-90% 932	-136	-71% 732	-238	1,1
2 Stages	-71% 2.896	584	1.058	474	10680	-91% 939	-151	-73% 755	-255	0,8
	TWh/y	€bn	€bn	€bn	€bn	MtCO2/a €/tCO2		MtCO2/a €/tCO2		Mjobs/yr


Investment Profile
Annual Investment (€bn) - NOT DISCOUNTED
140
120
100
80
60
40
20
0
2011
2015
2020
2025
2030
2035
2040
2045
2050
baseline
Slow & shallow
Fast & shallow
Central
Deep
2 stage

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