Modelling the impact of policy and measures with MURE: Czech Republic and Hungary Case studies

Final Meeting ***EEE-NMC***

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Contents

- The methodological approach
- Results from the impact assessment of the Czech Republic and Hungary P&Ms in the household sector

The methodological approach

- The MURE tool allows to evaluate the ex ante or ex post impact of P&Ms through a bottom-up approach
- The assessment is made measure by measure and the outputs are provided in terms of energy saved and CO_2 avoided;
- For each country, the savings corresponding to the application of the P&Ms, are evaluated by measuring the impact of a “Policy scenario” with respect to a “Reference scenario”.

The “Reference scenario”

- The “Reference scenario” is defined as a simulation in which the energy demand trend is calculated by considering the main energy consumption drivers (e.g. the demography and social drivers as measured by the n° of households);
- It includes possible saturation trends in the drivers, and could also comprise the residual impact of energy saving measures implemented before the reference year, that is the year from which the impact simulation exercise starts.

The “Policy scenario”

The “Policy scenario” refers to a scenario in which the energy demand development takes into account additional energy saving measures implemented *after* the reference year.

Setting the Policy scenario

1°	2°	3°	4°
Measures' selection	Measures' parameterization	Calculation	Energy savings

1°

Measures' selection

Measures Issued BEFORE Reference year

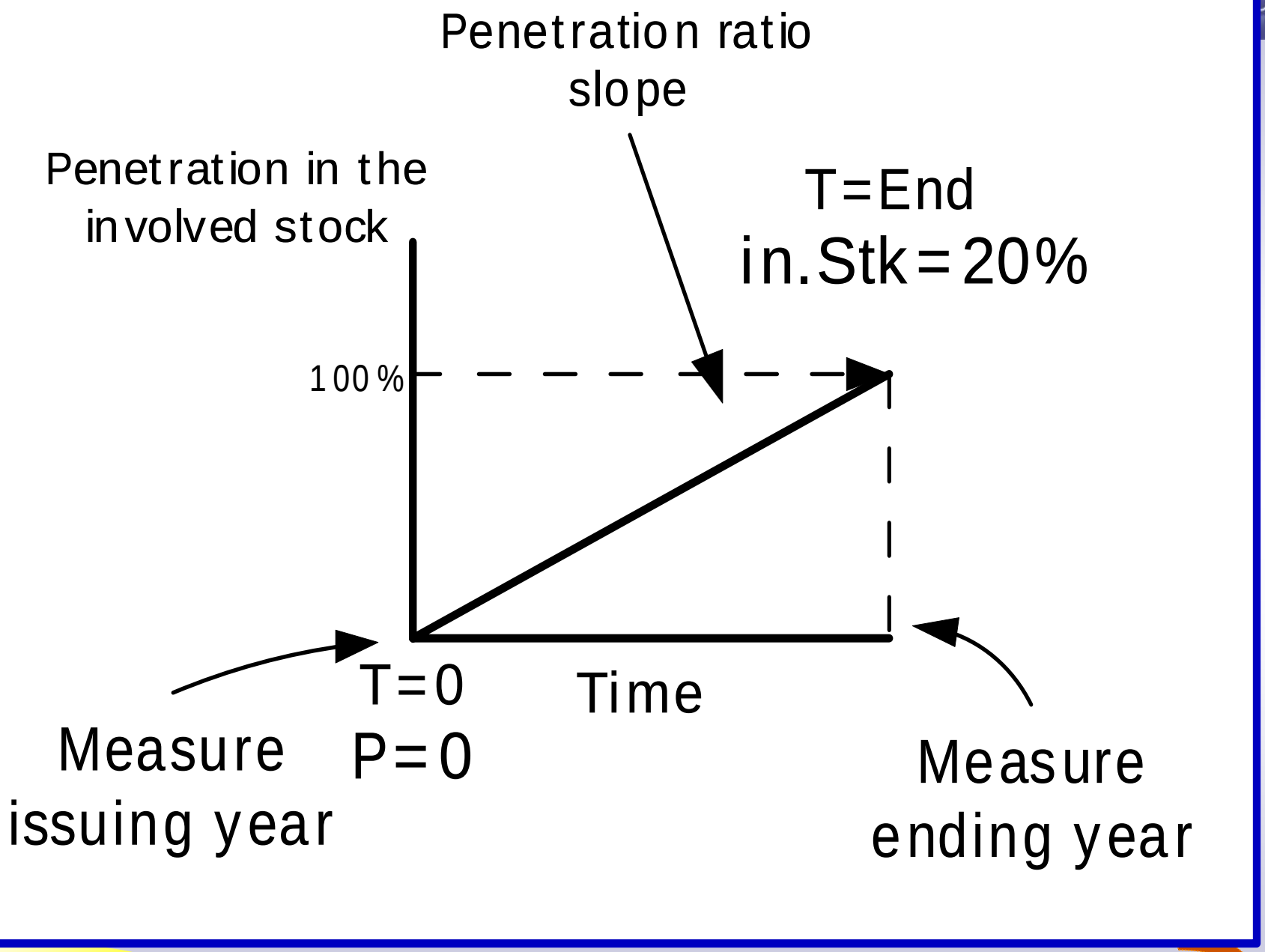
Measures Issued AFTER Reference year

2°

Measures' parameterization

Estimation of Penetration Rates

Estimation of Energy savings gain


Penetration ratio
slope
Penetration in the
involved stock
T=End
in.Stk=20%
100%
T=0
P=0
Time
Measure
issuing year
Measure
ending year

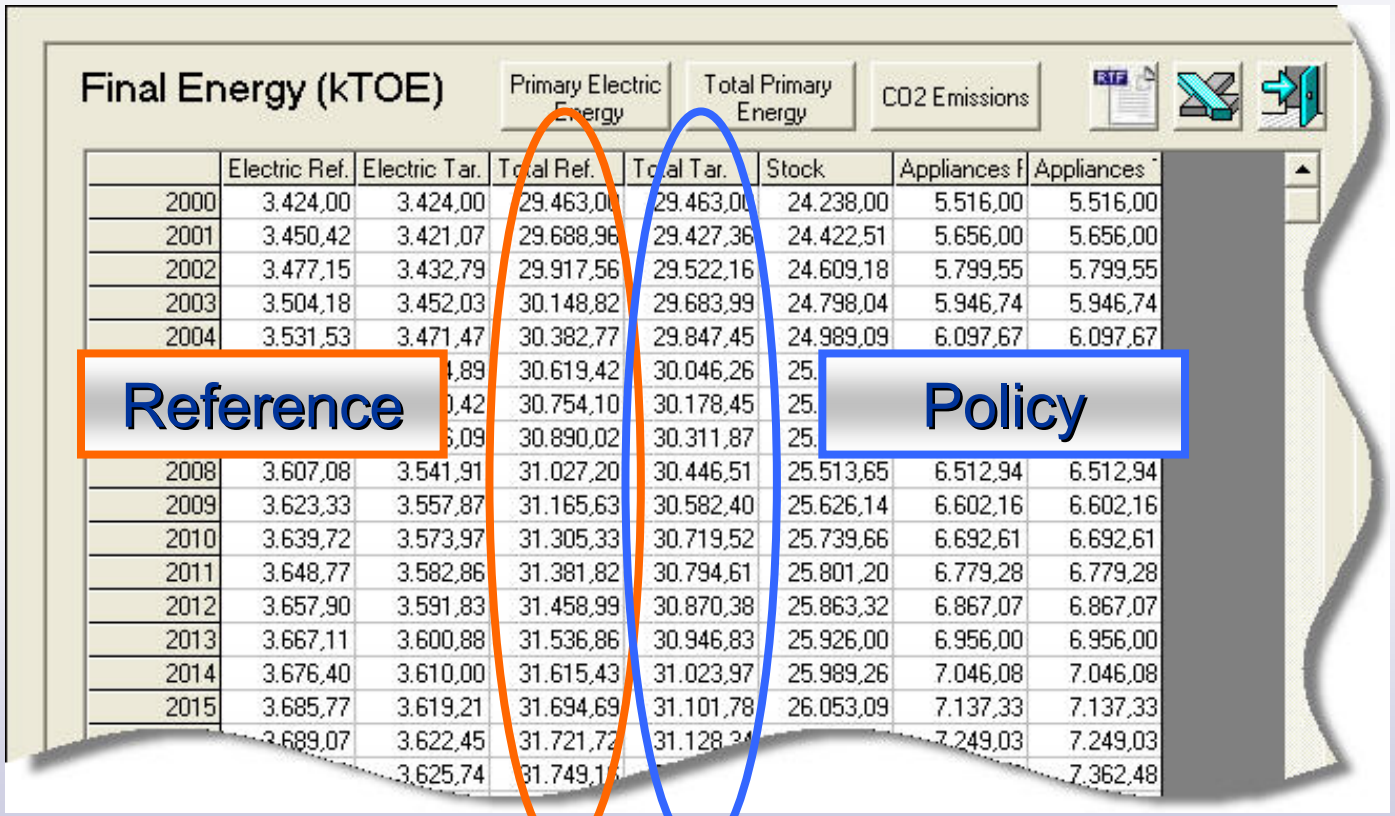
3°

4°

Intelligent Energy Europe

Calculation

Energy savings



	Electric Ref.	Electric Tar.	Total Ref.	Total Tar.	Stock	Appliances R	Appliances T
2000	3.424,00	3.424,00	29.463,00	29.463,00	24.238,00	5.516,00	5.516,00
2001	3.450,42	3.421,07	29.688,96	29.427,36	24.422,51	5.656,00	5.656,00
2002	3.477,15	3.432,79	29.917,56	29.522,16	24.609,18	5.799,55	5.799,55
2003	3.504,18	3.452,03	30.148,82	29.683,99	24.798,04	5.946,74	5.946,74
2004	3.531,53	3.471,47	30.382,77	29.847,45	24.989,09	6.097,67	6.097,67
2005		3.491,89	30.619,42	30.046,26	25.		
2006		3.512,42	30.754,10	30.178,45	25.		
2007		3.526,09	30.890,02	30.311,87	25.		
2008	3.607,08	3.541,91	31.027,20	30.446,51	25.513,65	6.512,94	6.512,94
2009	3.623,33	3.557,87	31.165,63	30.582,40	25.626,14	6.602,16	6.602,16
2010	3.639,72	3.573,97	31.305,33	30.719,52	25.739,66	6.692,61	6.692,61
2011	3.648,77	3.582,86	31.381,82	30.794,61	25.801,20	6.779,28	6.779,28
2012	3.657,90	3.591,83	31.458,99	30.870,38	25.863,32	6.867,07	6.867,07
2013	3.667,11	3.600,88	31.536,86	30.946,83	25.926,00	6.956,00	6.956,00
2014	3.676,40	3.610,00	31.615,43	31.023,97	25.989,26	7.046,08	7.046,08
2015	3.685,77	3.619,21	31.694,69	31.101,78	26.053,09	7.137,33	7.137,33
	3.689,07	3.622,45	31.721,72	31.128,34		7.249,03	7.249,03
		3.625,74	31.749,1				7.362,48

MURE ODYSSEE

The impact evaluation case studies

Measures' selection

CZECH REPUBLIC	
CZ1	Minimum thermal insulation standards
CZ2	Level of thermal energy demand according to Czech standards
CZ3	Minimum efficiency standards for boilers
CZ4	Control systems for heating
CZ5	Periodic mandatory inspection of boilers
CZ6	Mandatory energy labelling of electrical appliances
CZ7	Investment subsidies in the framework of Annual Government Programme
CZ8	Subsidies for elaboration of energy audits in the framework of Annual Government Programme

Measures' selection (2)

HUNGARY	
HUN1	Energy labelling of household appliances
HUN2	Building codes
HUN3	Energy efficient modernization of buildings
HUN4	Financial assistance for domestic energy savings
HUN5	Extension of RES for Municipalities and private individuals
HUN6	Introduction of bill settlement based on metering in district heating
HUN7	Modernization of secondary heating/SHW supply equipment of flats with district heating supply

Measures' selection(3)

CZECH REPUBLIC:

- **8 measures of which 0 before the Reference year and 8 after** (but 5 considered within the simulation)

HUNGARY:

- **7 measures of which 3 before the Reference year** (but 2 considered within the simulation) **and 4 after** (but 2 considered within the simulation)

Measures' selection(4)

- It is worth noting that the reference scenario of the Czech Republic has been developed taking into account the autonomous penetration (up to2025) of the buildings having the insulation standards of the buildings built during the years 1990-2000

Measures' parameterization

CZECH REPUBLIC:

- 3 measures described here

HUNGARY:

- 1 measure described here

in order to show how
the parameterization
has been pursued

CZ2 - Level of thermal energy demand according to Czech standards

The measure deals with the refurbishment of prefabricated buildings built during the years 60s and 70s and of other types of low income buildings.

CZ2 - Level of thermal energy demand according to Czech standards

Starting year:	2006
Ending year:	2025
Total stock:	4.3 millions
% involved stock:	16% Insulation – 35% Windows replacement
Gain:	15% Insulation – 20% Windows replacement
Notes:	The data comes from a study carried out in the city of Prague and from performed energy audits on buildings (Enviros).

CZ3 - Minimum efficiency standards for boilers

The measure specifies the minimum required efficiencies for electricity and heat production. For what concerns the household sector, it is addressed to all boilers using fossil fuels having heat capacity equal or greater than 200 kW.

CZ3 - Minimum efficiency standards for boilers

Starting year:	2002
Ending year:	2020
Total stock:	2.5 millions
% involved stock:	6,6%
Gain:	14%
Notes:	The involved stock of boilers has been obtained from the “Register of Sources of Air Pollution” (REZZO) – a database containing information about all heat sources with total capacity above 200kW. (Enviros)

CZ6 - Mandatory energy labelling of electric appliances

The measure applies the EU Directives on the domestic appliances.

In our simulation we have taken into account the cold appliances (freezers and refrigerators) and washing machines.

CZ6 - Mandatory energy labelling of electric appliances

Starting year:	2004
Ending year:	2025
% involved stock:	100%
Gain:	Calculated
Notes:	Data provided by other on going projects (i.e. Ecodesign)

Cold appliances 2001 mix	
A	33,80%
B	45,34%
C	19,74%
D,E,F	1,12%

Washing machines 2001 mix	
A	42,73%
B	36,83%
C	17,01%
D	3,43%

	Cold appliances	Washing machines
2001	A = 33,80% Sales Specific energy cons = 335.2 kWh/yr	A = 42,73% Sales Specific energy cons = 250 kWh/yr
2025	A^{++}=100% Sales Target energy cons = 158 kWh/yr	A^{++}=100% Sales Target energy cons = 180 kWh/yr

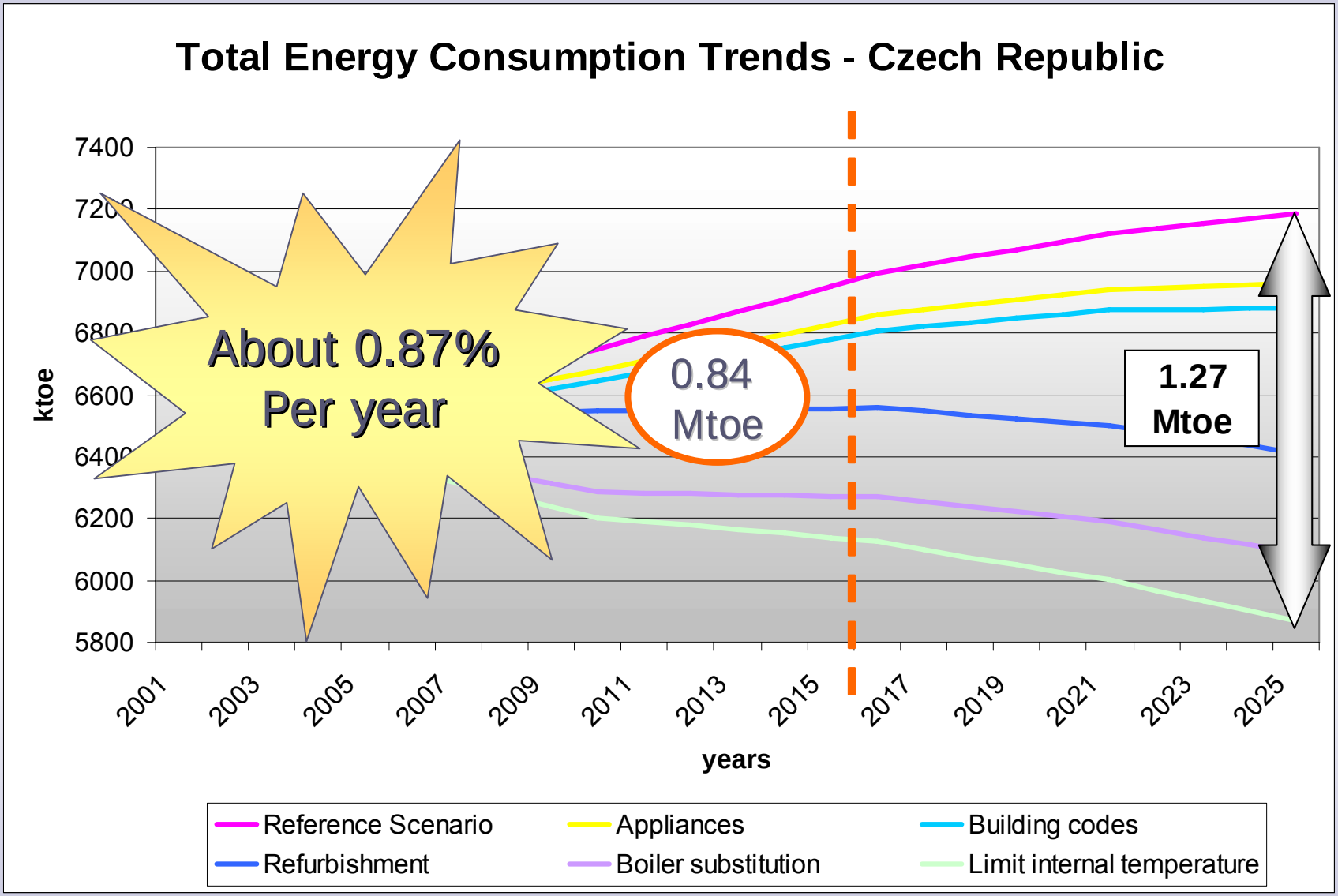
Measures' parameterization - Hungary

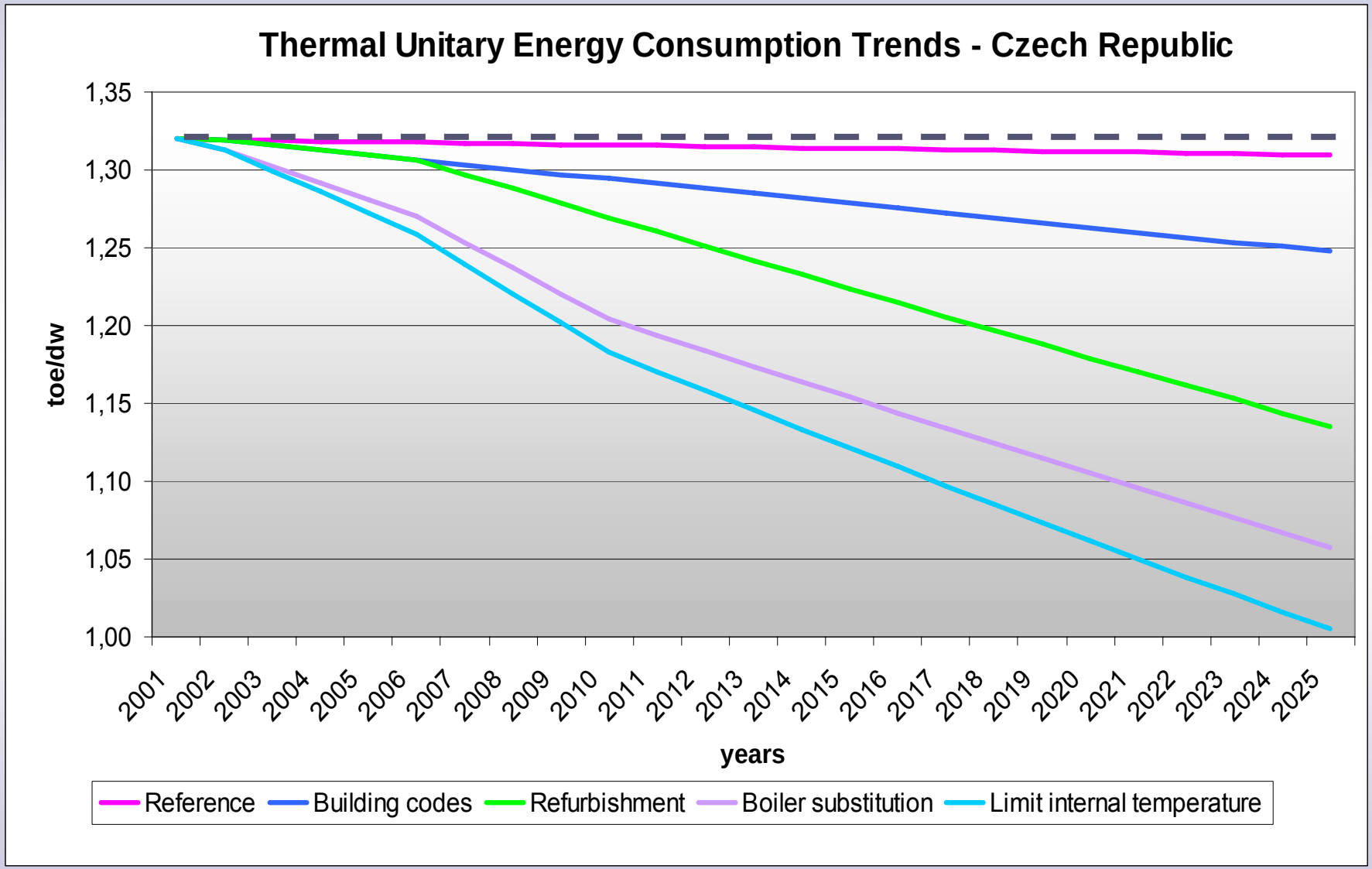
HUN3 – Energy efficient modernization of buildings

The measure deals with the renewal of prefabricated residential buildings through grants provided by central and local administrations. The target is the energy conservation as well as modernization and renovation of the buildings' surroundings.

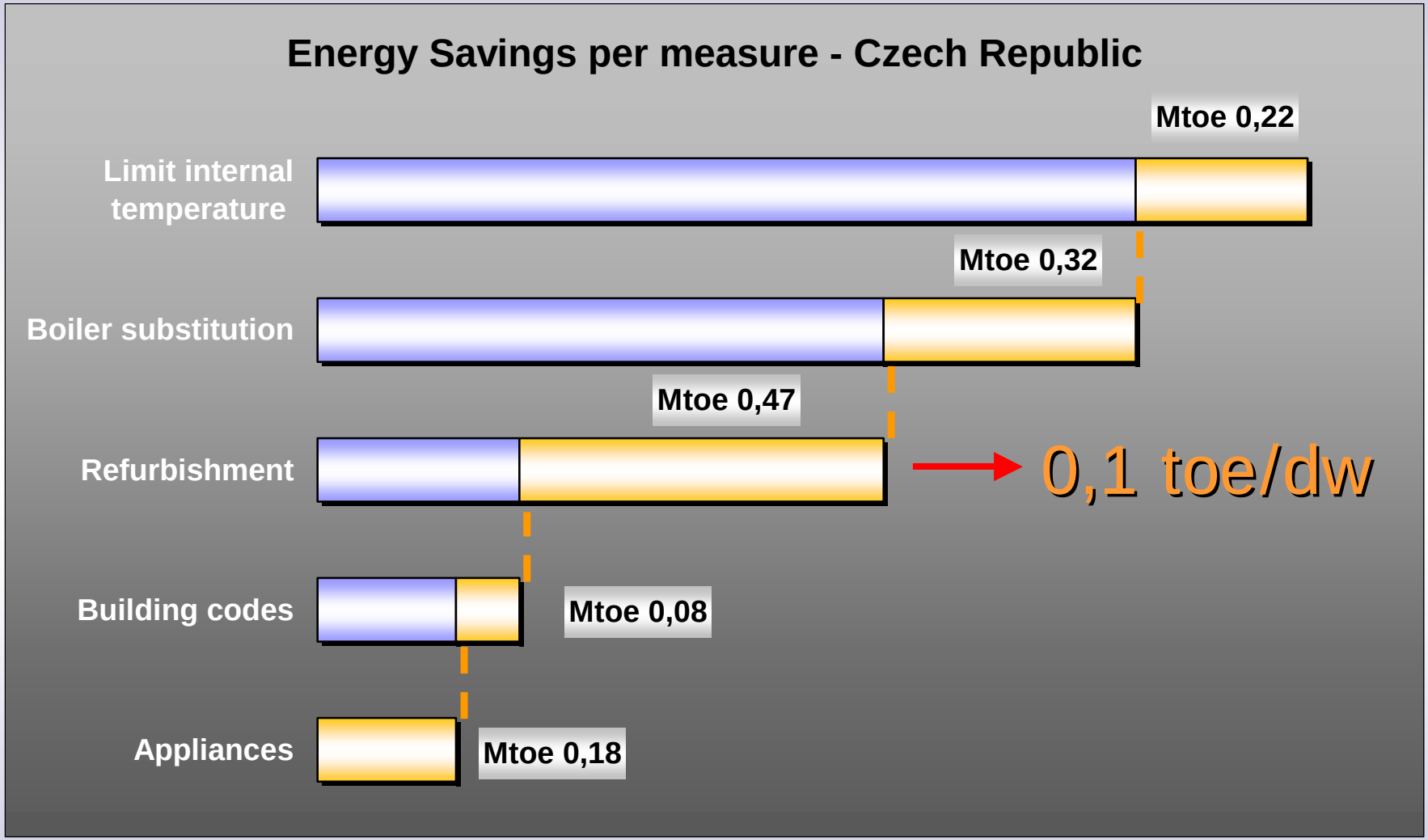
HUN3 – Energy efficient modernization of buildings

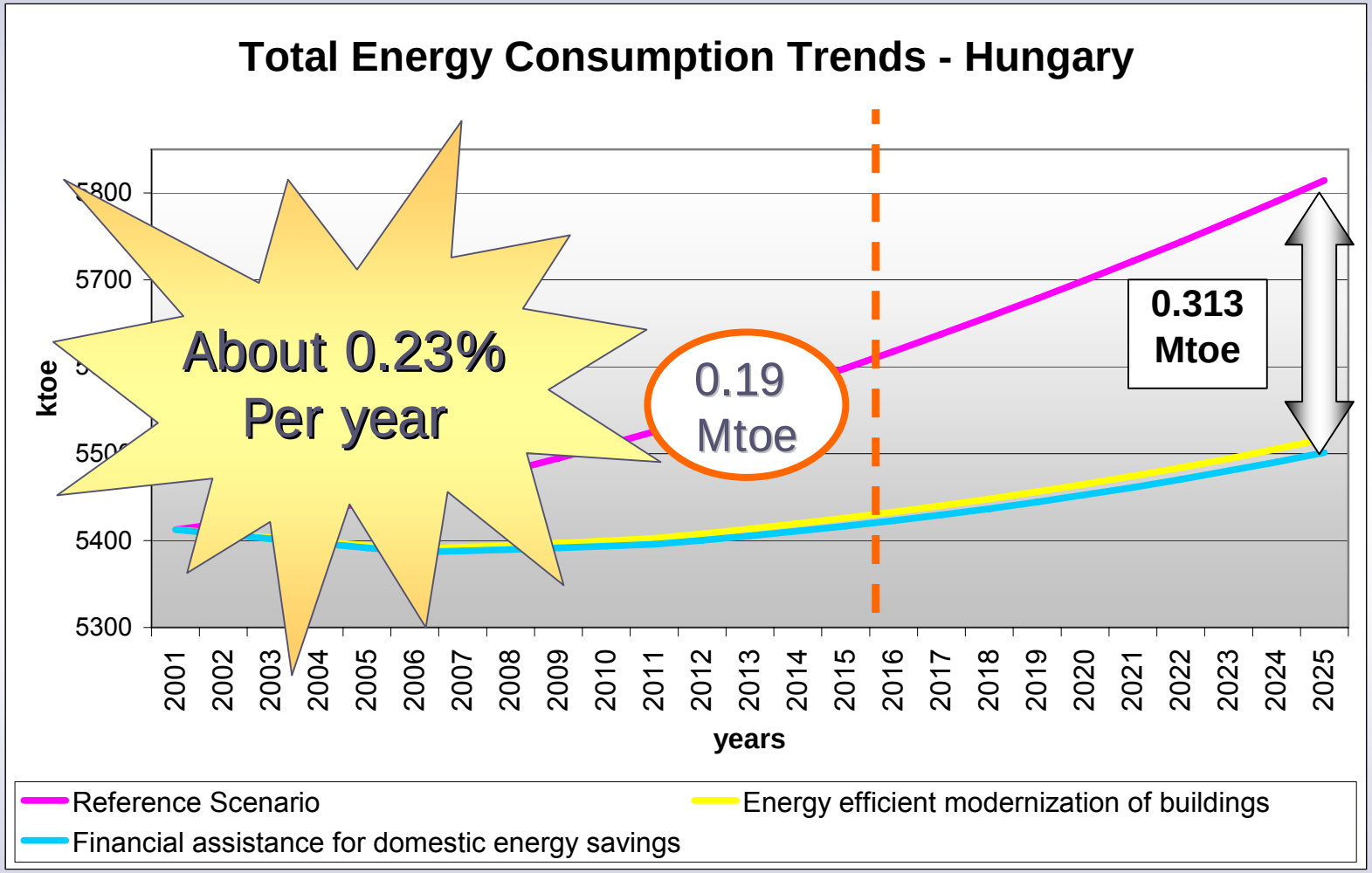
Starting year:	2001
Ending year:	2025
Total stock:	3.7 millions
% involved stock:	21%
Gain:	30% Insulation – 16% boilers substitution
Notes:	We have considered 3 interventions: 1. Insulation (double glazing windows, doors and external panels on walls) 2. Fuel substitution (up to 2025 a share of 50% of gas and 50% of district is foreseen) 3. Replacement of old boilers (Energy Centre H.)

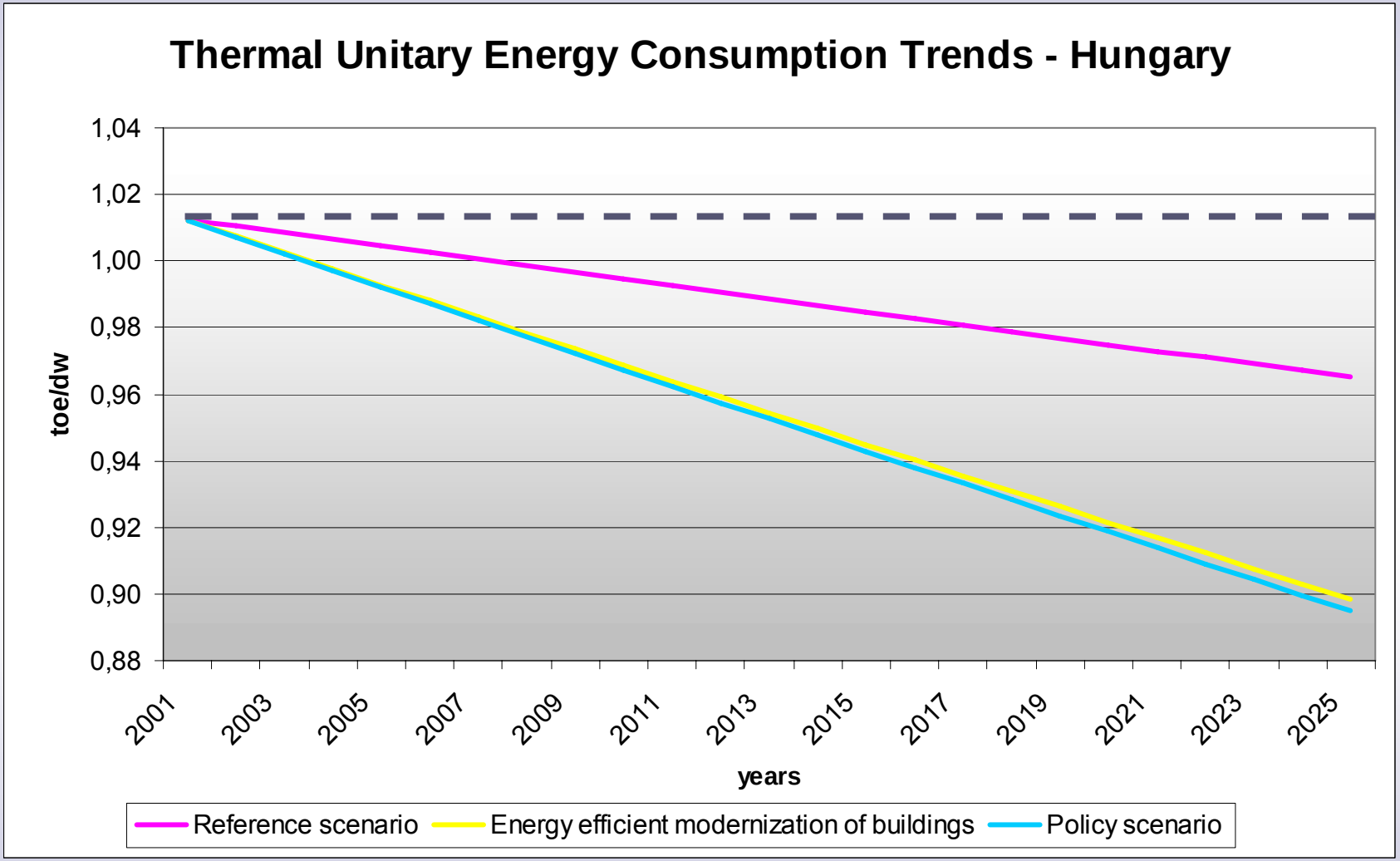

Total Energy Consumption Trends - Czech Republic
About 0.87%
Per year
0.84
Mtoe
1.27
Mtoe
ktoe
7400
7000
6800
6600
6400
6200
6000
5800
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
years
Reference Scenario
Appliances
Building codes
Refurbishment
Boiler substitution
Limit internal temperature


Thermal Unitary Energy Consumption Trends - Czech Republic
toe/dw
1,35
1,30
1,25
1,20
1,15
1,10
1,05
1,00
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
years
Reference
Building codes
Refurbishment
Boiler substitution
Limit internal temperature

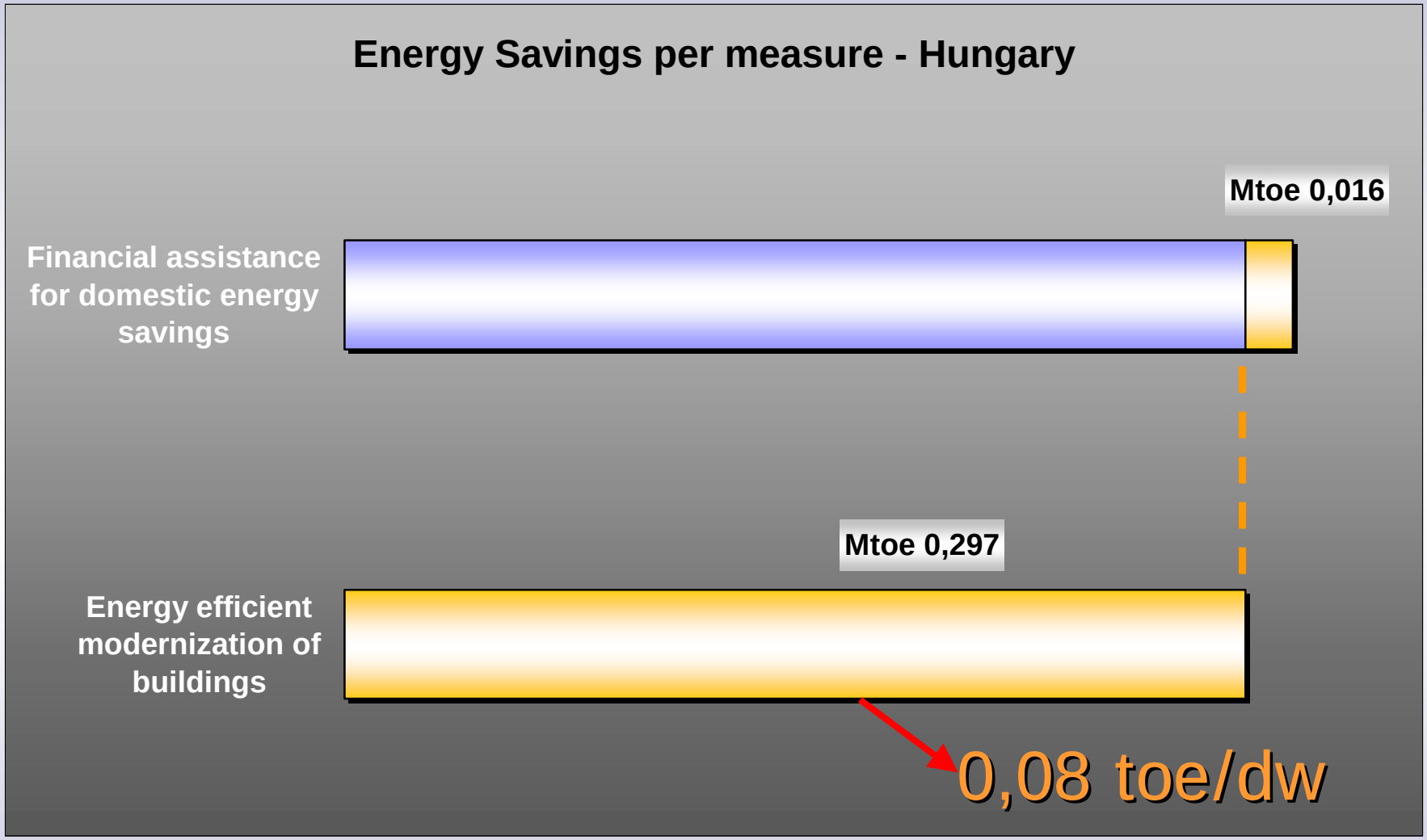
	Total Energy Consumption Trends Czech Republic		
	Thermal	**Electric**	**Total**
2001	5051,4	1358,0	6409,4
2025 Reference	5471,5	1668,7	7140,2
2025 Policy	4376,9	1490,8	5867,7


Energy Savings per measure - Czech Republic
Limit internal temperature
Mtoe 0,22
Boiler substitution
Mtoe 0,32
Refurbishment
Mtoe 0,47
0,1 toe/dw
Building codes
Mtoe 0,08
Appliances
Mtoe 0,18


Total Energy Consumption Trends - Hungary
ktoe
5800
5700
5400
5300
About 0.23%
Per year
0.19
Mtoe
0.313
Mtoe
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
years
Reference Scenario
Energy efficient modernization of buildings
Financial assistance for domestic energy savings


Thermal Unitary Energy Consumption Trends - Hungary
1,04
1,02
1,00
0,98
0,96
0,94
0,92
0,90
0,88
toe/dw
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
2023
2025
years
Reference scenario
Energy efficient modernization of buildings
Policy scenario

	Total Energy Consumption Trends Hungary		
	Thermal	**Electric**	**Total**
2001	4177,9	1234,7	5412,6
2025 Reference	4305,7	1508,6	5814,3
2025 Policy	3992,9	1508,6	5501,5


Energy Savings per measure - Hungary
Mtoe 0,016
Financial assistance for domestic energy savings
Mtoe 0,297
Energy efficient modernization of buildings
0,08 toe/dw

Conclusions

- By considering the energy savings per year, the Czech Republic is closer than Hungary to ESD requirements (0.87% vs. 0.23%)
- For Czech Republic the way to fulfil the Directive requirements is probably the extension of the boiler standards to the low-size boilers (≤ 200 kW) together with a future tighten of the new building codes
- Also Hungary should implement measures targeted to the heating systems improvement and control and update and tighten new building codes standards
- For both countries the enforcement of an extended auditing/information programme could help increasing the family awareness to the energy efficiency issues and achieve still high energy saving potentials

Many thanks to Mr Jiry Spitz of Enviros and Mr Laszlo Elek of the Hungarian Energy Centre for their collaboration in these case studies