THE EUROPEAN SAVINGS POTENTIAL IN BUILDINGS: WHICH POLICY MEASURES ARE NEEDED TO HARVEST THESE POTENTIALS

eceee annual policy seminar

"Capturing the vast energy savings potential in Europe's buildings"

Brussels, 19 November 2014

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Outline

- History: Past trends of energy consumption for buildings in the EU

Based on ODYSSEE database (co-funded by the Intelligent Energy Europe Programme)

- Future: Projections of buildings consumption and savings potentials until 2030

Based on new savings potential study until 2030 by Fraunhofer ISI, TU Vienna and pwc on behalf of DG ENER (October 2014)

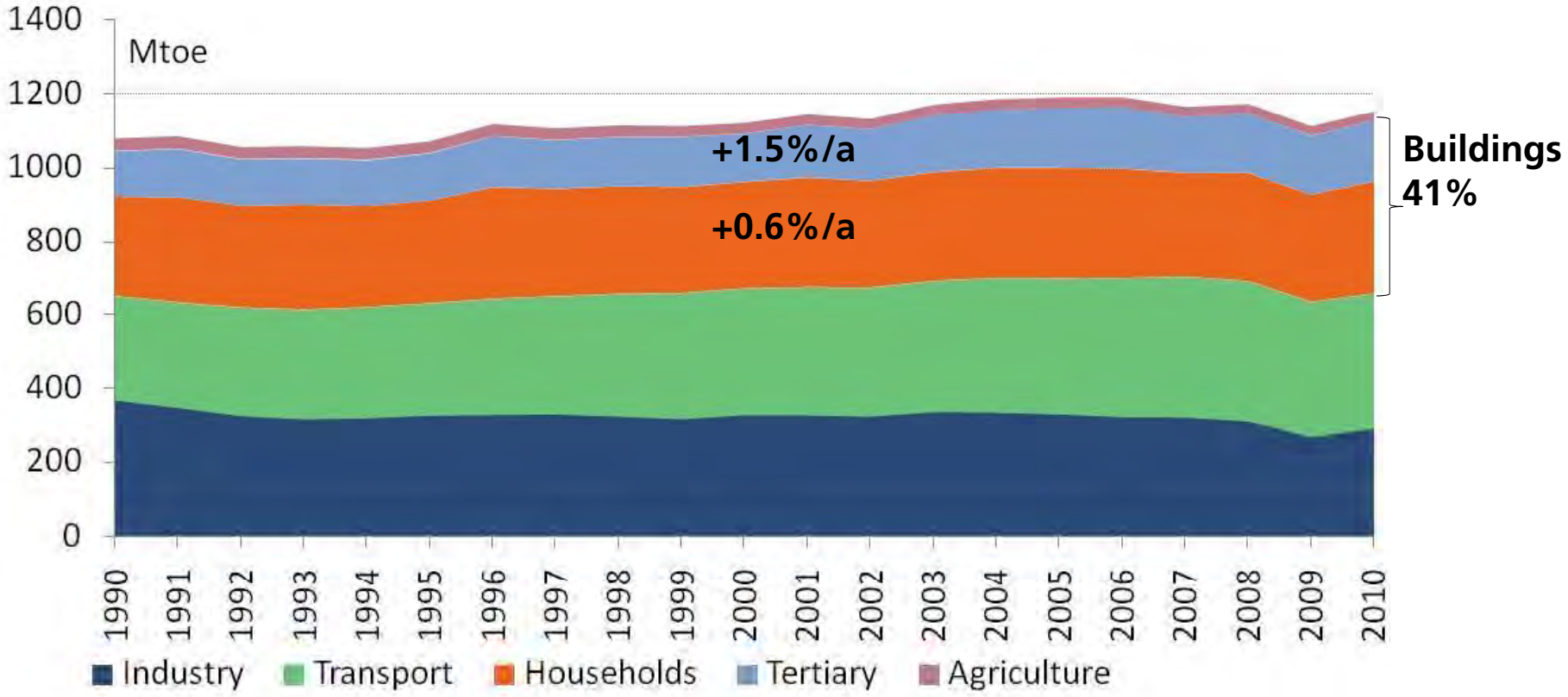
- Policy: Which policy measures are needed to harvest these potentials?

Based on MURE database (co-funded by the Intelligent Energy Europe Programme)

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Final energy consumption in the EU by sector

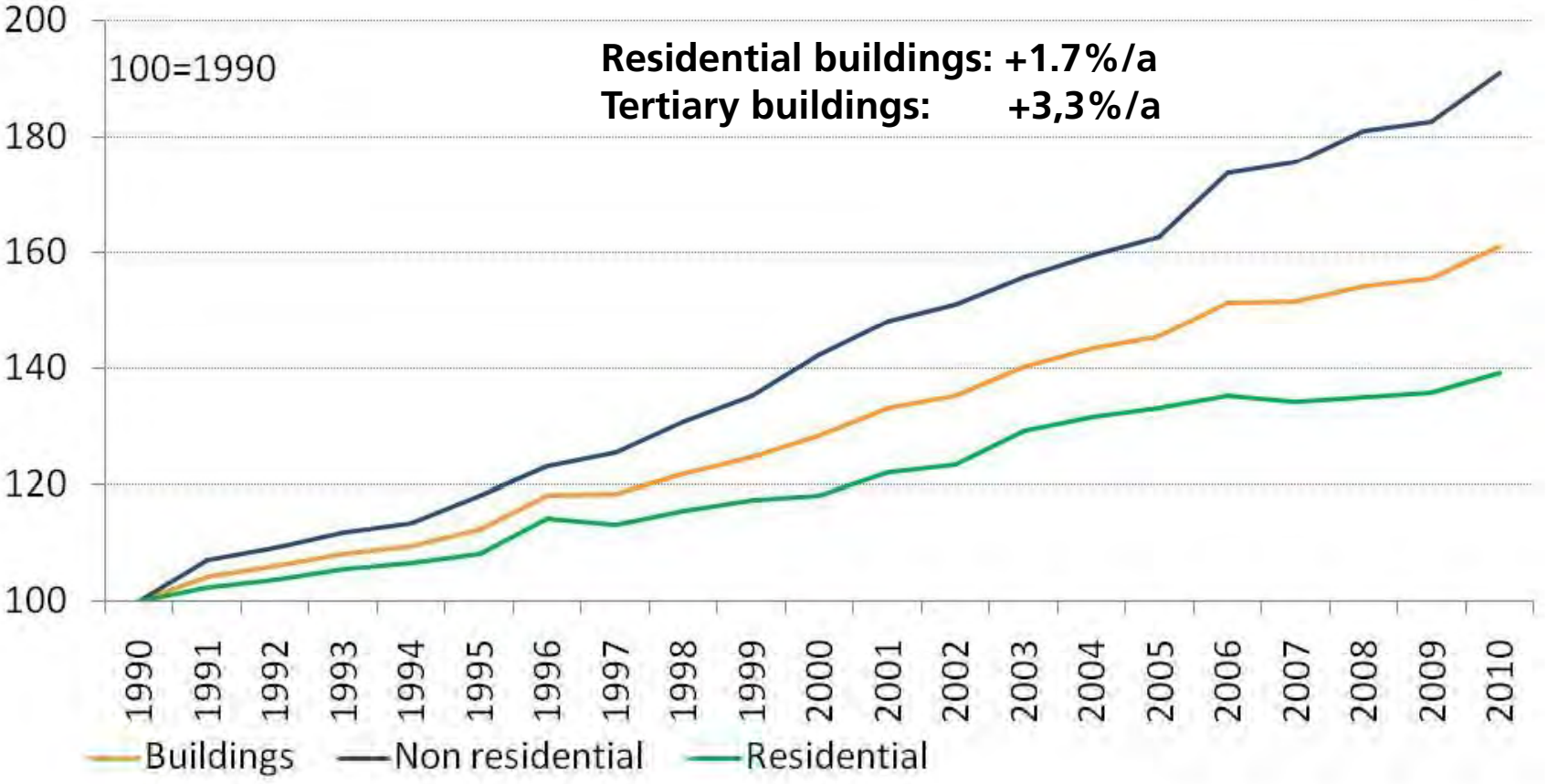


Source: ODYSSEE (based on Eurostat data)

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Increasing trend of electricity consumption in buildings

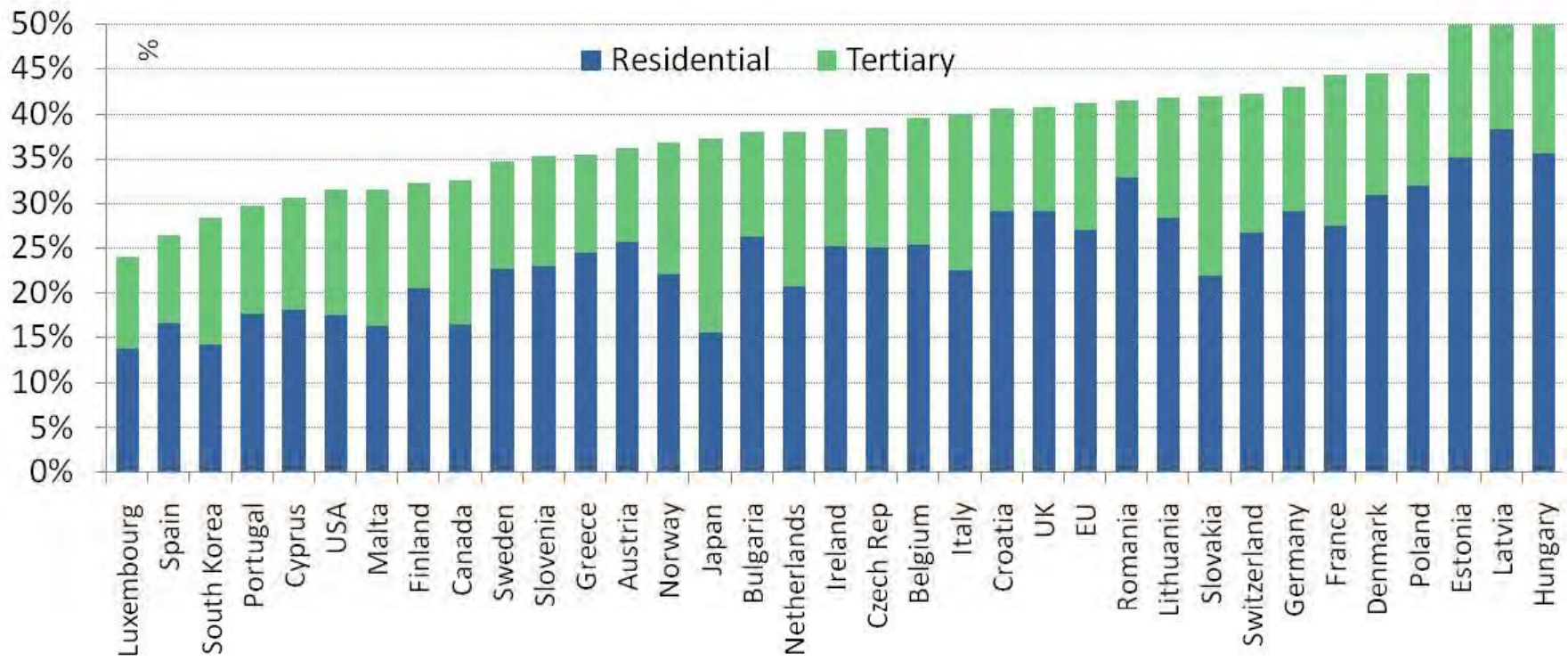


Source: ODYSSEE (based on Eurostat data)

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Share of energy consumption for buildings in final energy consumption by country (2009)

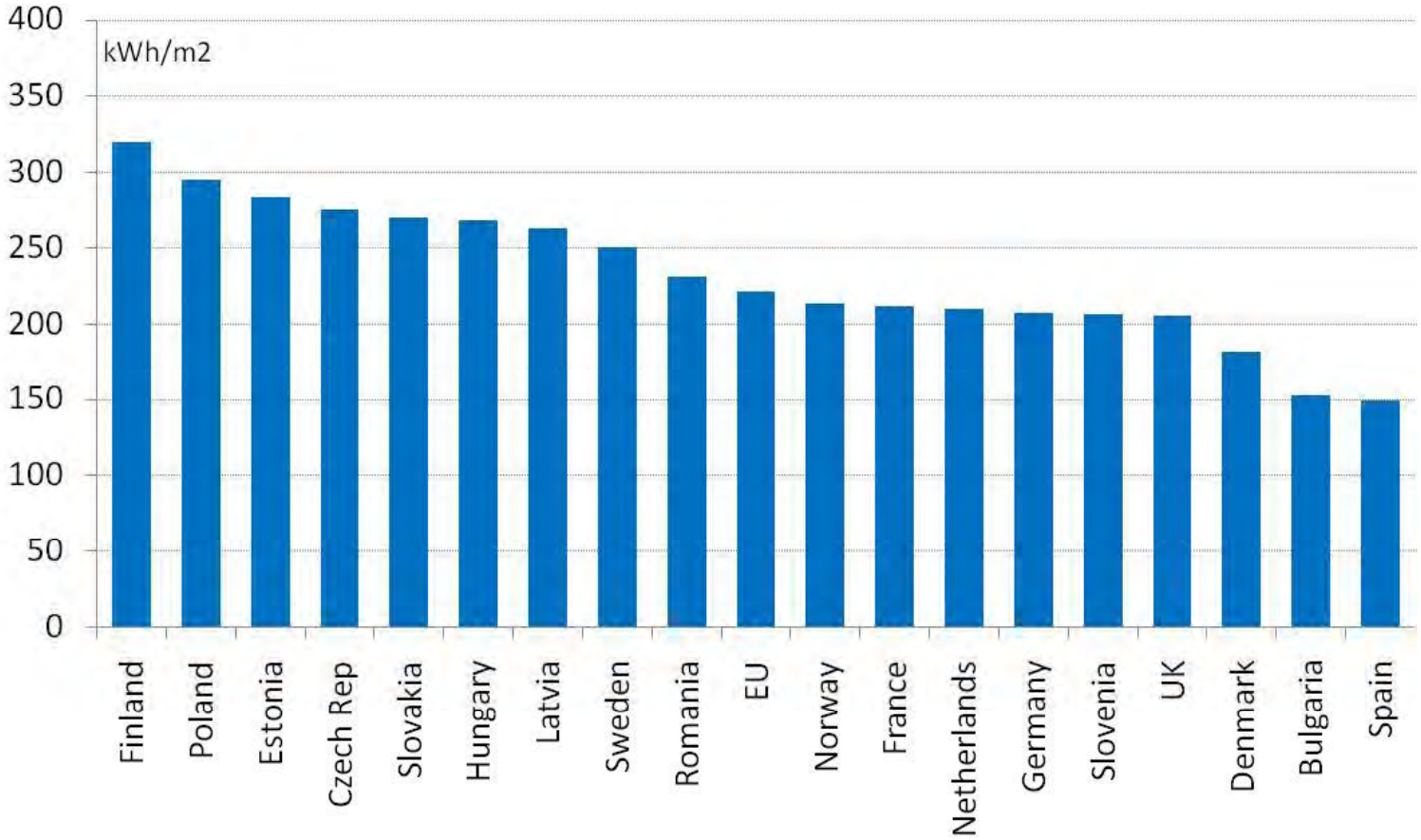


Source: ODYSSEE (based on Eurostat data)

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Energy consumption in buildings (kWh/m2) by country (2010) (normal climate)



Source: ODYSSEE

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Study evaluating the current energy efficiency policy framework in the EU and providing orientation on policy options for realising the cost-effective energy-efficiency/saving potential until 2020 and beyond

Study on behalf of the European Commission / DG ENER







I. Achievement of 2020 energy efficiency (EE) target

Three methods:

- **Bottom-up investigation of EE measures** based on Art. 7 notification and NEEAPs
- **Decomposition analysis** of statistical development 2008-2012 and projection to 2020
- **Bottom-up modelling of EU-wide and national policy measures** in 4 scenarios

II. Energy efficiency potentials for 2030

Method:

- **Bottom-up modelling of EU-wide and national potentials** in the extension of the 4 measure-based baseline scenarios + 3 potentials scenarios

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Bottom-up modelling of EU-wide and national potentials in 4 measure-based baseline scenarios

Scenario name	Short name	Explanation
Baseline No Early Action	BASE_noEA	Contains only measures before 2008. Can be roughly compared with the reference development of PRIMES 2009 (corrected for the drivers from PRIMES 2013), though the latter includes measures up to early 2009.
Baseline incl. Early Action	BASE_inclEA	Contains measures up to 2013 including. Can be compared with PRIMES 2013. Is useful in conjunction with EED (Art. 7) which admits "Early Action".
Baseline with measures	BASE_WM	Contains also measures which are already accepted or close to being accepted in 2014 and the near future. Sometimes this maybe very close to BASE_inclEA and can be the same.
Additional Measures	AM	Baseline with additional measures. Extends existing measures for each sector by around 3% in order to reach the EED target in case there is a gap. Some new measures (which represent a generalization of successful measures at the national level) are also proposed, especially for the transport sector and the space heating & hot water. The corresponding measures are listed in the report.

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Calculation of 3 potential scenarios

- The **INVERT/EE-Lab model** (run by TU Vienna in cooperation with Fraunhofer ISI) for residential and non-residential buildings
- The **FORECAST platform** (run by Fraunhofer ISI), including an industrial model as well as the electricity uses in the residential and service sector
- The **ASTRA model** (run by Fraunhofer ISI) providing potentials for the transport sector

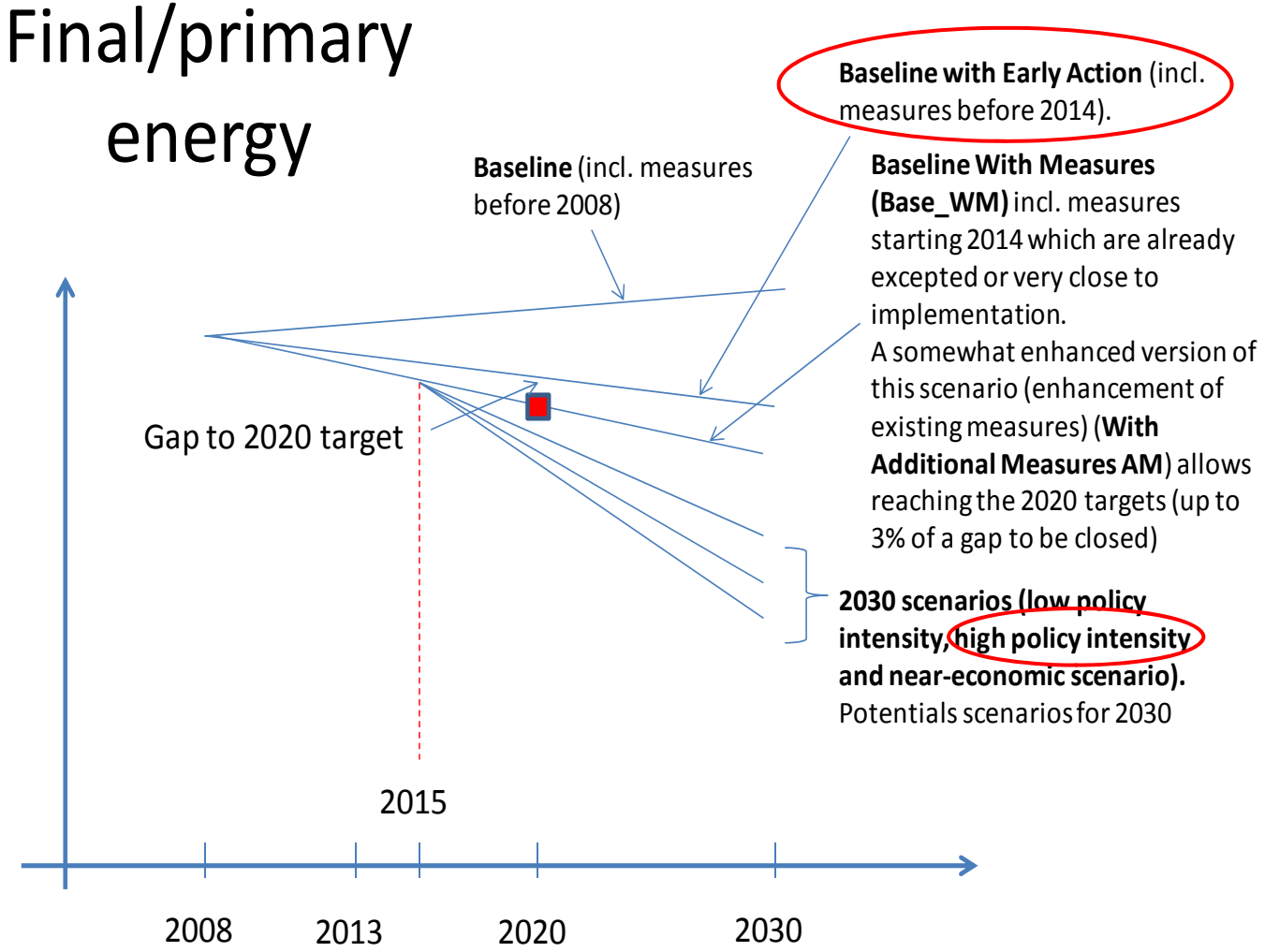
Scenario	Explanation
Low policy intensity (LPI)	Barriers and high discount rates (sector and partially country specific) persisting.
High policy intensity (HPI)	Low discount rates and barriers (partially or totally) removed. The discount rates are sector specific.
Near economic (NE)	Potentials which are not economic but scenario induces costs not much higher than present level energy consumption entails.

Analysis of potentials and cost relative to the Base_inclEA scenario (reference development, close to PRIMES 2013) and compared to 2008

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Graphical presentation of the scenarios



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Final energy savings by sector in the LPI/HPI/NE scenarios (EU27) for 2030

Potentials in 2030 compared to the BASE_inclEA Scenario						
	Mtoe			% compared to Base_inclEA in 2030		
	LPI	**HPI**	**NE**	**LPI**	**HPI**	**NE**
All final demand sectors	**103**	**194**	**221**	**9.6%**	**18.2%**	**20.6%**
Residential sector	23	73	79	8.3%	25.9%	28.1%
Tertiary sector	25	47	50	13.9%	25.9%	27.7%
Transport sector	28	41	46	9.2%	13.4%	14.9%
Industry sector	26	33	46	9.5%	12.2%	16.8%

62% of total potential

% compared to
Primes 2007 Baseline: **38%**
Primes 2013 Baseline: **22%**

Mtoe	**LPI**	**HPI**	**NE**			
	Mtoe			% compared to 2008		
All final demand sectors	**201**	**293**	**319**	**17.2%**	**25.0%**	**27.3%**
Residential sector	52	101	107	16.7%	32.7%	34.7%
Tertiary sector	34	56	59	17.9%	29.4%	31.1%
Transport sector	80	93	97	22.1%	25.7%	27.0%
Industry sector	36	43	56	11.6%	14.0%	18.0%

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A deeper look at the buildings sector potentials: residential buildings (EU 27)

Residential Buildings

EU27 , Mtoe, Final Energy Demand

Mode	2008	Base_noEA		Base_inclEA		Base_WM		AM		Potential_2030					
										LPI		HPI		NE	
		2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
Total Residential Buildings	247,89	241,87	223,06	232,31	209,84	232,31	209,84	222,34	192,64	226,18	197,12	197,49	156,78	197,49	156,78
New buildings (space heating)	0,00	9,62	15,73	9,22	14,77	9,22	14,77	8,82	13,53	8,98	13,87	7,80	10,94	7,80	10,94
Existing buildings (space heating), of	205,85	191,07	168,58	183,22	158,27	183,22	158,27	175,31	144,97	178,51	148,61	154,98	117,25	154,98	117,25
*envelope **										4,72	9,85	31,12	45,47	31,12	45,47
*heating systems **										0,35	1,05	1,13	3,38	1,13	3,38
Hot Water	42,22	41,37	38,92	40,05	36,99	40,05	36,99	38,43	34,37	38,86	34,81	34,93	28,82	34,93	28,82

** (absolute difference to AM scenario)*

Change compared to Base-InclEA:
75% ⇨ Economic potential: 25 %

Change compared to 2008:
63% ⇨ Economic potential: 37%

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A deeper look at the buildings sector potentials: residential buildings (MS)

Residential Buildings

Member States
Mtoe, Final Energy Demand

Country	2008	Base_noEA		Base_inclEA		Base_WM		AM		Potential_2030 LPI		HPI		NE	
		2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
Austria	5,85	5,26	4,83	5,14	4,61	5,14	4,61	5,03	4,46	4,99	4,42	4,74	3,85	4,74	3,85
Belgium	7,81	8,18	7,67	7,64	6,99	7,64	6,99	7,41	6,33	7,48	6,40	6,06	4,75	6,06	4,75
Bulgaria	1,91	1,65	1,42	1,65	1,42	1,65	1,42	1,52	1,29	1,62	1,39	1,45	1,17	1,45	1,17
Croatia	2,28	2,51	2,32	2,42	2,21	2,42	2,21	2,14	1,82	2,32	2,07	2,05	1,71	2,05	1,71
Cyprus	0,18	0,22	0,26	0,22	0,25	0,22	0,25	0,20	0,23	0,21	0,23	0,19	0,19	0,19	0,19
Czech Republic	6,20	6,12	5,49	5,89	5,24	5,89	5,24	5,58	4,76	5,66	4,89	5,36	4,46	5,36	4,46
Denmark	2,17	1,96	1,85	1,86	1,57	1,86	1,57	1,80	1,51	1,88	1,62	1,77	1,45	1,77	1,45
Estonia	1,00	0,84	0,68	0,81	0,65	0,81	0,65	0,86	0,72	0,78	0,61	0,83	0,67	0,83	0,67
Finland	4,74	4,26	3,83	4,17	3,66	4,17	3,66	4,05	3,51	4,21	3,76	3,97	3,37	3,97	3,37
France	36,16	36,81	33,96	34,49	31,07	34,49	31,07	33,47	28,14	33,81	28,43	27,02	20,70	27,02	20,70
Germany	58,31	49,10	41,72	48,00	39,80	48,00	39,80	46,95	38,53	46,56	38,21	43,42	31,87	43,42	31,87
Greece	4,25	4,35	4,30	4,22	4,09	4,22	4,09	3,98	3,75	4,06	3,83	3,63	3,06	3,63	3,06
Hungary	5,48	5,53	5,08	5,32	4,85	5,32	4,85	4,73	4,02	5,11	4,52	4,54	3,77	4,54	3,77
Ireland	2,81	3,19	3,16	2,98	2,88	2,98	2,88	2,89	2,61	2,92	2,63	2,37	1,96	2,37	1,96
Italy	20,05	20,88	20,40	20,17	19,26	20,17	19,26	19,02	17,66	19,40	18,02	17,37	14,43	17,37	14,43
Latvia	1,56	1,31	1,08	1,26	1,03	1,26	1,03	1,26	1,03	1,21	0,96	1,21	0,97	1,21	0,97
Lithuania	1,48	1,24	1,00	1,19	0,96	1,19	0,96	1,27	1,07	1,14	0,89	1,22	1,01	1,22	1,01
Luxembourg	0,45	0,52	0,51	0,48	0,47	0,48	0,47	0,47	0,42	0,47	0,43	0,38	0,32	0,38	0,32
Malta	0,03	0,03	0,02	0,03	0,02	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Netherlands	8,68	8,51	8,07	8,31	7,68	8,31	7,68	8,13	7,44	8,07	7,38	7,21	5,57	7,21	5,57
Poland	10,73	12,28	11,35	11,81	10,84	11,81	10,84	9,74	8,15	11,35	10,12	9,35	7,65	9,35	7,65
Portugal	1,47	1,48	1,47	1,44	1,40	1,44	1,40	1,36	1,28	1,39	1,31	1,24	1,05	1,24	1,05
Romania	6,26	6,02	5,26	6,02	5,26	6,02	5,26	5,57	4,77	5,92	5,14	5,28	4,25	5,28	4,25
Slovakia	2,21	2,24	2,04	2,15	1,95	2,15	1,95	2,06	1,82	2,07	1,82	1,98	1,71	1,98	1,71
Slovenia	1,06	1,16	1,07	1,12	1,03	1,12	1,03	0,99	0,84	1,07	0,96	0,95	0,79	0,95	0,79
Spain	12,07	11,64	10,63	11,68	10,70	11,68	10,70	11,03	9,84	11,25	10,03	10,02	8,00	10,02	8,00
Sweden	5,61	5,09	4,53	5,04	4,48	5,04	4,48	4,89	4,31	5,09	4,61	4,80	4,13	4,80	4,13
United Kingdom	39,33	42,00	41,35	39,21	37,69	39,21	37,69	38,04	34,13	38,43	34,49	31,13	25,61	31,13	25,61
EU-27	247,89	241,87	223,06	232,31	209,84	232,31	209,84	222,34	192,64	226,18	197,12	197,49	156,78	197,49	156,78
EU-28	250,17	244,38	225,37	234,72	212,06	234,72	212,06	224,47	194,46	228,50	199,19	199,54	158,49	199,54	158,49

Member States
%, change compared to Base_inclEA

Country	HPI		NE	
	2020	2030	2020	2030
Austria	92%	84%	92%	84%
Belgium	79%	68%	79%	68%
Bulgaria	88%	83%	88%	83%
Croatia	85%	77%	85%	77%
Cyprus	86%	75%	86%	75%
Czech Republic	91%	85%	91%	85%
Denmark	95%	92%	95%	92%
Estonia	102%	103%	102%	103%
Finland	95%	92%	95%	92%
France	78%	67%	78%	67%
Germany	90%	80%	90%	80%
Greece	86%	75%	86%	75%
Hungary	85%	78%	85%	78%
Ireland	80%	68%	80%	68%
Italy	86%	75%	86%	75%
Latvia	96%	94%	96%	94%
Lithuania	103%	105%	103%	105%
Luxembourg	79%	68%	79%	68%
Malta	86%	74%	86%	74%
Netherlands	87%	72%	87%	72%
Poland	79%	71%	79%	71%
Portugal	86%	75%	86%	75%
Romania	88%	81%	88%	81%
Slovakia	92%	88%	92%	88%
Slovenia	85%	77%	85%	77%
Spain	86%	75%	86%	75%
Sweden	95%	92%	95%	92%
United Kingdom	79%	68%	79%	68%
EU-27	85%	75%	85%	75%
EU-28	85%	75%	85%	75%

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Final and primary energy savings in the HPI scenario in 2030 (compared to PRIMES 2013)

	2030		
	Reference Development (PRIMES 2013)	Development based on economic EE potentials (HPI)	Development if 40% GHG reduction are achieved in 2030 (27% RES)
Degree of realisation of sectoral EE potentials		**100%**	**48%**
Final energy savings ambition (comp. to PRIMES 2013 baseline)		**-21.7%**	**-10.4%**
Final energy demand (Mtoe)	1118	875	1002
Residential	295	208	253
Tertiary	166	134	151
Transport	352	267	311
Industry	305	266	286
Primary energy demand (Mtoe)	1482	1132	1265
Primary energy saving ambition (comp. to PRIMES 2013 baseline)		**-23,6%**	**-14.6%**
of which savings from demand side		**-22%**	**-10%**
of which savings from supply side		**-2%**	**-5%**

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The discount rate dispute…

Discount rates (in real terms)	Standard discount rates of PRIMES	Modified discount rates due to EED	
		2015	2020 - 2050
Power generation	9%	9%	9%
Industry	12%	12%	12%
Tertiary	12%	11%	10%
Public transport	8%	8%	8%
Trucks and inland navigation	12%	12%	12%
Private cars	17.5%	17.5%	17.5%
Households	17.5%	14.75%	12%

PRIMES 2013/EC

This boils down to the question in how far discount rates used to evaluate FUTURE policies shall reflect PRESENT individual decision making processes with rather imperfect mechanisms to include risk assessment into the discount rates.

PRIMES integrates **(perceived or existing) risks** into the discount rates to a large degree, our scenario approach essentially uses usual **capital costs, considering that there are instruments to mitigate the risks and the risk perception**

Sector	Scenario	Discount rate
Household – space heating and hot water	All	3.1% to 3.7%
Tertiary – space heating and hot water	All	4.7% to 5.4%
Household – Appliances	Potential_2030_LPI	Typically 6% (discount rates vary between different countries, appliances)
	Potential_2030_HPI Potential_2030_NE	2% (assuming removal of barriers from 2020)
Tertiary – Appliances	Potential_2030_LPI Potential_2030_HPI Potential_2030_NE	15% 5% 5%
Industry	Potential_2030_LPI Potential_2030_HPI Potential_2030_NE	Paypack up to 2 years accepted by 50% of companies; heating systems 15% Paypack up to 5 years accepted by 60% of companies; heating systems 15% Companies accept longer payback periods [3] heating systems 3%
Transport	N/A	N/A

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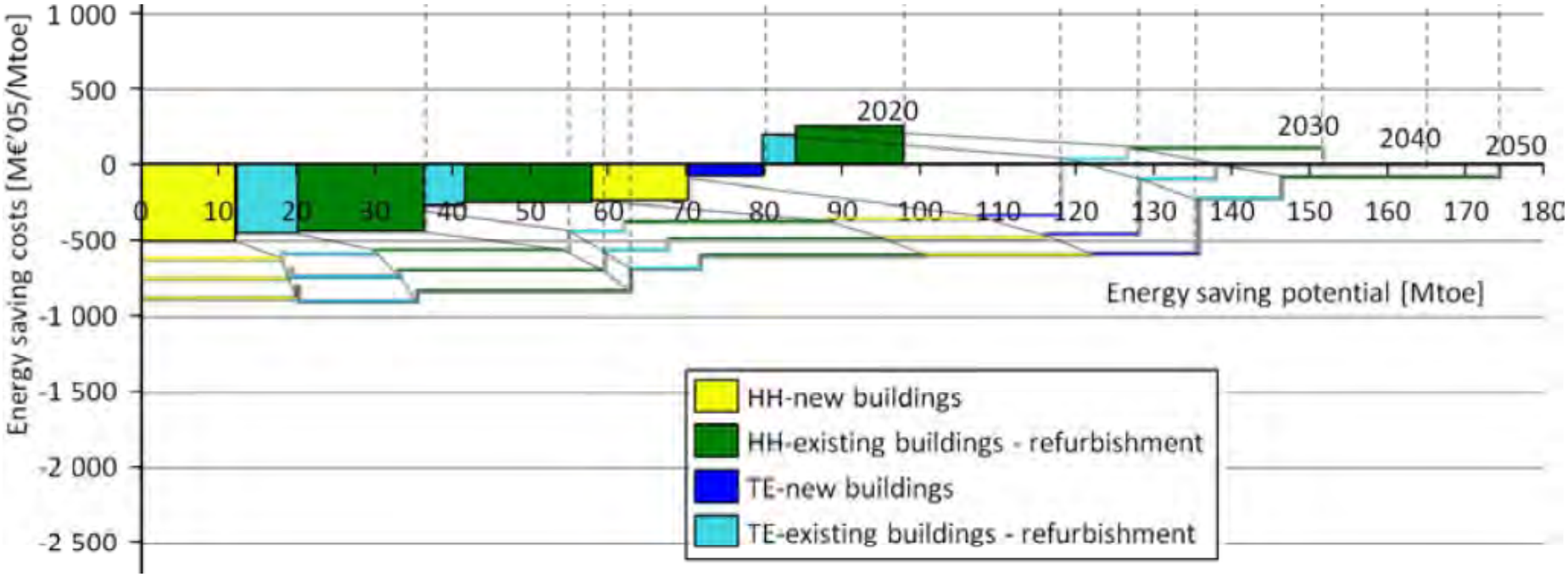
The impact of such high discount rates on investment decisions is dramatic...

- Case that a standard individual house is replaced with a passive house building: Such a building may cost 300000 Euro and the additional costs for passive house standard are around 8% or **24000 Euro**.
- The original house may use 30000 kWh/year and the passive house 90% less energy. We assume 25 years lifetime for the investment.
- With a gas price of 5.5 centsEuro/kWh and a 17.5% discount rate the net present value of the energy saved is around **9800 Euro**.
- With a discount rate of 12%, this would reach around **13000 Euro**, with 9% around **16000 Euro**,
- On the other hand we may use typical capital costs of 2-4% as applied in our modeling. With 3% the net present value of the savings in the above example would be nearly **27000 Euro** over the 25 years lifetime assumed.

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Role for policies to overcome non-economic barriers !

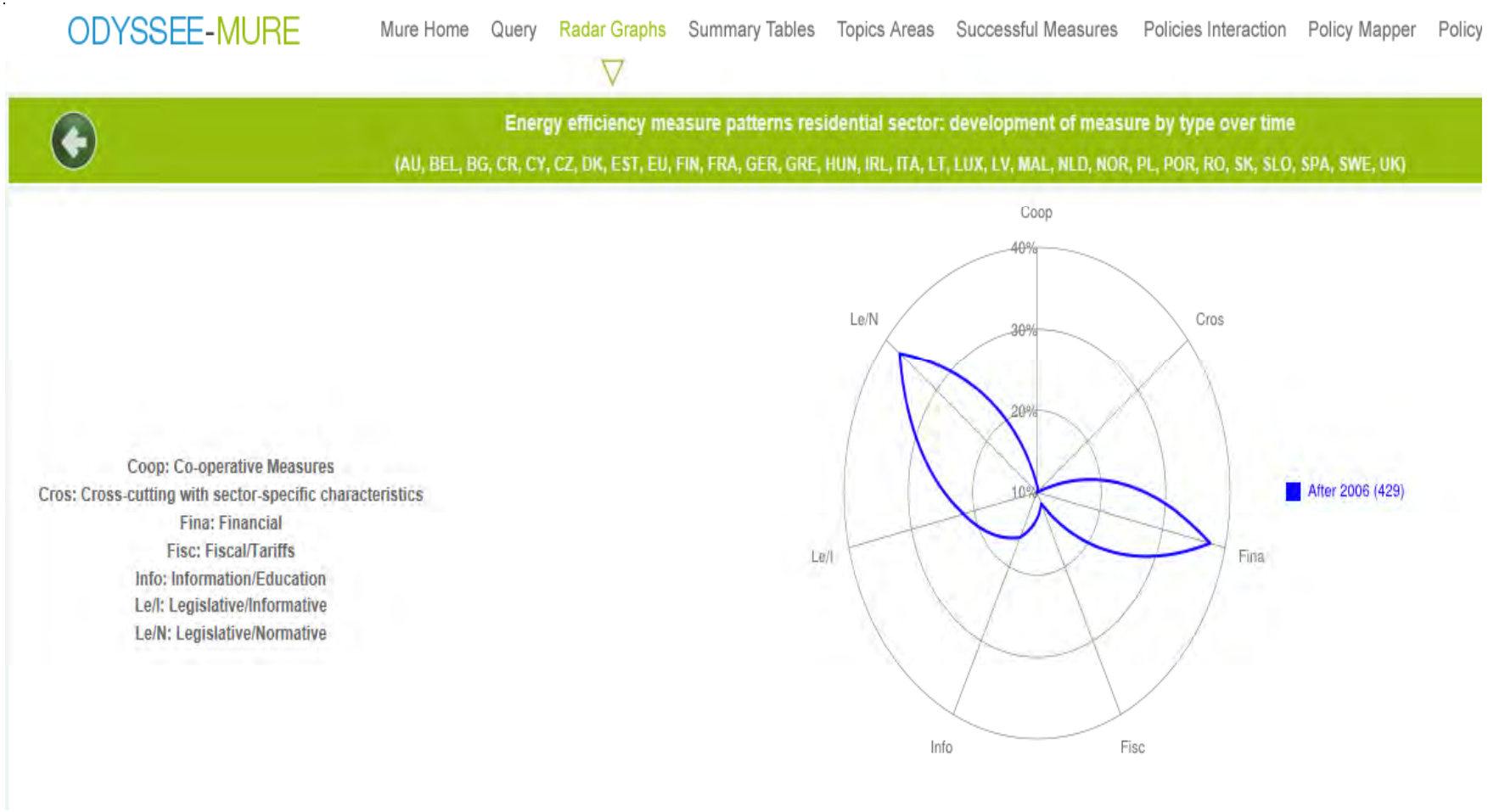
Cost curve for energy savings potentials in buildings up to 2050



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Present policy mix for the building sector in Europe: mix of legislative and financial measures

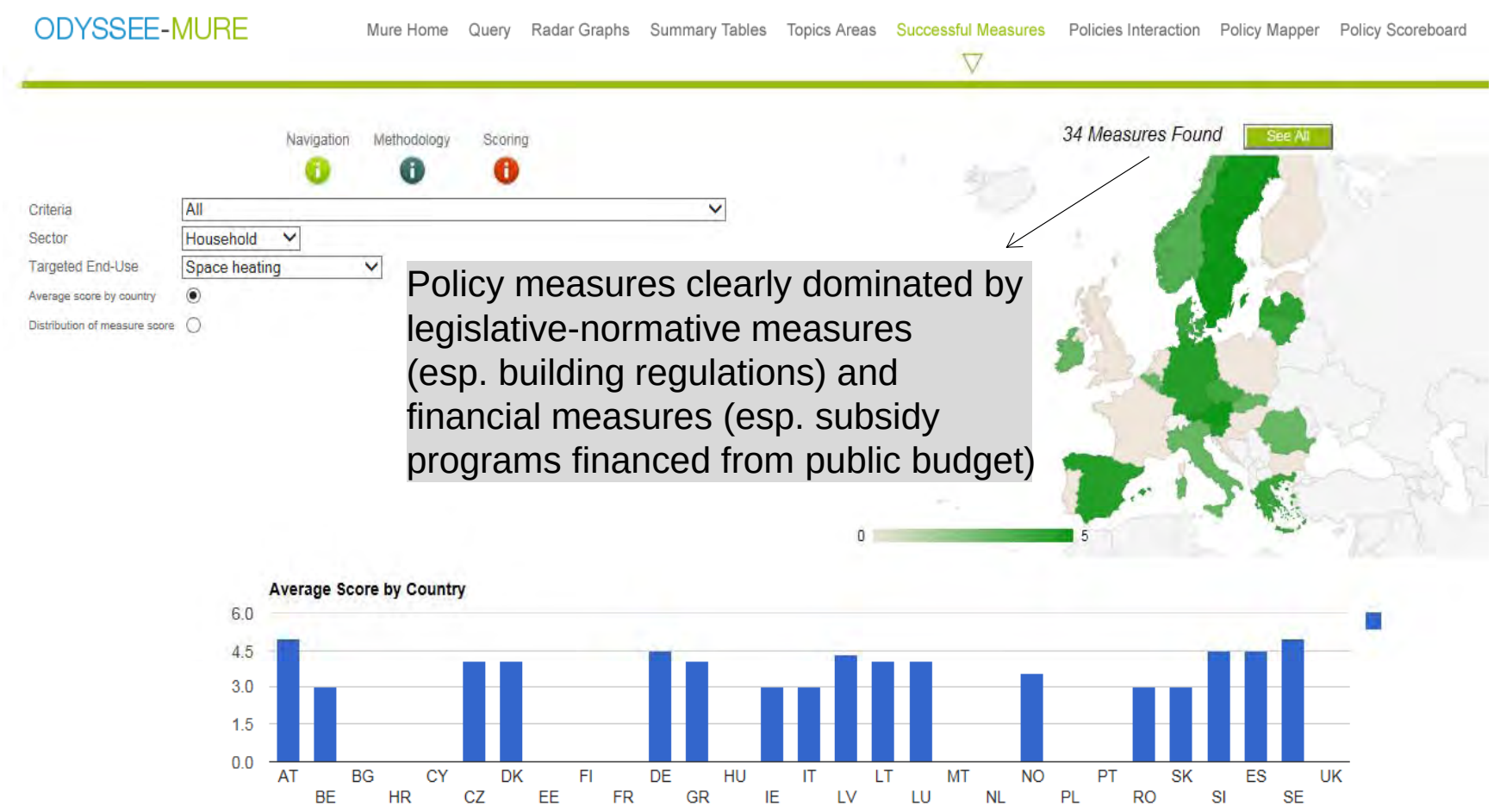


Source: MURE database

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Most successful measures addressing residential space heating in the Member States



Source: MURE database

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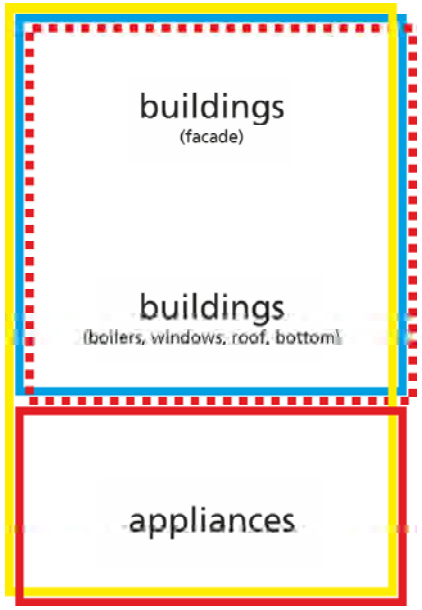
Challenges to exploit the (economic) savings potentials in the building sector

- In the Baseline scenario incl. Early Action, we assumed an ambitious implementation of the EPBD (Recast) in the Member States and ambitious revisions of the eco-design implementing mesures, a moderate adoption of new implementing measures and an ambitious recast of the labelling directive ⇨ some policy effort is still needed to fullfil these conditions.
- In the HPI scenario, we assumed a removal of economic and non-economic barriers ⇨ significant policy effort is needed to remove these barriers
- In order to realize the economic potentials, substantial upfront investments are necessary despite the fact that the investments will pay largely off in the future. The order of magnitude is estimated by Ecofys and Fraunhofer ISI at around 800 billion Euro only until 2020
- ⇨ additional financial tools apart from public financing must be further exploited as e.g. (leveraging of private investments from companies in the energy sector through energy saving obligations or energy service companies, or a levy on energy consumption).

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Policy mix addressing economic and non-economic barriers and budget constraints



Our conclusion:
Solutions exist to cover the large investment needs for the built environment. However, Member States and the EU need to design stable mixtures of policy instruments, depending only partially on state budgets in order to provide the required long-term stability to investors in efficient buildings (incl. deep renovations).



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Thank you for your attention

For more information:

http://www.odyssee-mure.eu

http://ec.europa.eu/energy/efficiency/studies/efficiency_en.htm

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