Employment impacts and other co-benefits of a Large-Scale Deep Building Energy Retrofit Programme in Hungary and Poland


Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary

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Diana Urge-Vorsatz

EU 2020 Objectives in Central and Eastern Europe

2011, July 6, Parliament

Outline

- Background
- Research aims
- Methodology and novelty
- Key findings
  - Why to go deep: the lock-in effect
- Conclusions and recommendations

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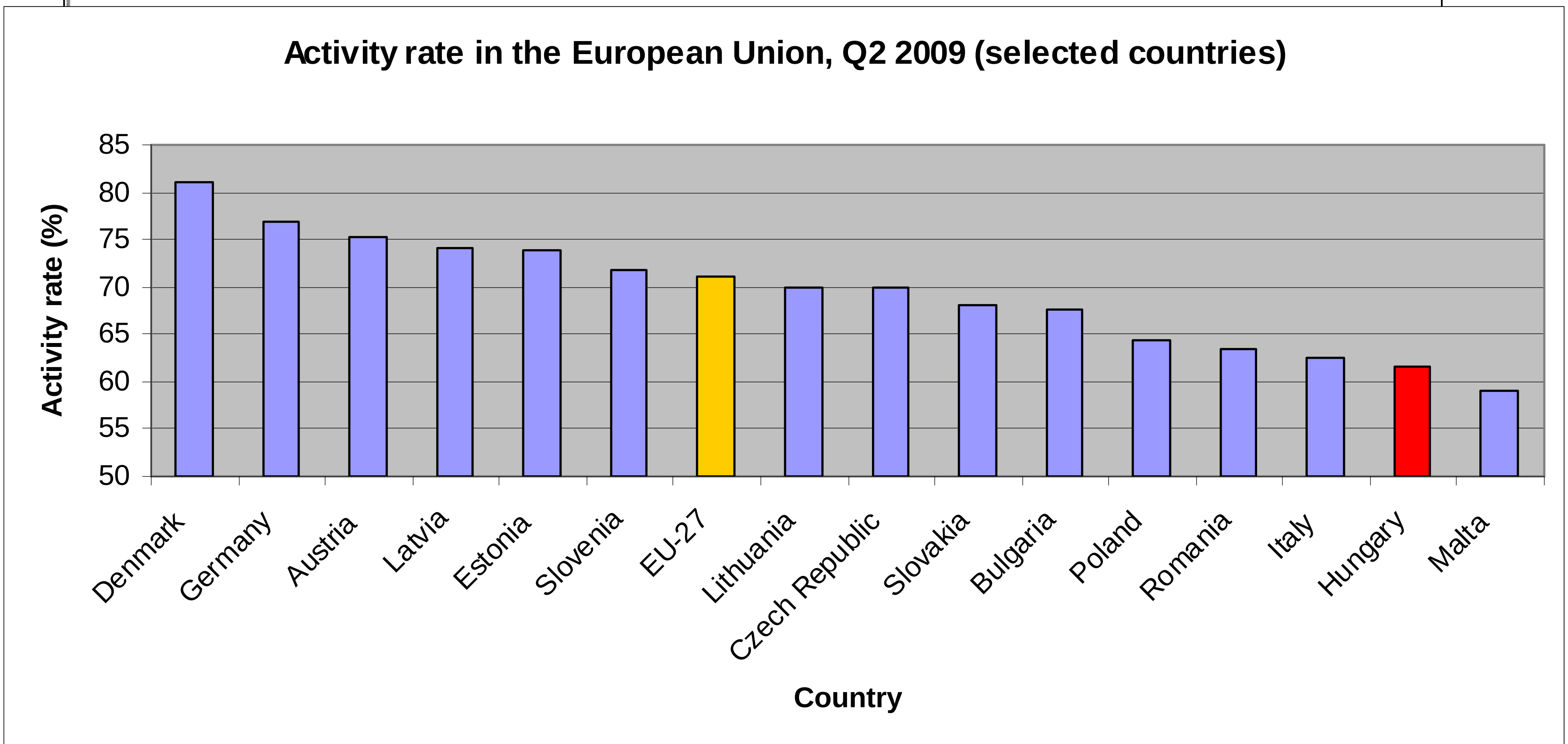
Background

- Economic profitability or environmental goals have not been strong enough drivers for EE policy
- Increasing evidence of significant co-benefits, especially for building EE
- These may prove to be stronger entry points into policy-making than the economic/climate rationales
- Hungary and Poland
  - Low activity rate in EU
  - Energy security is major issue (in Hu)
  - Fuel poverty major problem
  - Poor thermal performance of the building stock

Background



Households' specific energy consumption (kWh/m2a) scaled to EU average climate. Hungary vs. CEE Member States. Average 2000-2007
Source: own elaboration based on data retrieved from the ODYSSEE database

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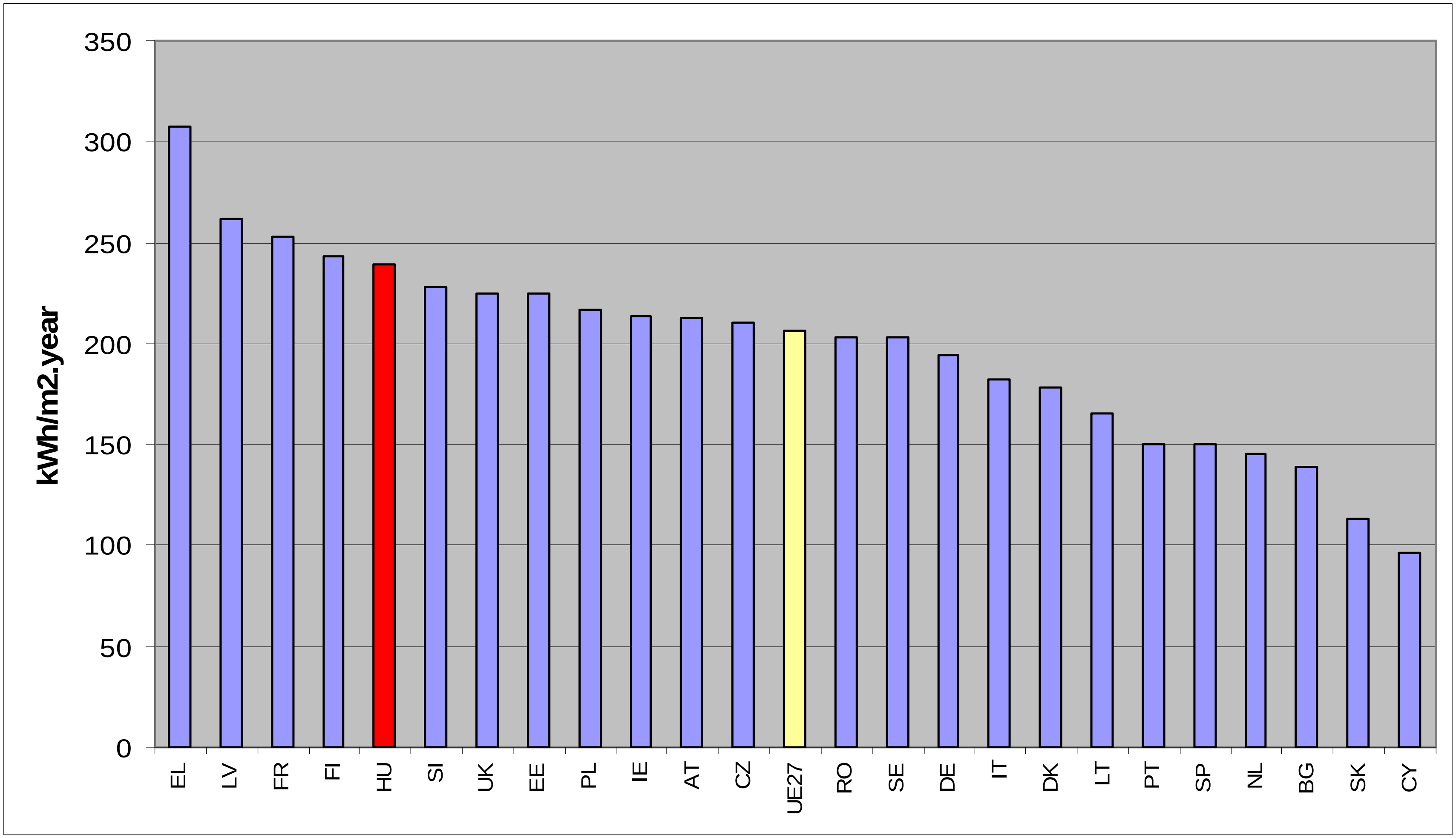
Energy performance of the residential building stock

Per unit energy consumption scaled to EU average climate



Source: ODYSSEE

Purpose

- **Objective**: to gauge the net employment impacts of a large-scale deep building energy-efficiency renovation programme
- Using a robust methodology
  - Novel hybrid of i/o analysis and upscaling assessment
- to ensure full credibility:
  - Reputable team
  - Broad expert review

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The research team (Hu)

Principal investigator

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Research and data collection in Hungary and Austria

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Methodology

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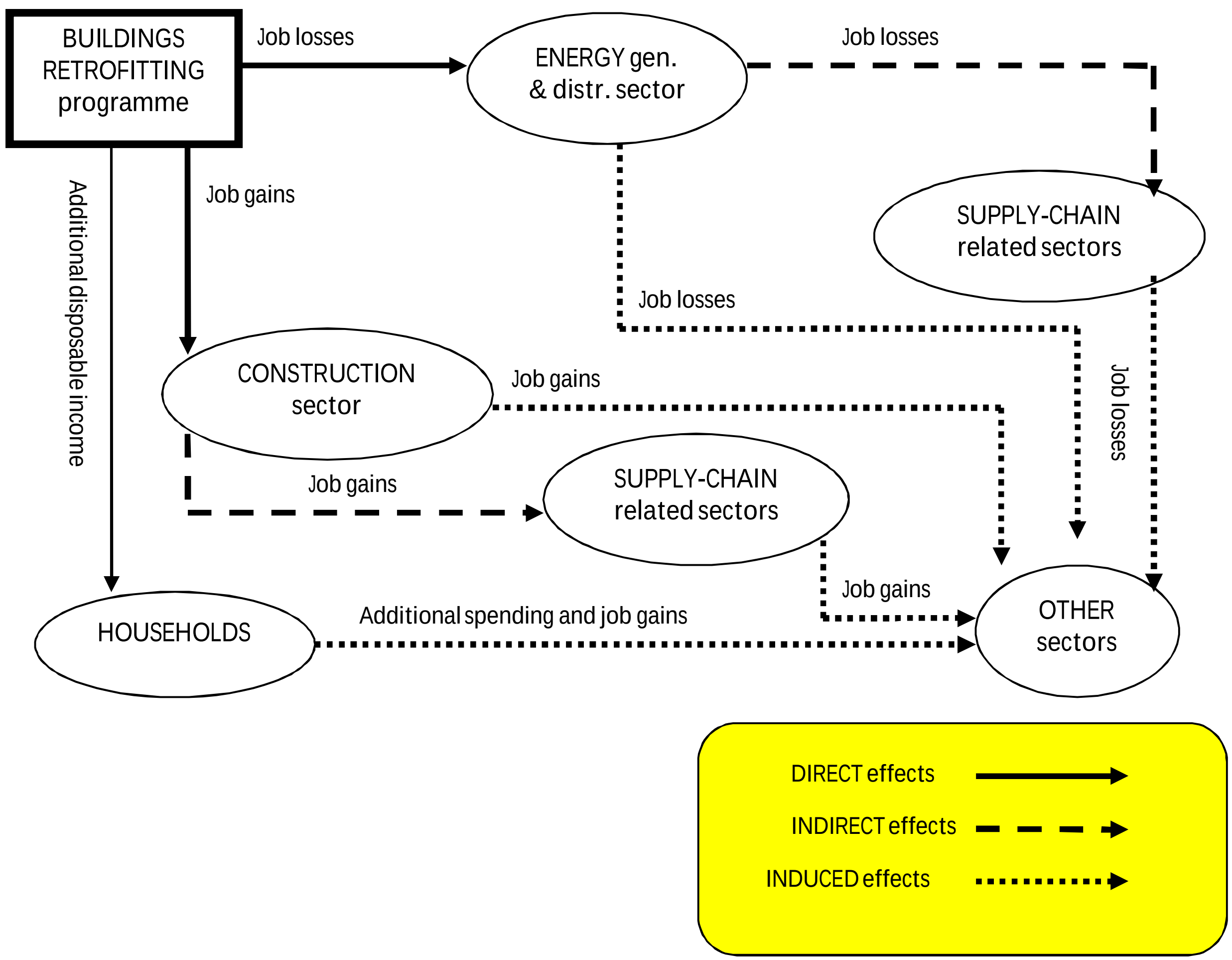
Employment Effects: Overview

- Direct impacts
  - Positive on the construction industry
  - Negative on the energy industry
- Indirect impacts
  - Upstream in the supply chain
- Induced impacts
  - Caused by the increased disposable income:
    - From new jobs (directly and indirectly generated)
    - From energy savings
- Qualitative analysis
  - Types of employment generated and skill levels
  - Geographical distribution
  - Durability of the jobs (short/long-term)
  - Supply of labour

Employment Effects: Overview



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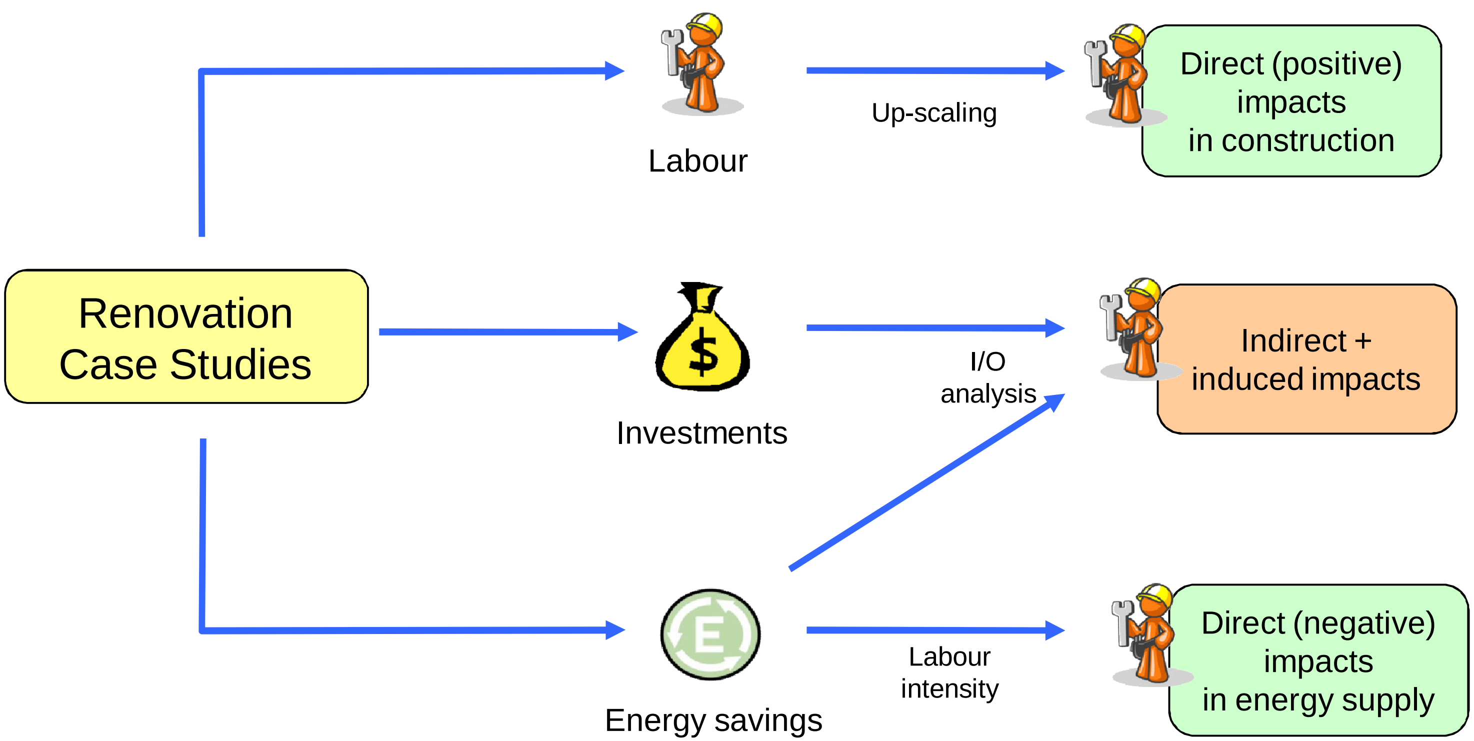
Methodology used

- Mixed: Up-scaling + Input-Output analysis



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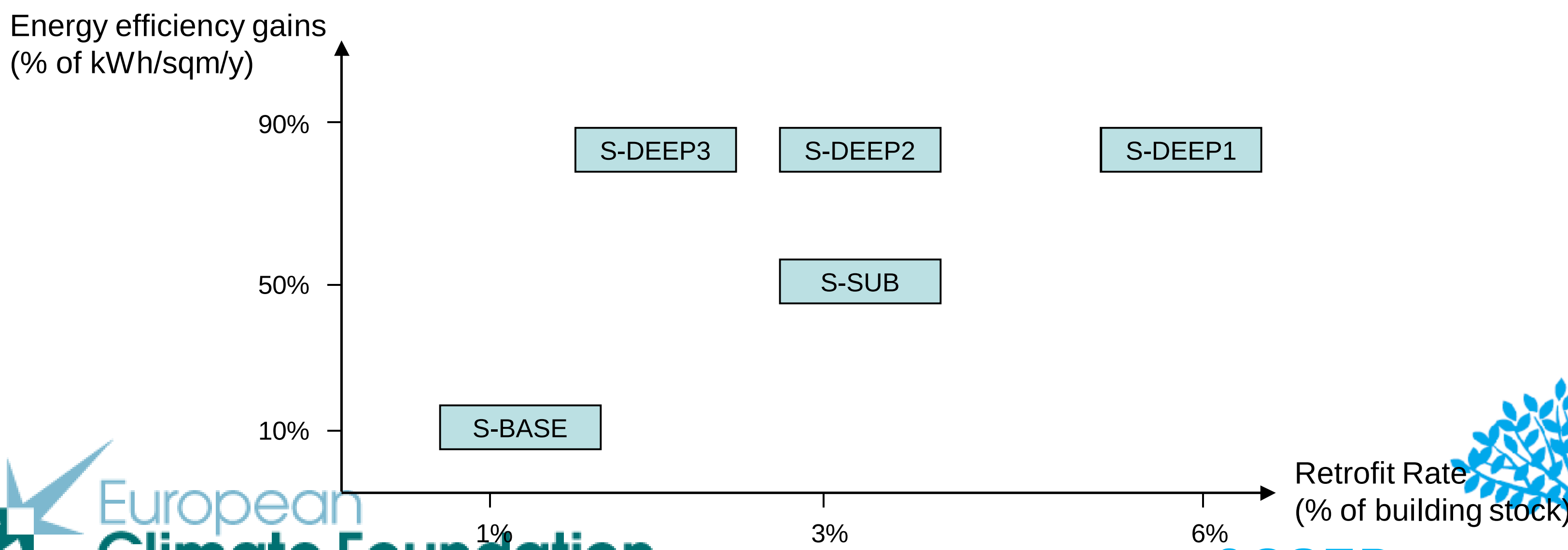
Scenarios considered

Name	Scenario	Retrofit rate	Type of retrofits	Forecasted completion
S-BASE	Baseline scenario: no intervention	1.3% of the total building stock (around 4.5 million square metres a year, equivalent to 55,000 dwellings)	"Business as usual" retrofits	N/A
S-DEEP1	Deep retrofit with fast implementation rate	Around 20 million square meter (equivalent to 250,000 dwellings) per year	Deep retrofits	17-18 years
S-DEEP2	Deep retrofit with medium implementation rate	Around 12 million square meter (equivalent to 150,000 dwellings) per year	Deep retrofits	26-28 years
S-DEEP3	Deep retrofit with slow implementation rate	Around 8 million square meter (equivalent to 100,000 dwellings) per year	Deep retrofits	39-41 years
S-SUB	Suboptimal retrofit with medium implementation rate	Around 12 million square meter (equivalent to 150,000 dwellings) per year	Suboptimal retrofits	26-28 years



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Summary: key findings

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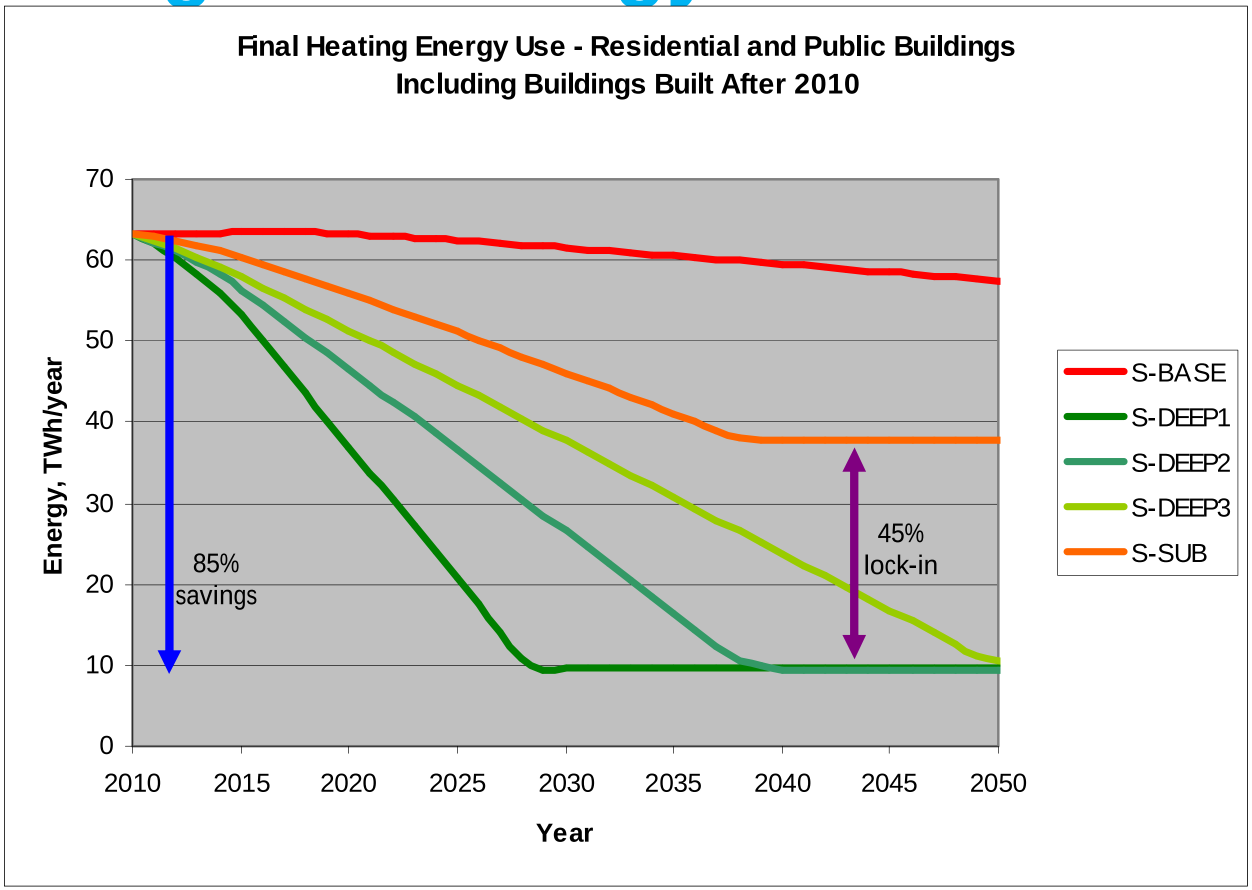
Scenario results: Hungary heating and cooling final energy use until 2050



- 85% of energy is saved in deep scenarios
- 45% of the savings remain locked-in by the suboptimal scenario

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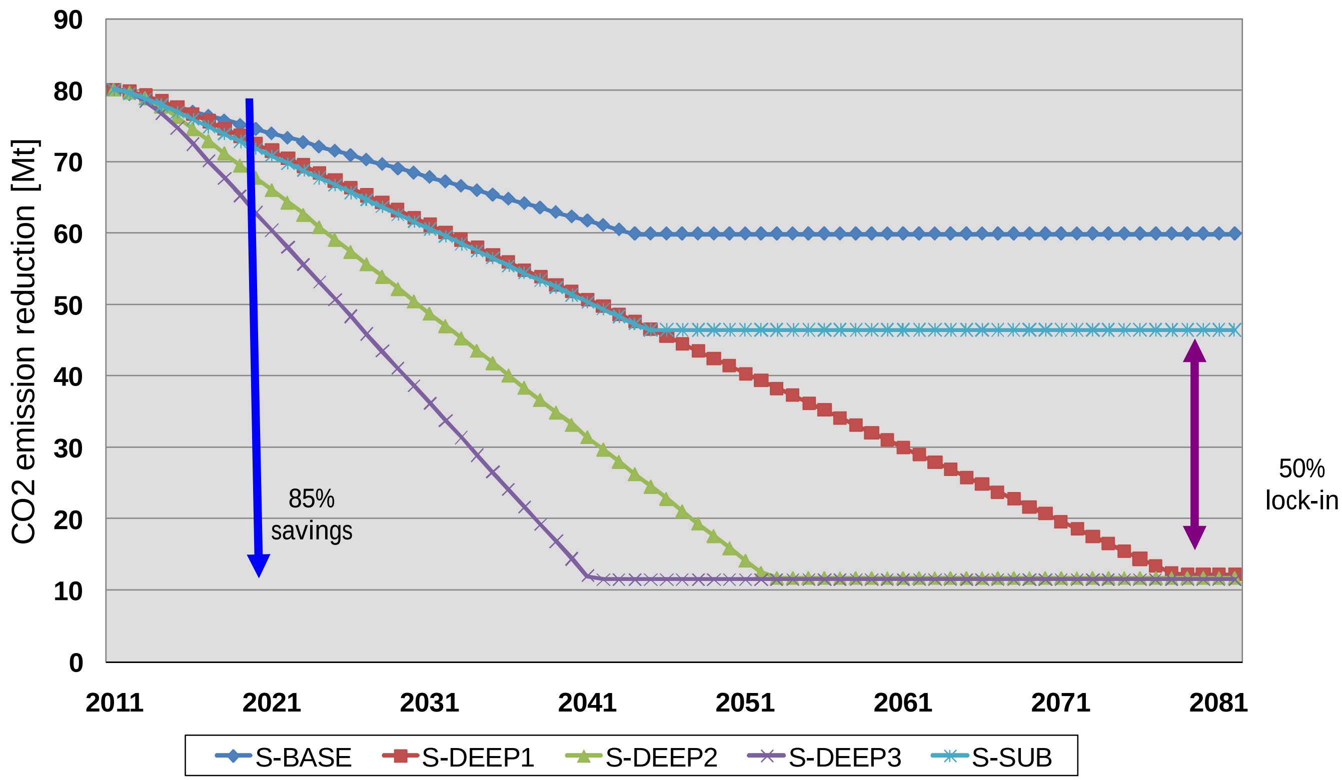
Scenario results: Poland heating and cooling related CO2 emissions until 2050



- 86% of energy is saved in deep scenarios
- 50% of the savings remain locked-in by the suboptimal scenario

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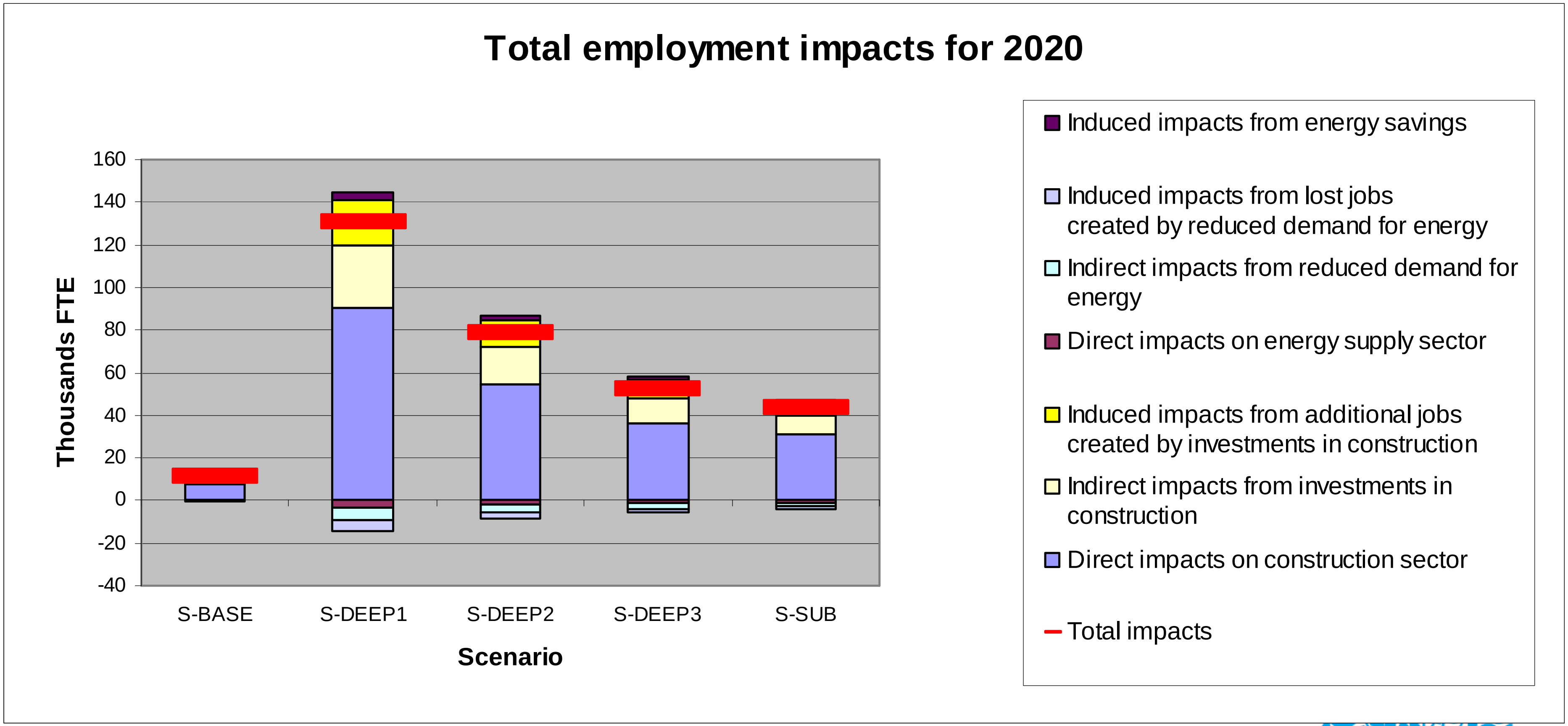
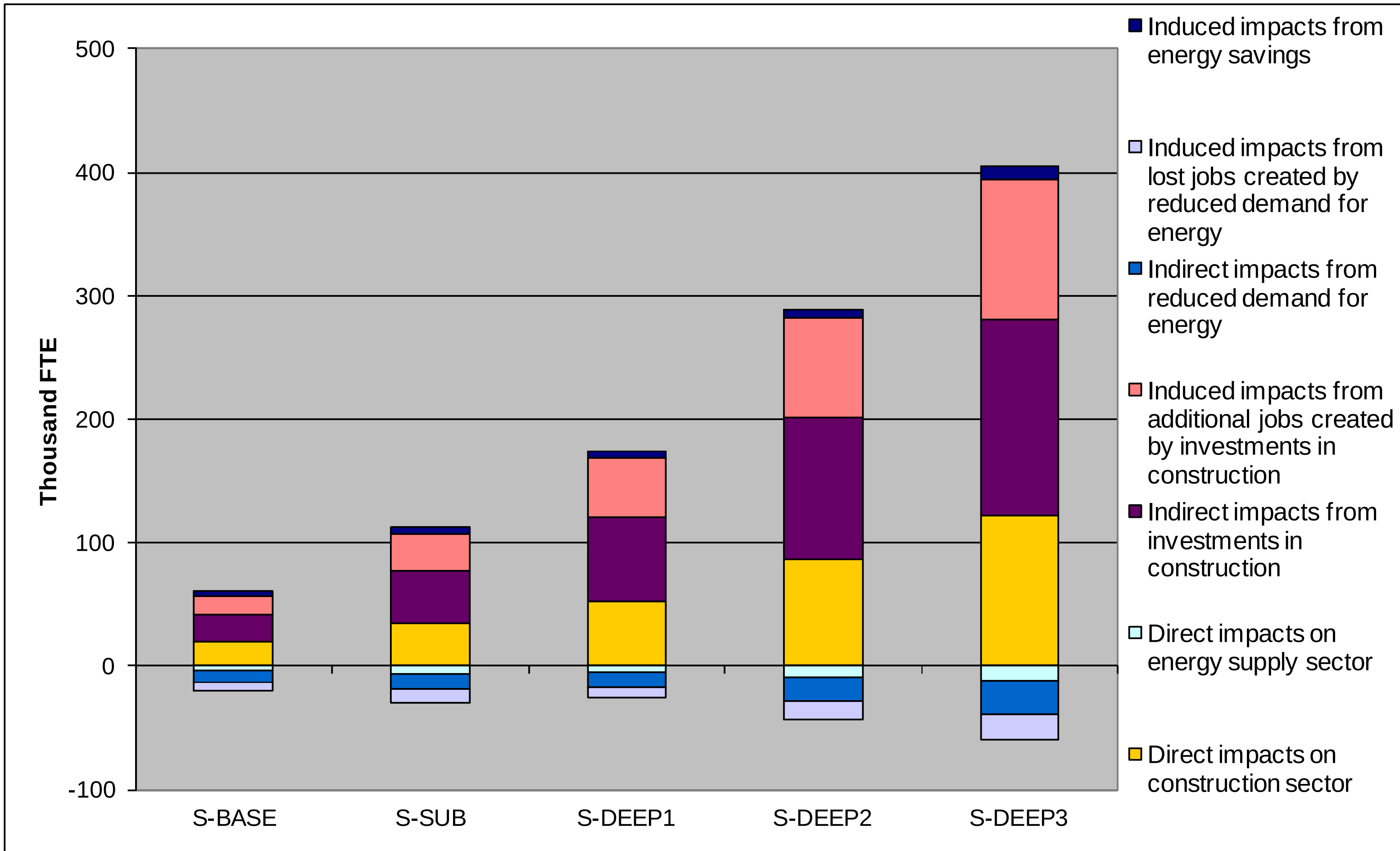
Total net employment impacts: snapshot in 2020 for Hungary

- Direct effects
  - Calculated with bottom-up method
  - Shown in the previous slides
- Indirect + induced effects
  - Application of I/O tables
  - Indirect + induced impacts have the same order of magnitude as the direct impacts



Total (direct and indirect) impacts for Polish renovation scenarios



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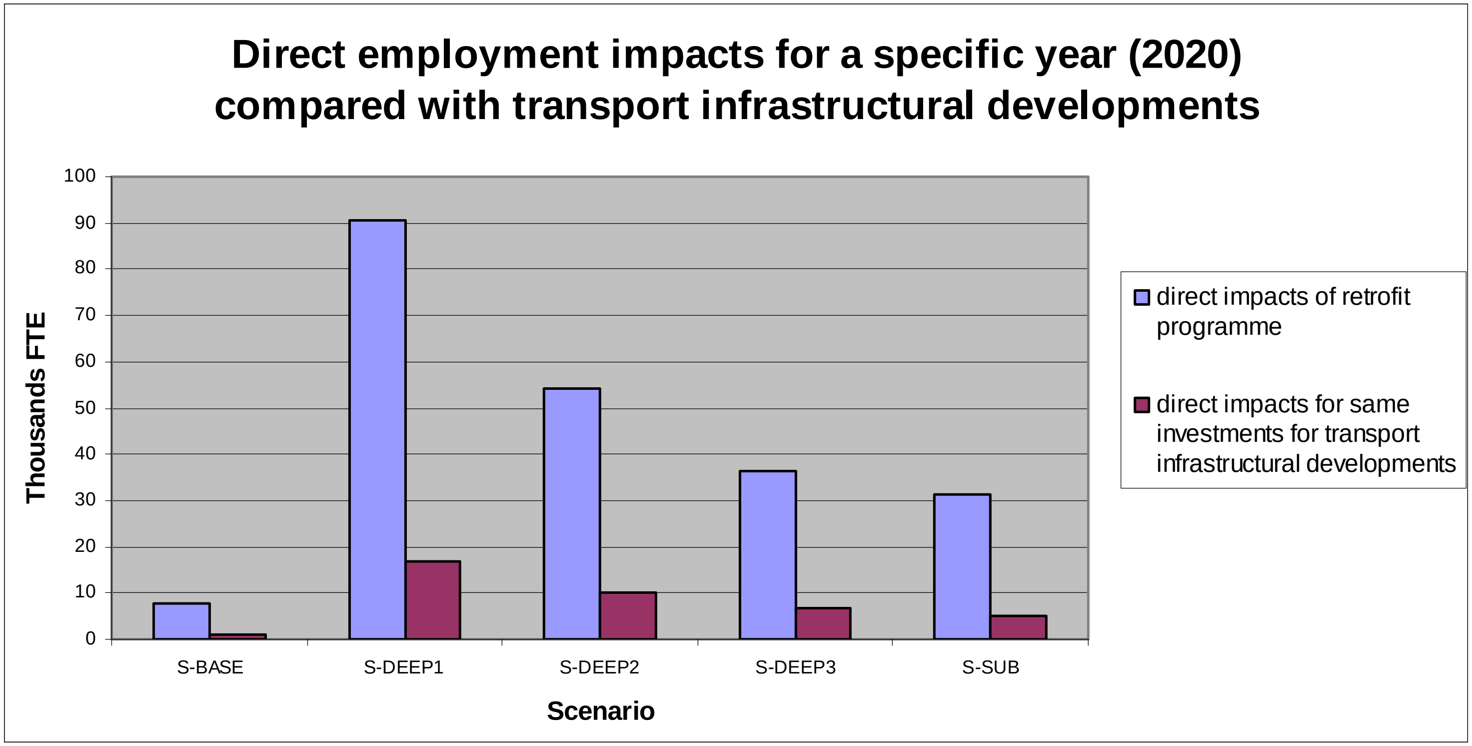
Hungary: Direct employment impact investment comparison



- Labour intensity in renovations is much higher than labour intensity in many other sectors
- E.g. many more jobs would be created with these programmes than if the money was spent in building highways

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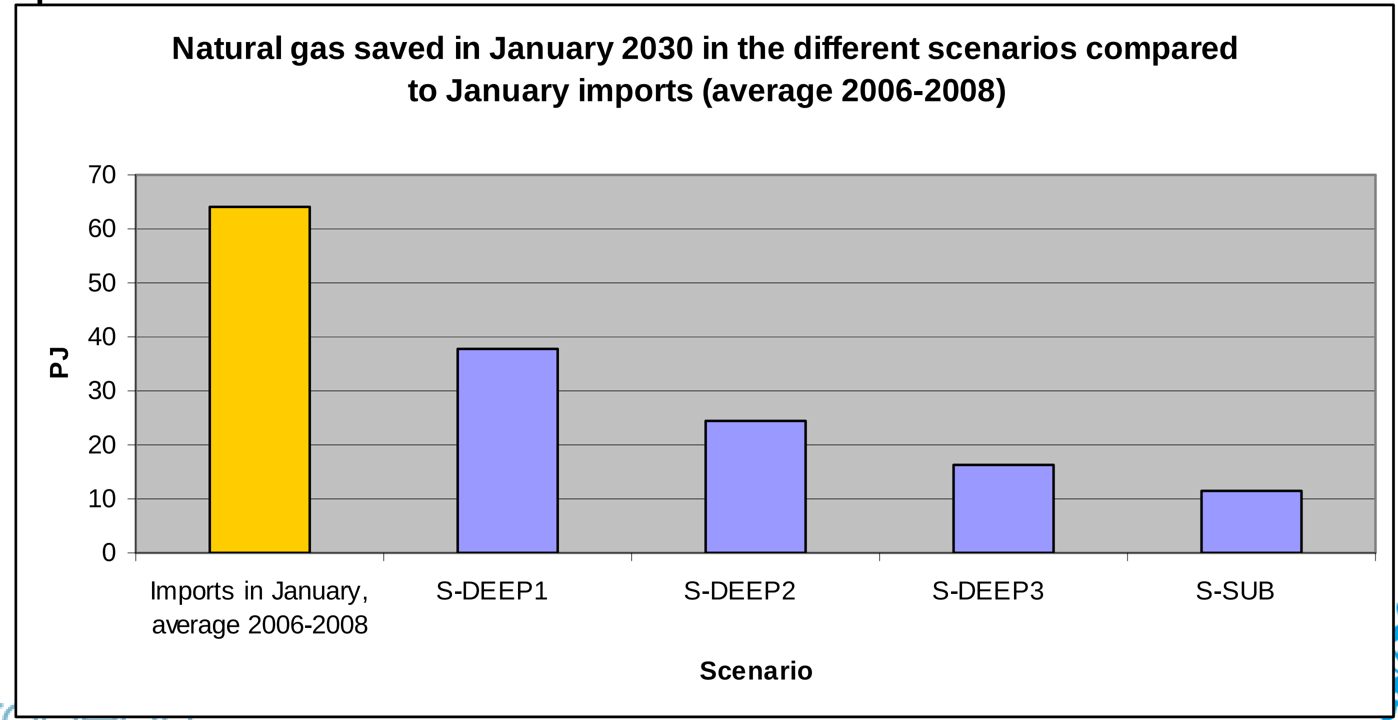
Energy Security Benefits

- Reduced import of Natural Gas
  - deep renovation scenarios can save up to 39% of the current natural gas imports
  - In January (peak for imports) the energy savings achieved by 2030 would be equivalent to between 59% (*S-DEEP1* scenario), 26% (*S-DEEP3* scenario) and 18% (*S-SUB* scenario) of the natural gas imports recorded for that month



Cumulative (undiscounted) investments and savings

- Total investments needed to refurbish the whole building stock:
  - S-DEEP1: 60 Bln EUR
  - S-DEEP2: 50 Bln EUR
  - S-DEEP3: 44 Bln EUR
  - S-SUB: 28 Bln EUR
- Cumulative savings substantially outstrip the investment needs in the longer run. By 2050:
  - S-DEEP1: 97 Bln EUR (vs. 60)
  - S-DEEP2: 81 Bln EUR (vs. 50)
  - S-DEEP3: 60 Bln EUR (vs. 44)
  - S-SUB: 37 Bln EUR (vs. 28)

Cumulative investments vs. cumulative savings (Billion Euros)	2025	2050	2075
S-DEEP1			
Cumulative investments	50.47	59.83	59.83
Cumulative savings	14.13	97.00	197.73
S-DEEP2			
Cumulative investments	30.29	50.05	50.05
Cumulative savings	8.48	80.56	179.39
S-DEEP3			
Cumulative investments	20.20	42.20	43.58
Cumulative savings	5.65	59.56	156.06
S-SUB			
Cumulative investments	13.53	28.17	28.17
Cumulative savings	3.94	37.43	83.34

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Financing

- Such programme will need a vast amount of financing
  - E.g. in 2020:
    - S-DEEP1 – 3.5 B€$_{2005}$ (13% of 2009 HU budget)
    - S-DEEP2 – 2.1 B€$_{2005}$ (8% of 2009 HU budget)
    - S-DEEP3 – 1.4 B€$_{2005}$ (5% of 2009 HU budget)
- The energy savings are higher than the investments, but they accrue later
- However, at least part of the initial funds can come from:
  - the EU (up to 400M€ per year)
  - Redirecting the current energy subsidies (about 800M€ per year)
  - An ESCO-type scheme of financing in which part of the savings go into repaying the investment costs

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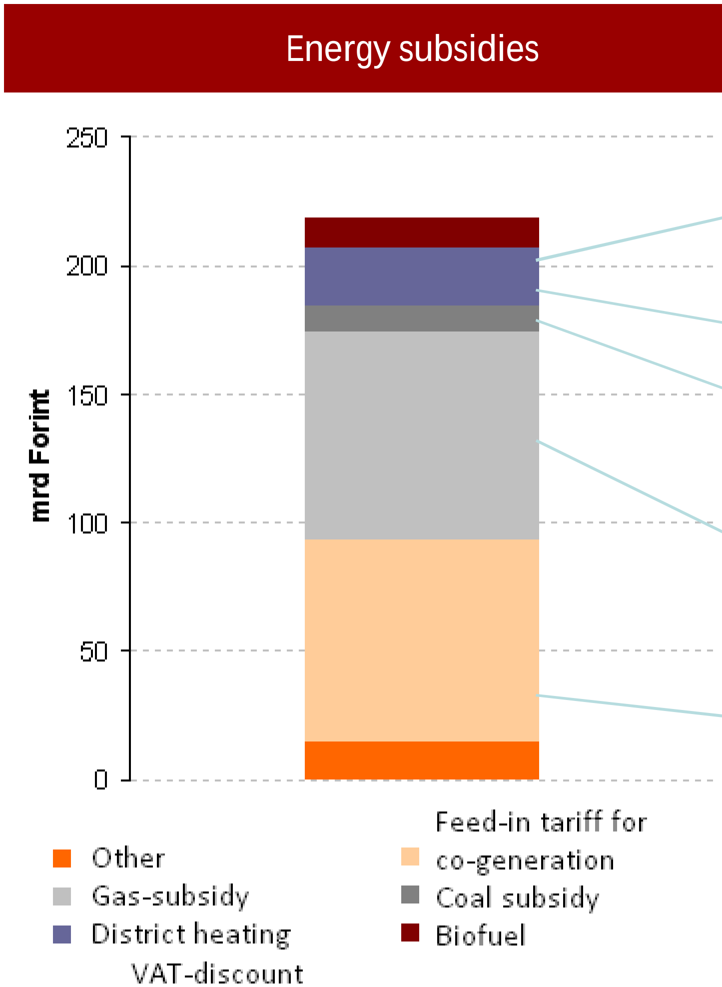
Energy subsidies in Hungary

Source: slides from Mr. Laszlo Varro, Strategy Director at MOL



Biofuel: relatively little CO2 emission mitigation at a high cost

District heating VAT discount: further decreases energy efficiency

Coal subsidy: artificially increases the competitiveness of high carbon intensity energy

Gas subsidy: decreases energy efficiency and competitiveness of renewable heat

Feed-in tariff for co-generation: predominantly subsidy of gas based co-generation, decresaes competitiveness of renewable heat

\+

- 300 Bn HUF state investment to a new lignite plant.
- 1 Mt additional CO2 emission compared to a BAT gas turbine

Investment vs. cumulative savings in Poland

Cumulative investments vs. cumulative savings (Billion Euros)		2025	2050	2080
S-DEEP1	Cumulative investments	45	103	157
	Cumulative savings	7	67	244
S-DEEP2	Cumulative investments	74	171	179
	Cumulative savings	11	111	332
S-DEEP3	Cumulative investments	103	196	196
	Cumulative savings	15	145	367
S-SUB	Cumulative investments	28	71	71
	Cumulative savings	7	69	180

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Summary of results: conclusions

- Deep renovation scenarios give higher climate and energy benefits compared to suboptimal renovation scenarios
  - Deep retrofit scenarios save 85% of energy use and relative carbon emissions by 2030, vs. 45% in a suboptimal; 50% lock-in in the Polish case
  - Thus the deep scenario avoids a 40% lock-in with serious climate, security and fuel poverty implications
  - Deep retrofit scenarios can reduce up to 39% of annual natural gas needs in 2030, 59% in the critical month of January (compared to average 2006-2008 values), vs. 10% in the suboptimal scenario
  - A deep retrofit scenario essentially eradicates fuel poverty
- Employment impacts are highly positive in the short to medium term, especially for deep renovation scenarios
  - 131,000 jobs created in *S-DEEP1*, 78,000 in *S-DEEP2*, 52,000 in *S-DEEP3,*
    - Around 38% are indirect and induced effects in other sectors
  - Labour intensity in deep retrofit is higher than if the money was invested in other initiatives (e.g., 5 times higher than road construction)
- The major issue is financing
  - But sufficient financing could be made available from identified sources without any new taxes

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Summary of results: recommendations

- The recommendation is to promote a deep renovation scenario with a less ambitious rate of renovation
  - The climate, energy security and fuel poverty lock-in effect is avoided
  - e.g. *S-DEEP3* –(2.3% of the floor area, 100,000 dwellings-equivalent)
  - 52,000 jobs created by 2020 (initially more)
  - App. 1 billion Euros annual investment
- The impacts are slightly lower but sustained: no shock in the economy and in the industry
  - The slower rate of renovation allows for a “smooth” transition period
  - Time is allowed for the firms to learn, train employees and increase production of materials
  - The learning factor ensures that the costs become lower throughout the years
    - The investment shock is reduced
    - Less money is “locked in” on renovations which could have been less expensive in following years
  - Labour supply issues and wage effects are reduced

Report on the Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary

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Thank you for your attention

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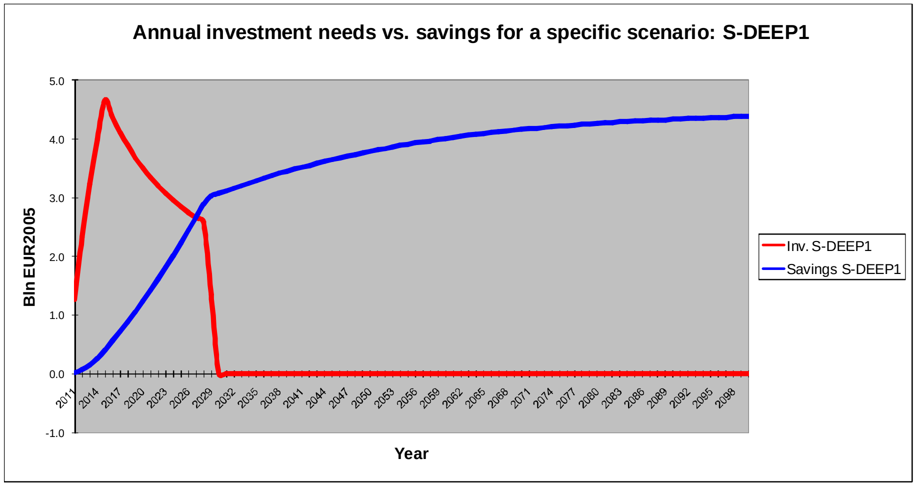
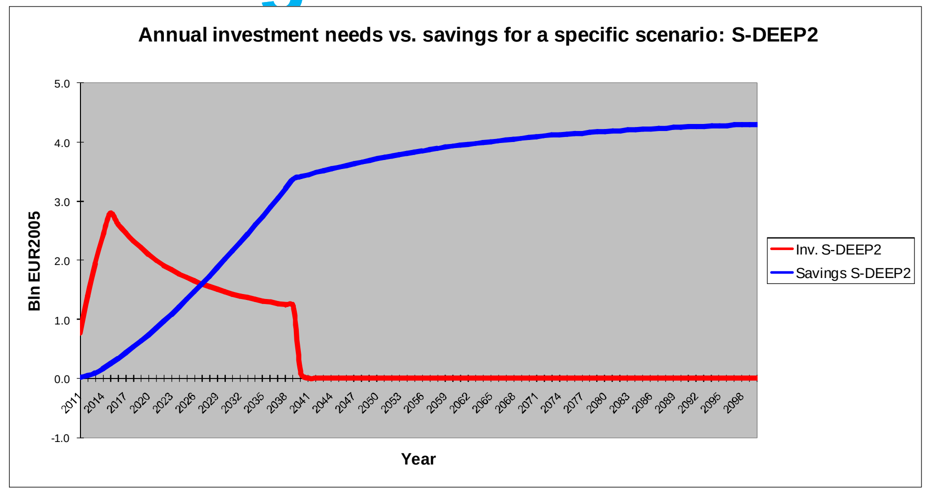
Supplementary slides

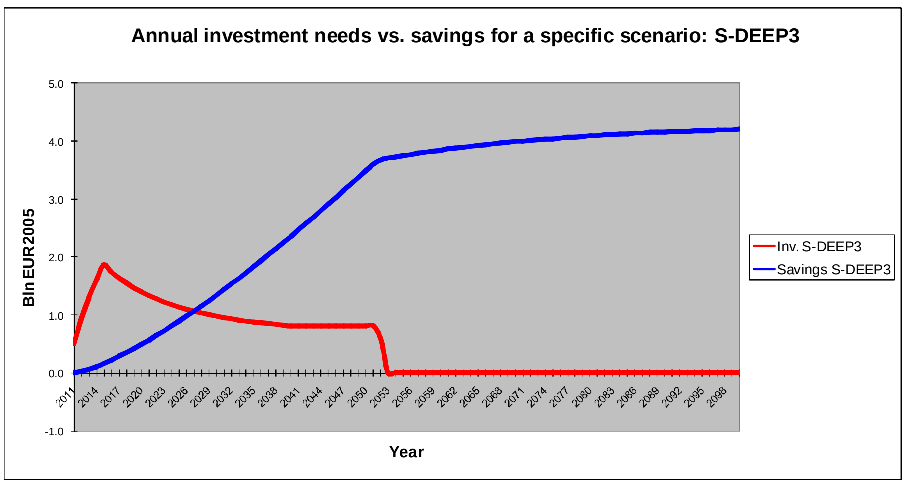
Center for Climate Change
and Sustainable Energy Policy

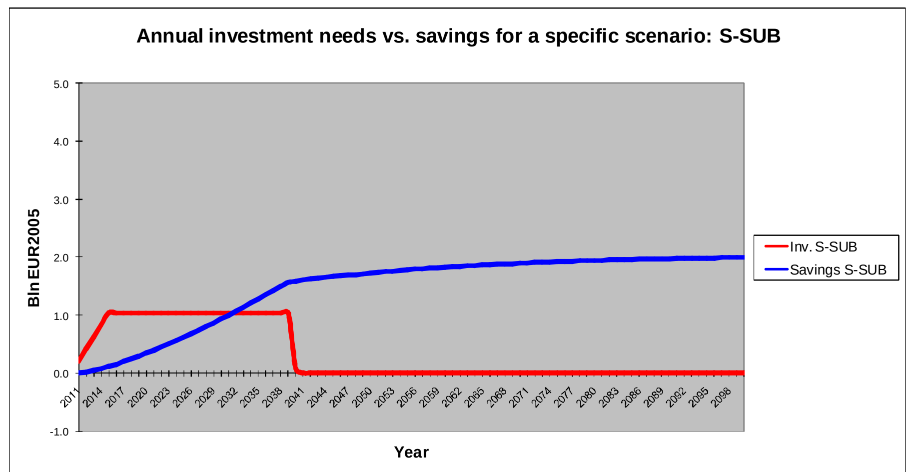
Central European University

Scenario results: annual investment needs vs. savings









- Annual savings become higher than the investment needs in 20 years

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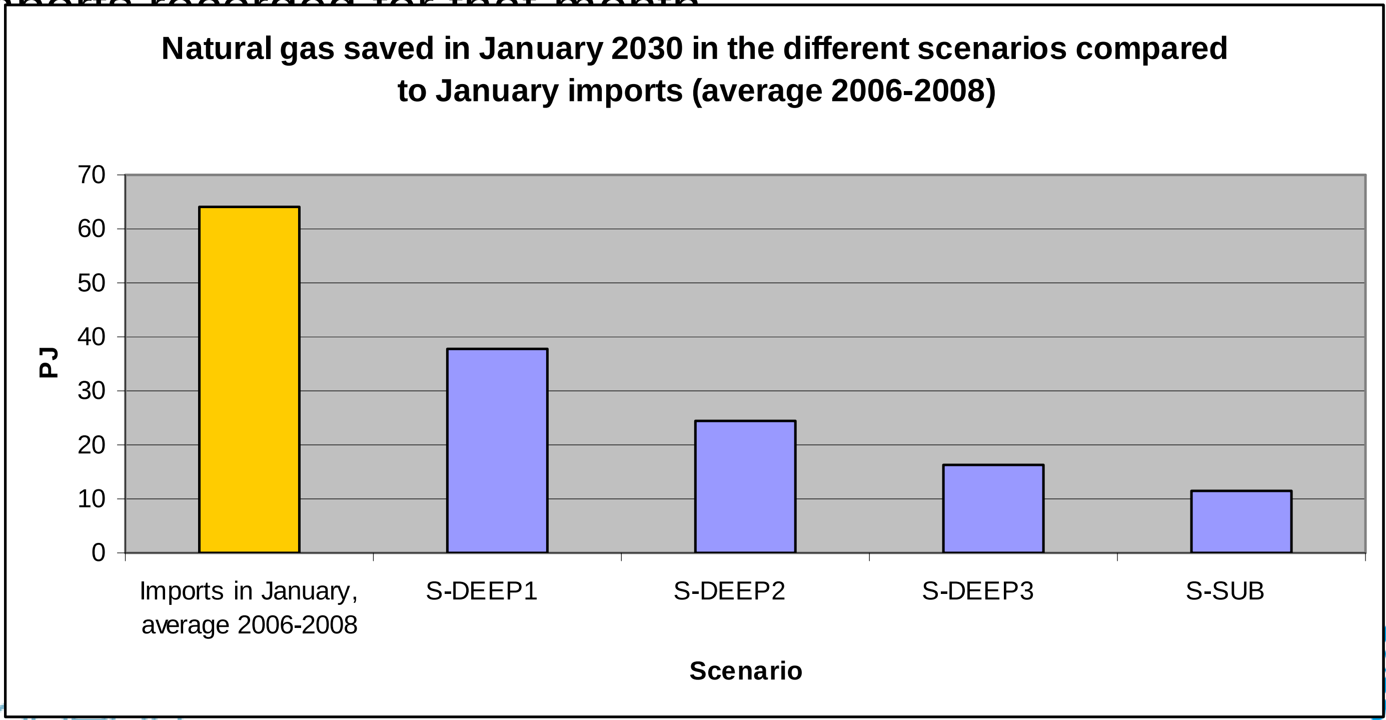
Energy Security Benefits (2)

- Reduced import of Natural Gas
  - deep renovation scenarios can save up to 39% of the current natural gas imports
  - In January (peak for imports) the energy savings achieved by 2030 would be equivalent to between 59% (*S-DEEP1* scenario), 26% (*S-DEEP3* scenario) and 18% (*S-SUB* scenario) of the natural gas imports recorded for that month



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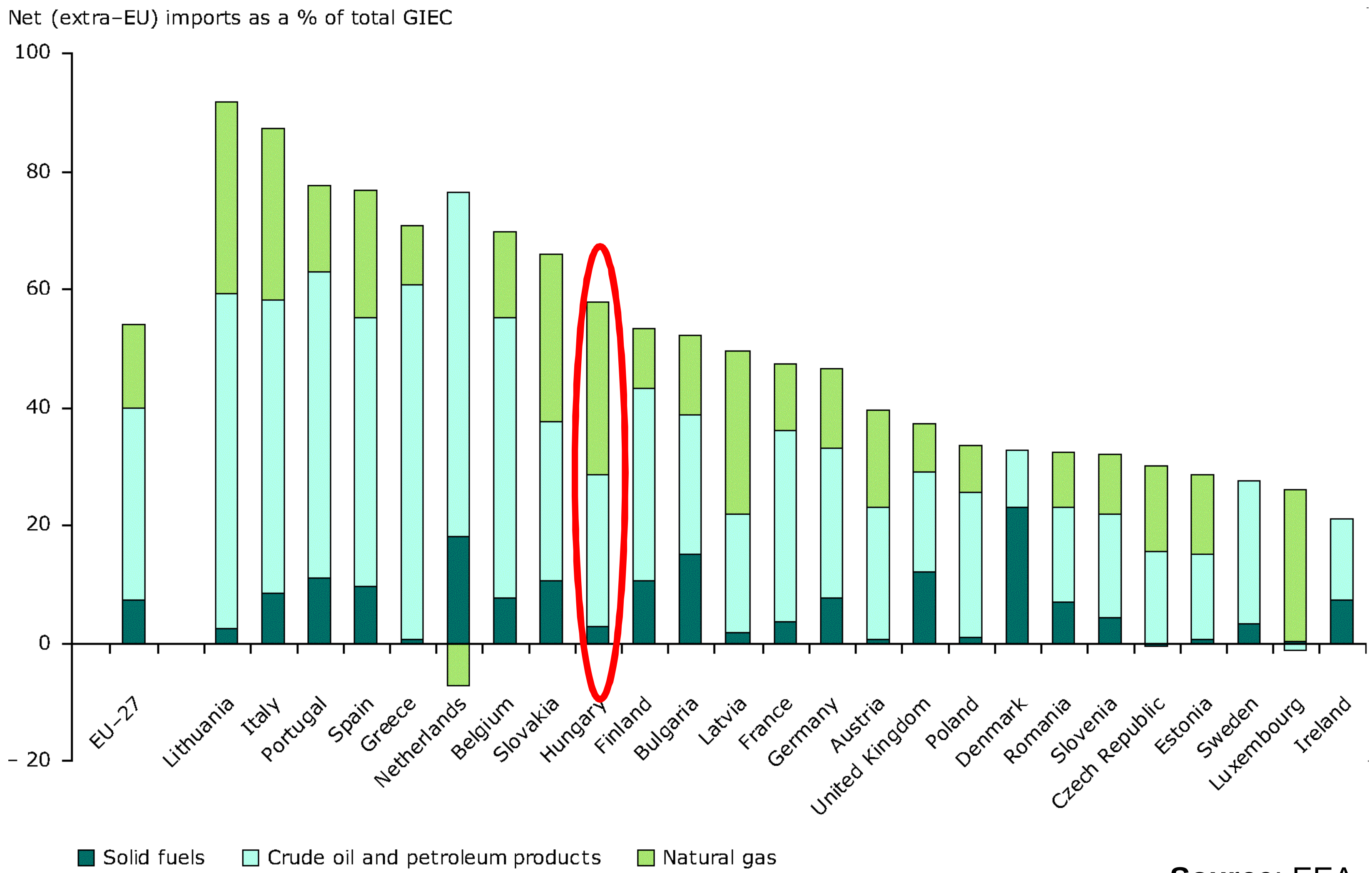
Energy dependency

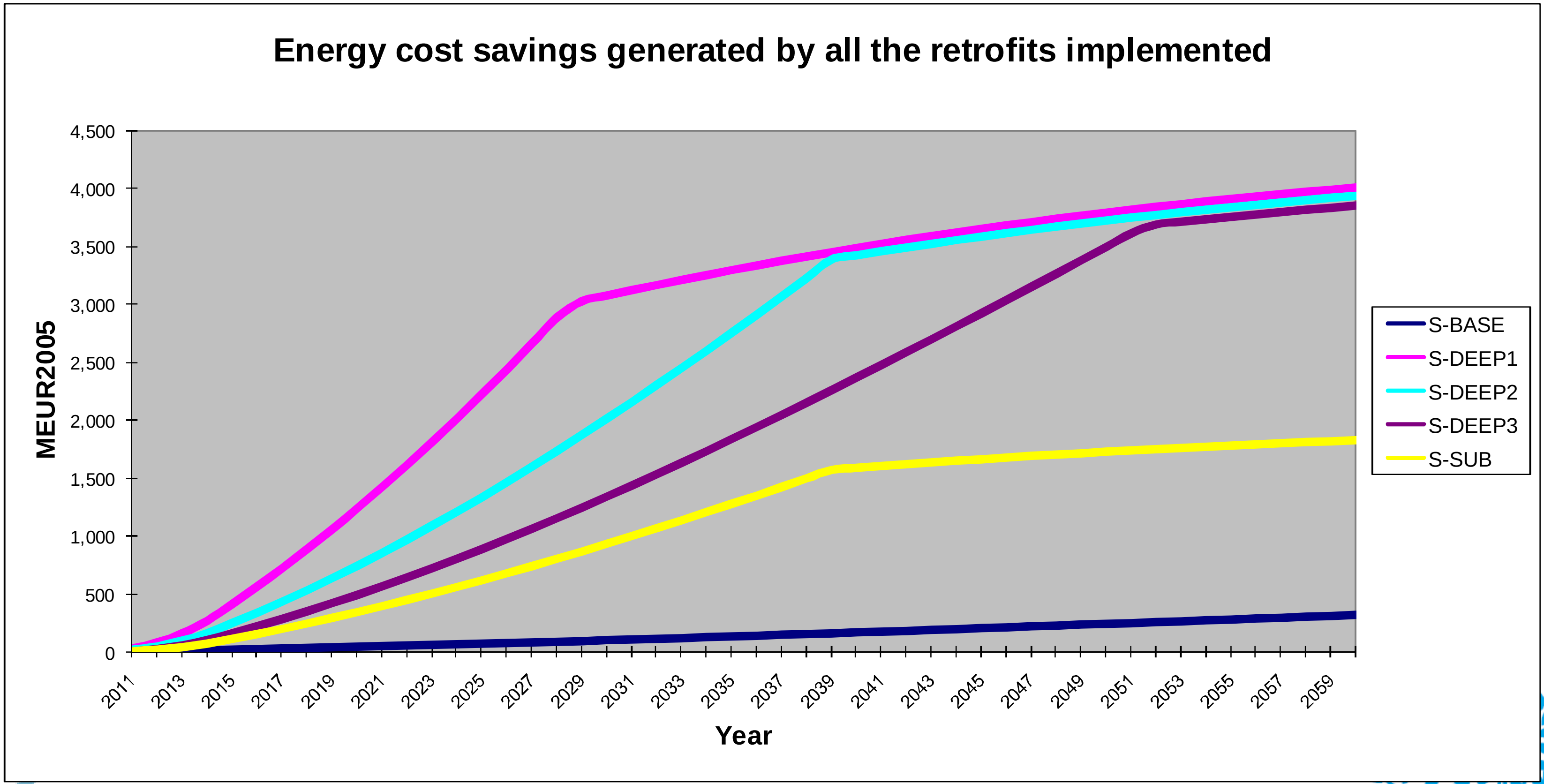
Net (extra-EU) imports as % of Gross Inland Energy Consumption (2007)



Source: EEA

Scenario results: energy cost savings

- Energy savings generated each year by all retrofits implemented until that year



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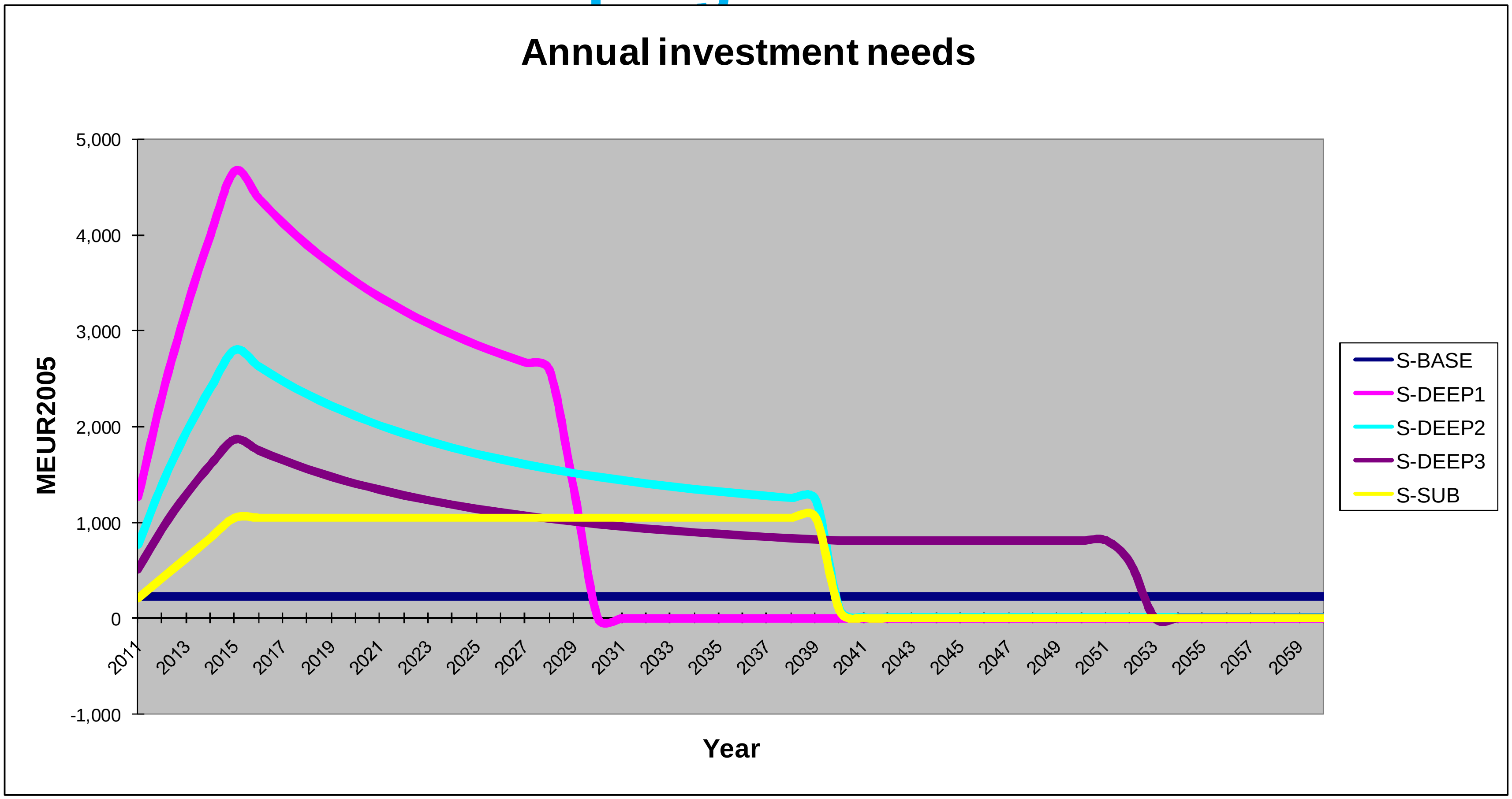
Scenario results: Investments for the programme



- Initial 5-year ramp-up period
- Subsequent decrease thanks to learning factor

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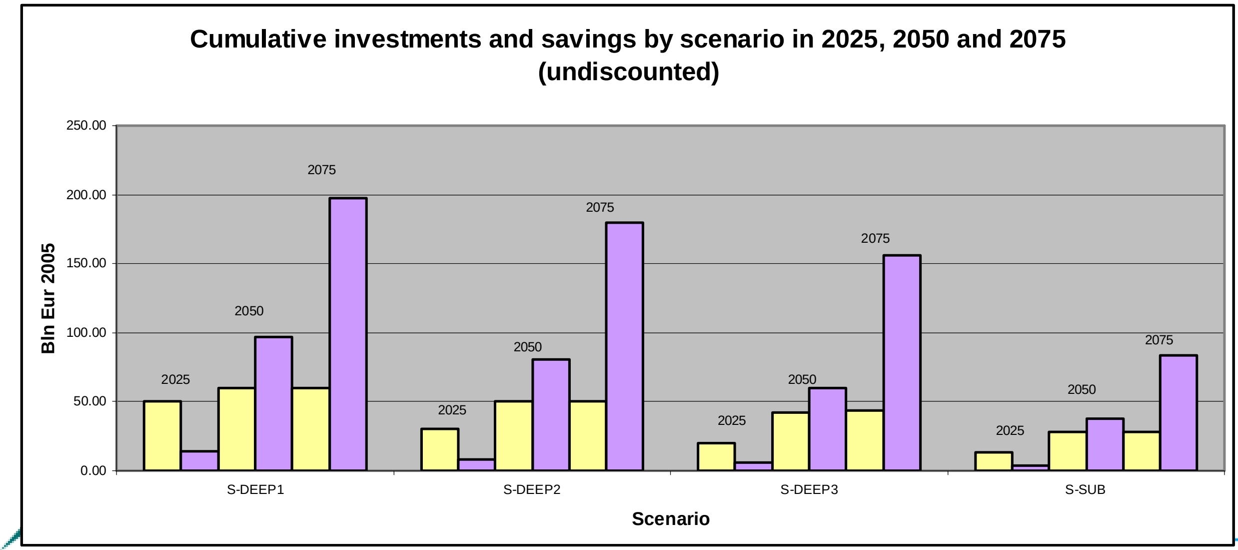
Cumulative investments and savings by scenario in 2025, 2050 and 2075 (undiscounted)
Bln Eur 2005
250.00
200.00
150.00
100.00
50.00
0.00
2025
2050
2075
S-DEEP1
S-DEEP2
S-DEEP3
S-SUB
Scenario

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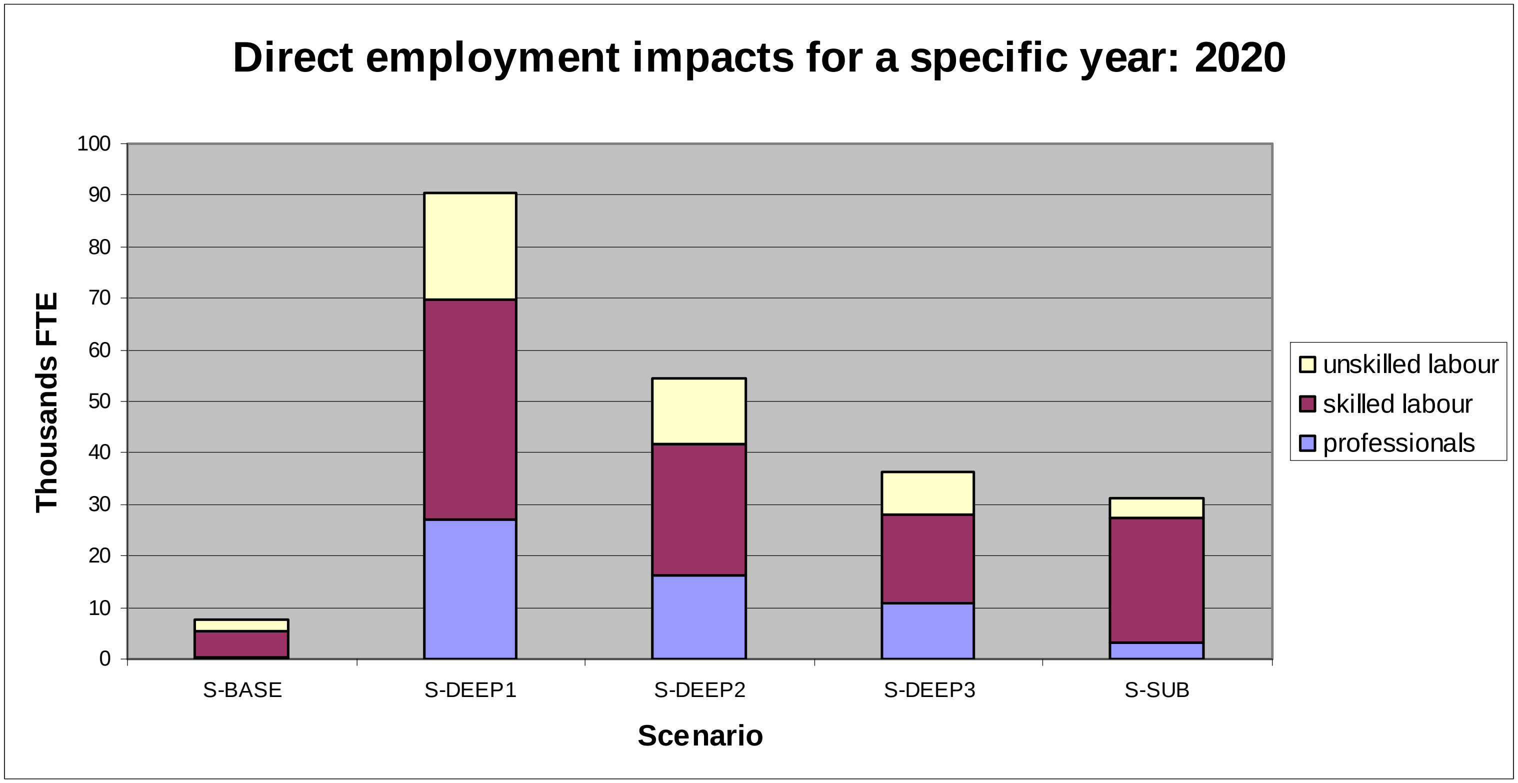
Thousands FTE	S-BASE	S-DEEP1	S-DEEP2	S-DEEP3	S-SUB
Million EUR invested in 2020	224	3,506	2,104	1,402	1,040
Direct impacts on construction sector	8	91	54	36	31
Direct impacts on energy supply sector	0	-3	-2	-1	-1
Indirect impacts from investments in construction	2	29	18	12	9
Induced impacts from additional jobs created by investments in construction	1	21	13	9	6
Indirect impacts from reduced demand for energy	0	-6	-4	-2	-2
Induced impacts from lost jobs created by reduced demand for energy	0	-5	-3	-2	-1
Induced impacts from energy savings	1	4	2	1	1
Total net employment impacts in 2020	11	131	78	52	43

Direct employment impacts in construction per skill: snapshot in 2020



- The effects on professional labour are highest in the deep renovation scenarios

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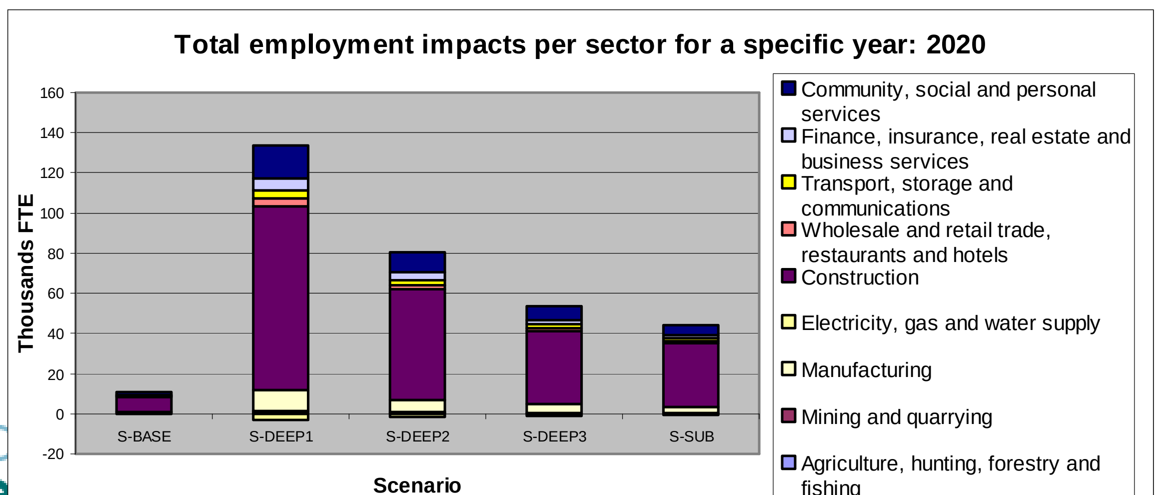
Total net employment impacts divided by sector: snapshot in 2020

Thousands FTE	S-BASE	S-DEEP1	S-DEEP2	S-DEEP3	S-SUB
Agriculture, hunting, forestry and fishing	0.1	0.5	0.3	0.2	0.2
Mining and quarrying	0.0	0.7	0.4	0.3	0.2
Manufacturing	0.7	10.5	6.3	4.2	3.2
Electricity, gas and water supply	-0.1	-3.1	-1.8	-1.2	-0.8
Construction	7.7	91.8	55.1	36.7	31.7
Wholesale and retail trade, restaurants and hotels	0.3	3.6	2.2	1.4	1.1
Transport, storage and communications	0.3	4.2	2.5	1.7	1.3
Finance, insurance, real estate and business services	0.5	5.8	3.5	2.3	1.8
Community, social and personal services	1.5	16.7	10.0	6.7	5.0
Total	11.0	130.7	78.4	52.3	43.4



Summary: Key findings

- Energy use and CO2 emissions reduction
  - Up to 85% of Hungarian heating energy use and the corresponding CO2 emissions can be avoided by a consistent and wide-spread deep retrofit programme
  - A suboptimal scenario (saving only 40% of energy use) locks in 45% of 2010 building heating-related emissions at the end of the programme
  - This makes medium-term national emission reduction targets (75 – 85%) very difficult and expensive to achieve
- Energy security enhancement
  - A deep retrofit programme can reduce significantly Hungary's natural gas import dependence (in % of 2006-2008 average NG imports):
    - Up to 39% annual import needs by 2030
    - Up to 59% of the January import needs (the most critical month for energy security
  - A suboptimal retrofit programme would lack the same strength
    - Only 10% of natural gas imports saved in 2030
    - Peak (January) savings reduced to 18%

Summary: Key findings 2.

- Employment benefits
  - Up to 131,000 net jobs created by 2020, including the losses in the energy supply sector
    - This value is 184,000 in 2015
    - 38% of this value: indirect and induced effects in other sectors than construction
  - Suboptimal scenario: 43,000 jobs
- Deep renovation activities are much more labour intensive than other economic recovery activities
  - e.g. 5 times more jobs are created than with the same investments in road construction
- The corresponding investment needs are also higher
  - For the most ambitious programme (5.7% floor area/yr):
    - 4.5 Bln EUR/year initially, and 2.8 Bln EUR/year towards the end; vs. 2 bln/year for a gradual program (2.3% floor area renovated/year), declining to 1 bln/year
    - Cumulative undiscounted investments: 59 Bln EUR, vs. 44 in a more gradual program
    - Cumulative undiscounted savings: 97 Bln EUR by 2050

Summary: Recommendation

- Recommendation: deep renovation programme with more gradual implementation
  - App. 8 million sqm per year, 2.3% of the floor area, 100,000 dwellings-equivalent
  - 52,000 jobs created by 2020
  - Initial costs peak at 2 Bln EUR per year, and are reduced to less than 1 Bln EUR in the final phases of the programme
    - Take advantage of the initial learning period
- App. 1 billion Euros public funds per year could potentially be made available
  - Partly from EU funding
  - Partly from redirecting current energy subsidies
- Pay-as-you-save schemes and other innovative financing schemes also relieve the financing burden
- More gradual implementation means less shock for the labour market
- For all scenarios:
  - Employment created is long-term
  - New jobs will be distributed across the country
- Public administration should be heavily involved
  - To the achievement of deep savings through deep renovations
  - To reduce the risks of supply bottlenecks

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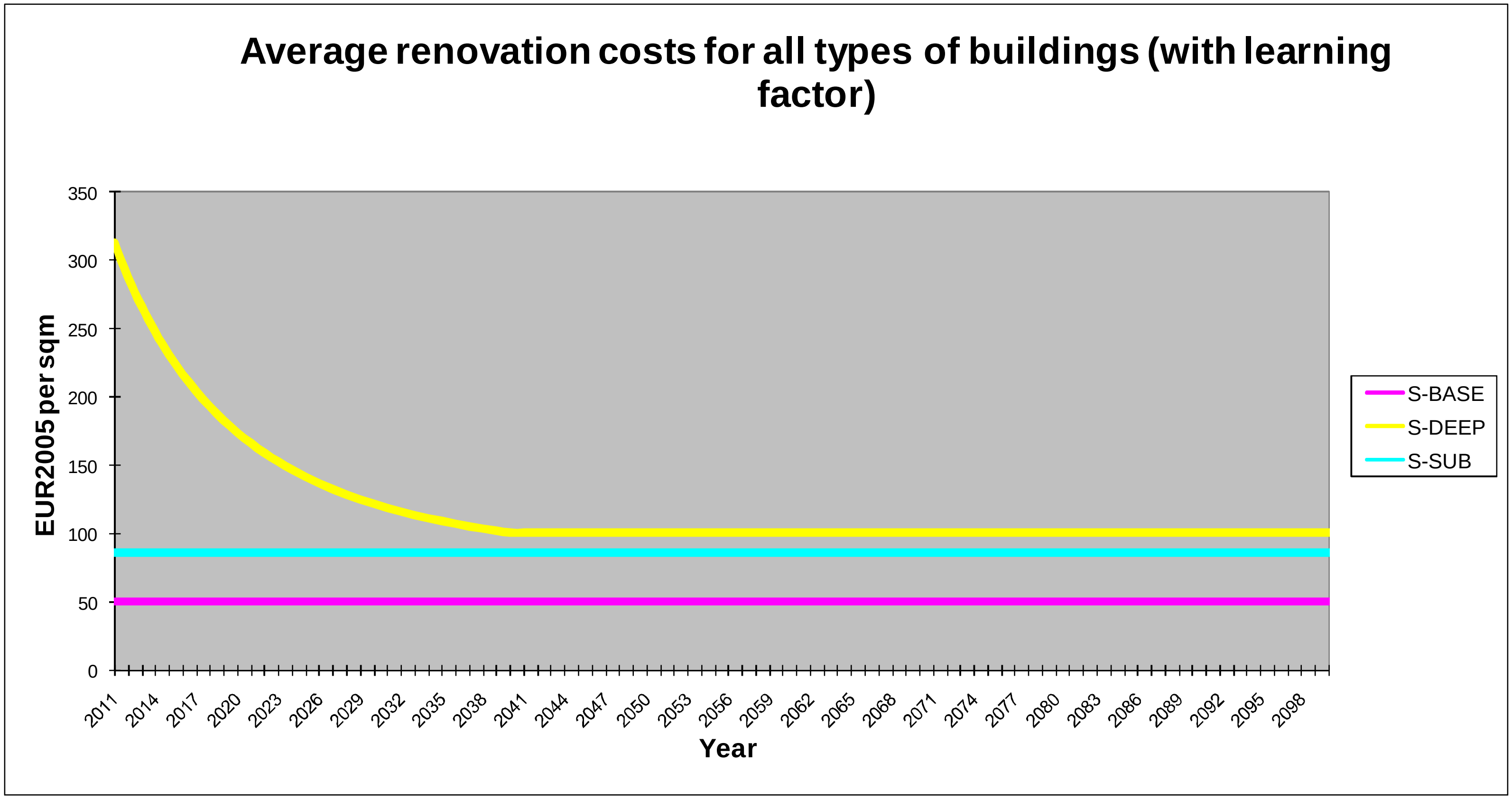
Scenario results: renovation costs

- Investments for renovations
  - Use of best practices to estimate the cost per sqm in every scenario, for every building type
  - SOLANOVA case study (Dunaujvaros):
    - Pilot project for deep renovation in a panel building
    - The only deep renovation project available in Hungary
    - 90% energy savings
    - 42 dwellings, 2300 sqm
    - Cost: 250€ per sqm
  - Examples abroad: Mostly in Austria and Germany
  - Transfer of results to Hungary

Evolution of investments per sqm, with learning factor



- Baseline and suboptimal costs remain fixed (mature technology)
- Deep renovation costs decrease until they reach double baseline renovation costs

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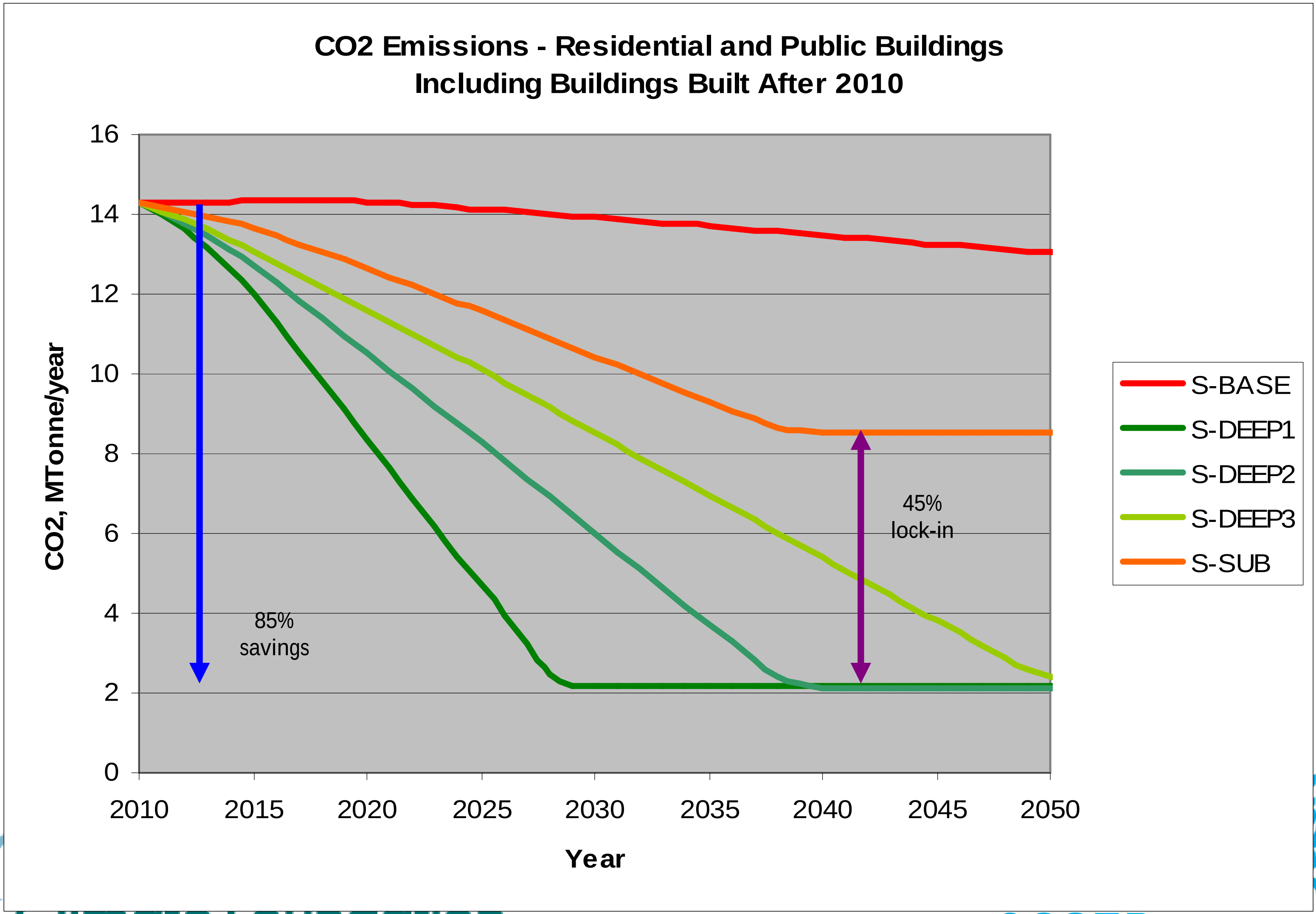
Scenario results: CO2 emission reductions until 2050: 45% locked in by suboptimal scen



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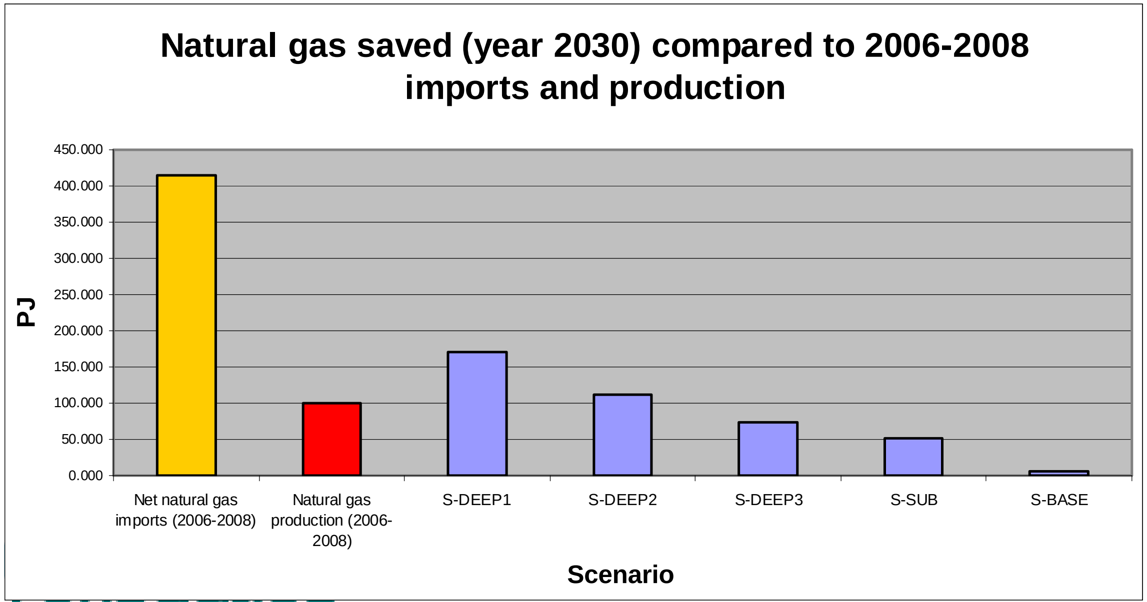
Energy Security Benefits

- Reduced import of Natural Gas
  - At the end of their implementation, the deep renovation scenarios can save up to 39% of the current natural gas imports
  - The natural gas saved in 2030 is the same order of magnitude as Hungary's NG production (2008 levels**)**



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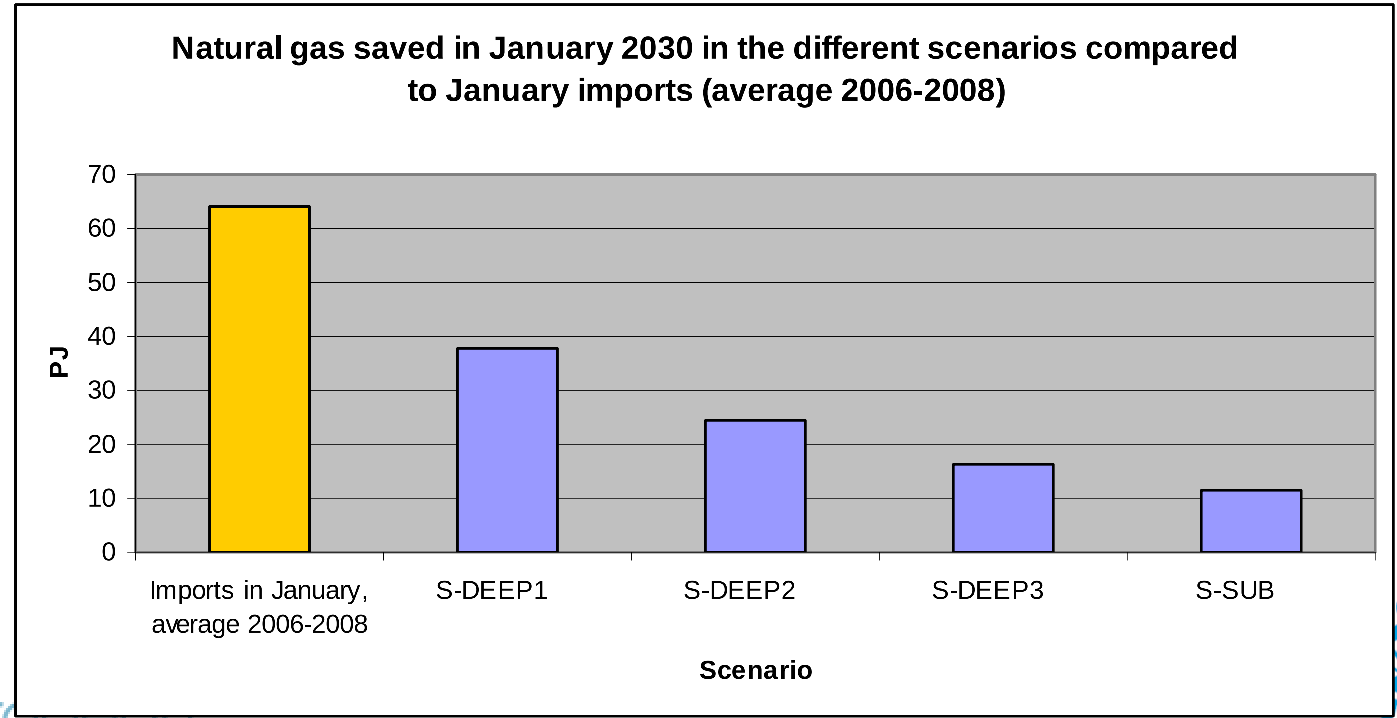
Energy Security Benefits (2)

- In January (peak month for imports) the energy savings achieved by 2030 would be equivalent to between 59% (*S-DEEP1* scenario), 26% (*S-DEEP3* scenario) and 18% (*S-SUB* scenario) of the natural gas imports recorded for that month



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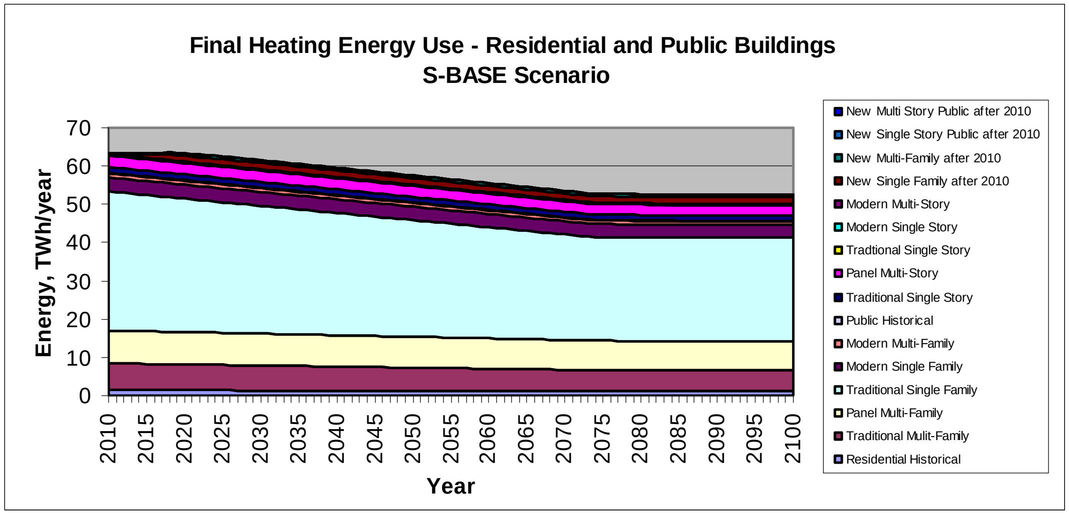
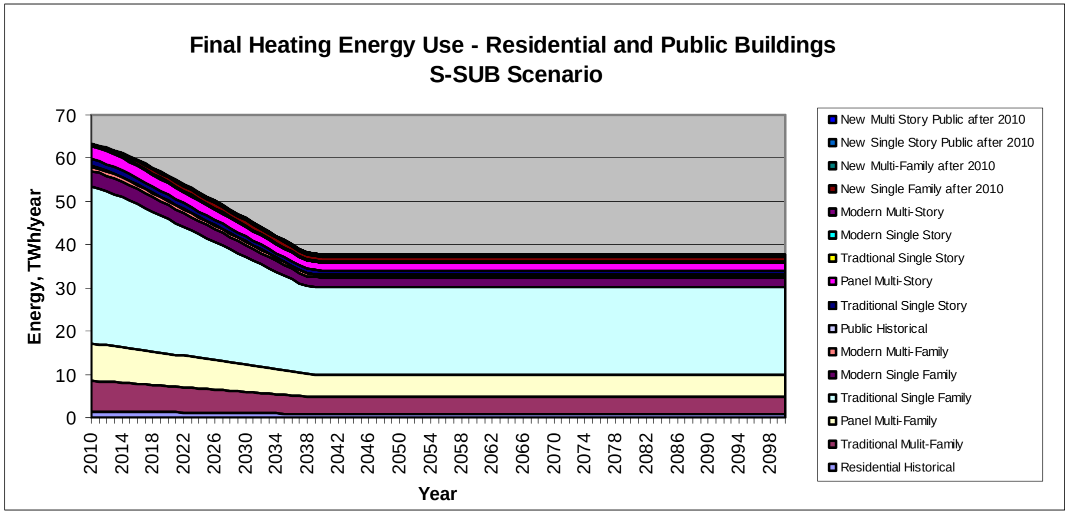
Scenario results: Energy savings by building category





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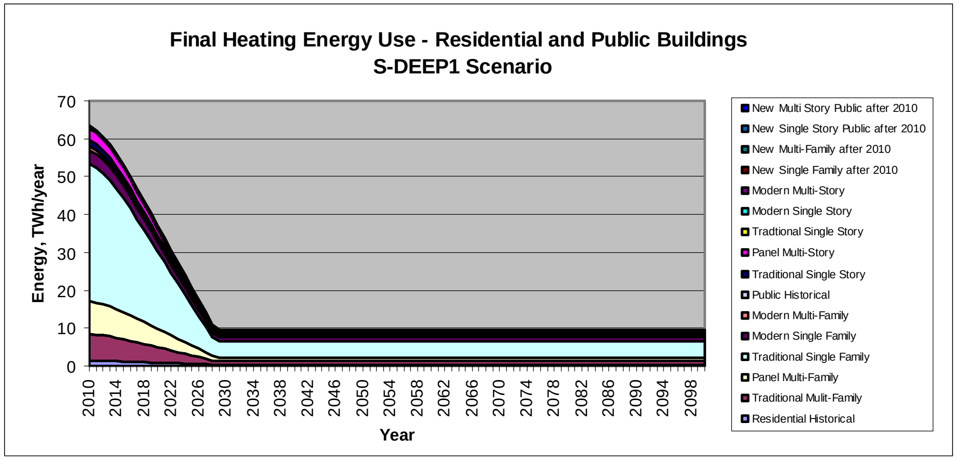
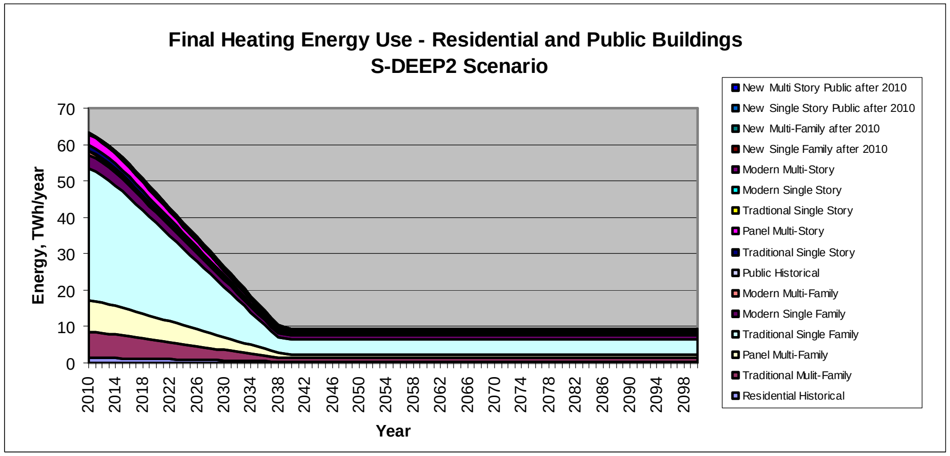
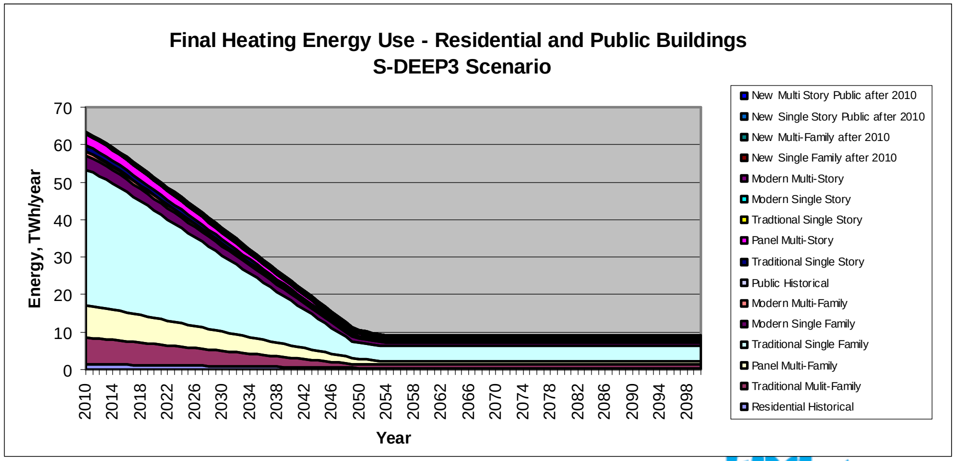
Scenario results: Energy savings by building category







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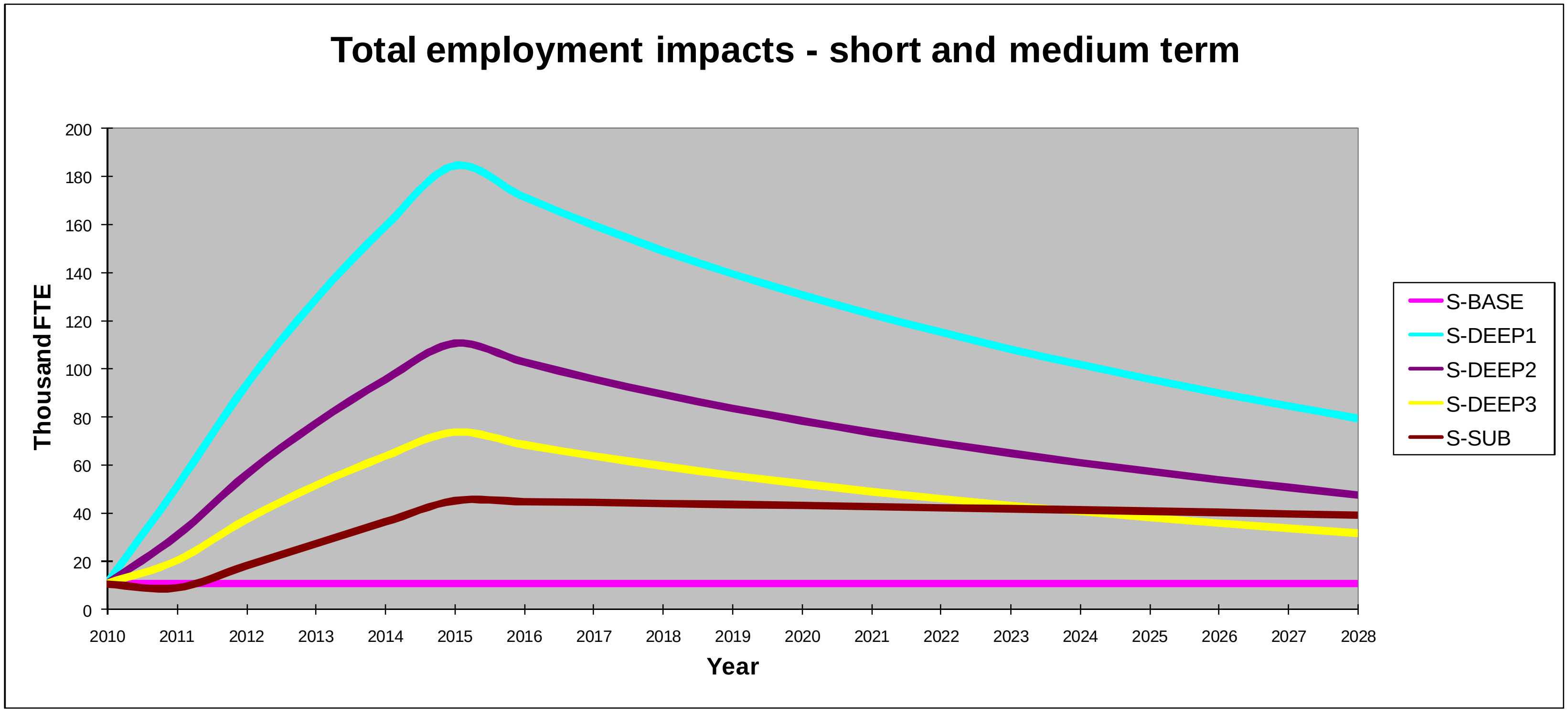
Net employment impacts in construction: medium-term view



- The initial increase shows the ramp-up period
- The subsequent decrease is due to the learning factor
  - Productivity increases
  - Therefore costs and labour intensities decrease
  - There is practically no learning factor in S-BASE and S-SUB: the technologies are mature

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Further issues

- Distributed geographic effects
  - The buildings are renovated throughout the country
  - Work is mainly done by SMEs
  - Induced consumption is also distributed
- Durability of effects
  - Such a programme lasts 20-30 years, effectively a worker's lifetime
- Employment effects in the energy sector
  - Large fixed costs in the energy sector: Job losses are probably in "lumps" – e.g. power stations still need people to maintain them, even if the demand is lowered
  - Some increase in energy demand is expected from other sectors (e.g. commercial, manufacturing) which will compensate the losses from residential sector

Further issues (2)

- Supply of labour
  - There is availability of labour in Hungary for all skill levels
    - Entrepreneurs, professionals
    - Skilled, unskilled – among unemployed and inactive
  - However, these workers need to be attracted to the construction industry
    - Training
    - “Promotion” of the sector
    - Possibly higher wages (at least in the beginning)
  - Population aging
  - What if there is no sufficient labour supply?
    - Guest workers might be brought in
- Such a large-scale program is likely to raise the wage level in the country
  - Increases the costs of the project
  - Increases the costs of other investments (because opportunity costs are higher)
  - But also increases consumption (hence more induced effects)
- Supply of materials
  - Manufacturing must keep up with the increased demand from construction sector

Further issues (3)

- Grey labour
  - Opportunity for the State to increase the control on grey labour in construction
- Fuel poverty
  - Such a programme has the potential of eradicating fuel poverty
  - Great attention has to be put in financing, especially for the lower income households
- Real estate markets
  - The value of buildings increases
  - The lifetime of buildings is extended

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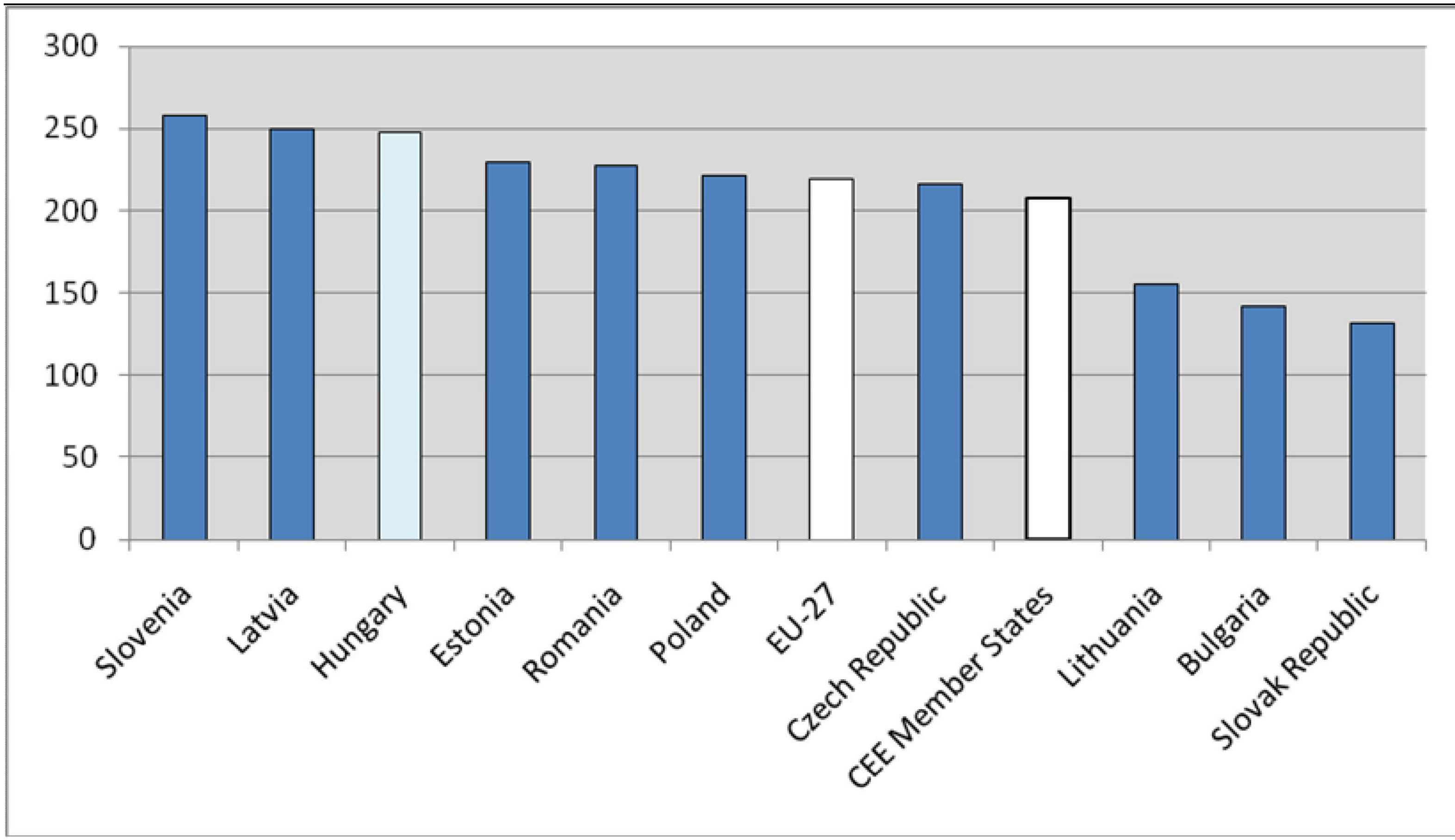
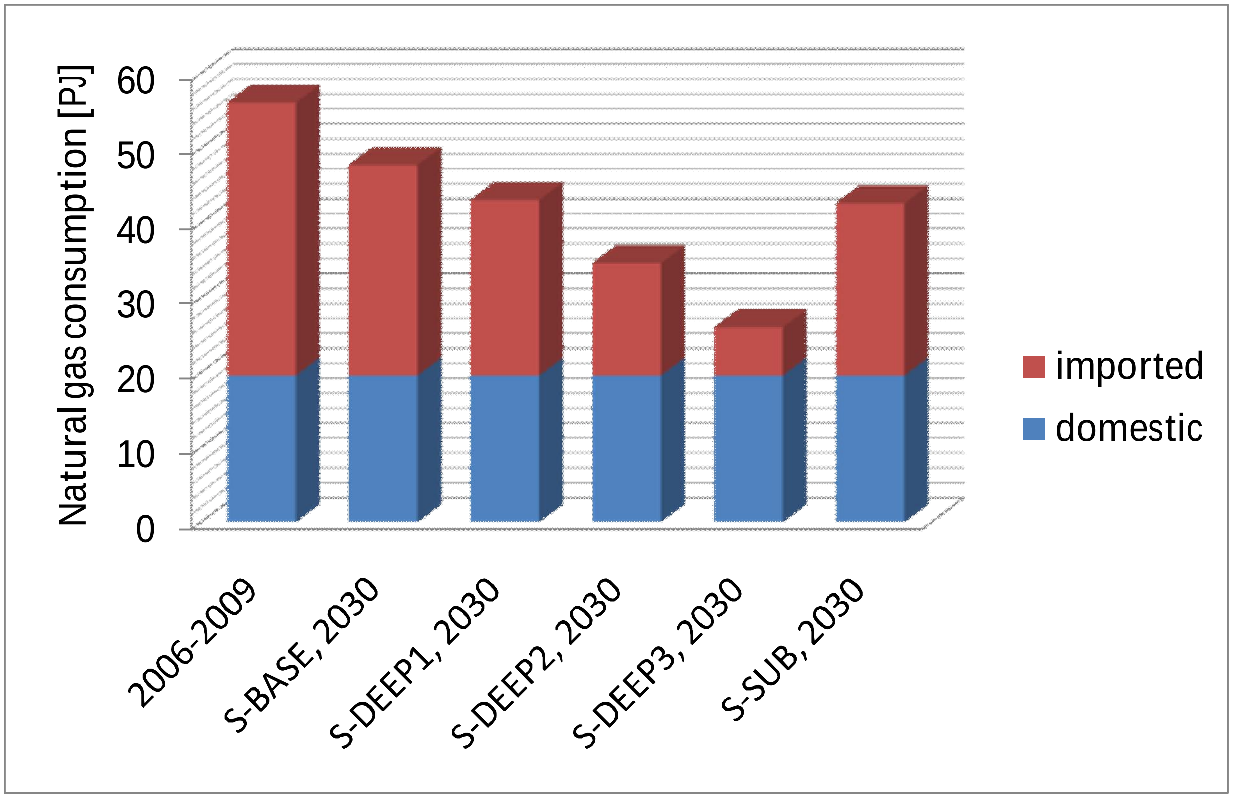
Background

- Inefficiency of Hungarian buildings
  - Largest potential for energy consumption reduction among end-use sectors
  - Contribute 50% of energy-related emissions in Hungary
  - Only Slovenia and Latvia are less energy-efficient in residential heating

Households' specific energy consumption (kWh/m2a) scaled to EU average climate. Hungary vs. CEE Member States. Average 2000-2007
Source: own elaboration based on data retrieved from the ODYSSEE database



Natural Gas Saved in Year 2030 by Retrofit Scenarios in Poland



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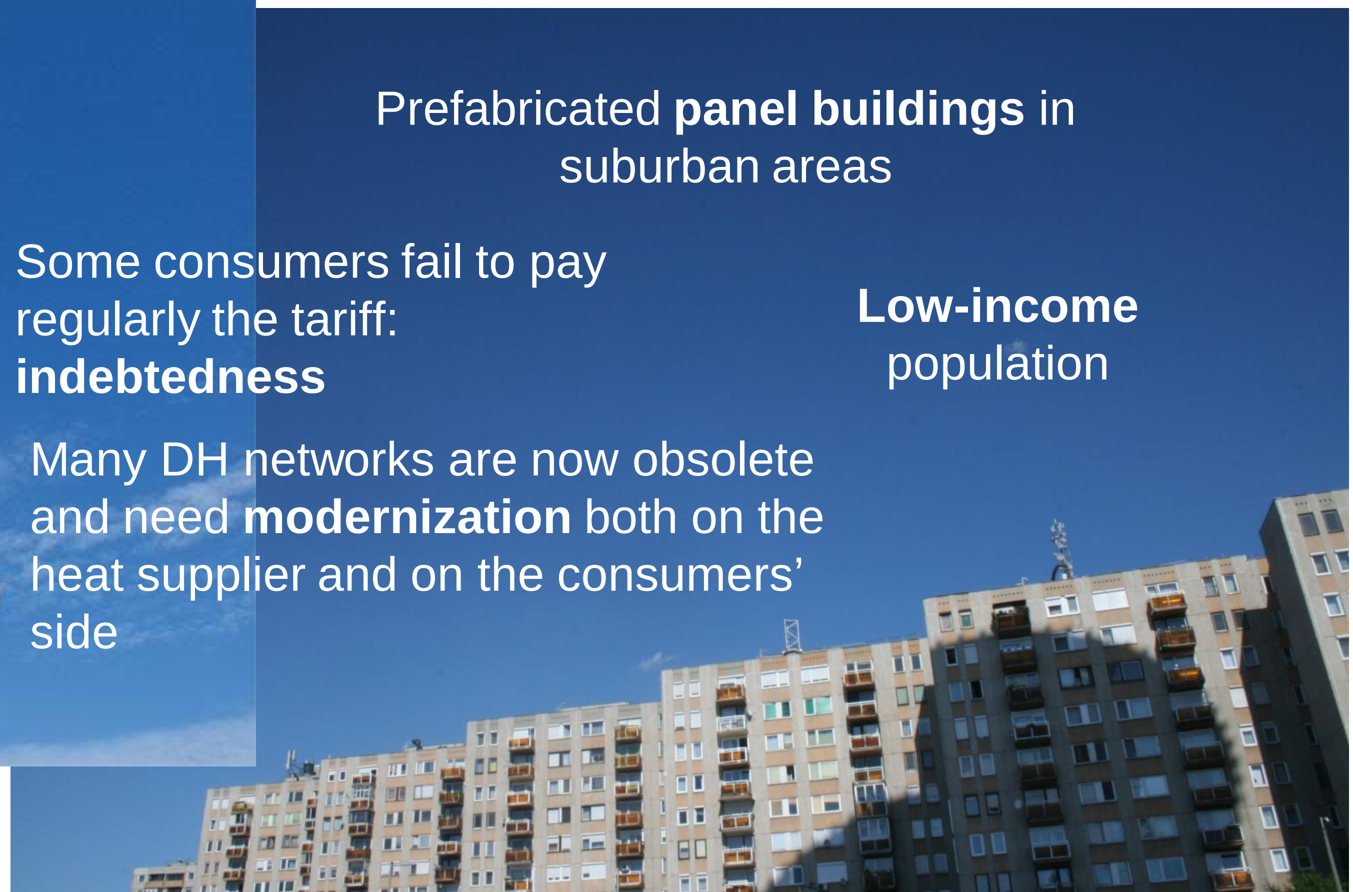
District heating and panel buildings

The thermal trap



Inability to control indoor temperature **thermal discomfort**

Fixed flat rate, no individual meters

DH providers **do not easily allow to switch** to other fuel or company

Prefabricated **panel buildings** in suburban areas

Some consumers fail to pay regularly the tariff: **indebtedness**

Low-income population

Many DH networks are now obsolete and need **modernization** both on the heat supplier and on the consumers' side

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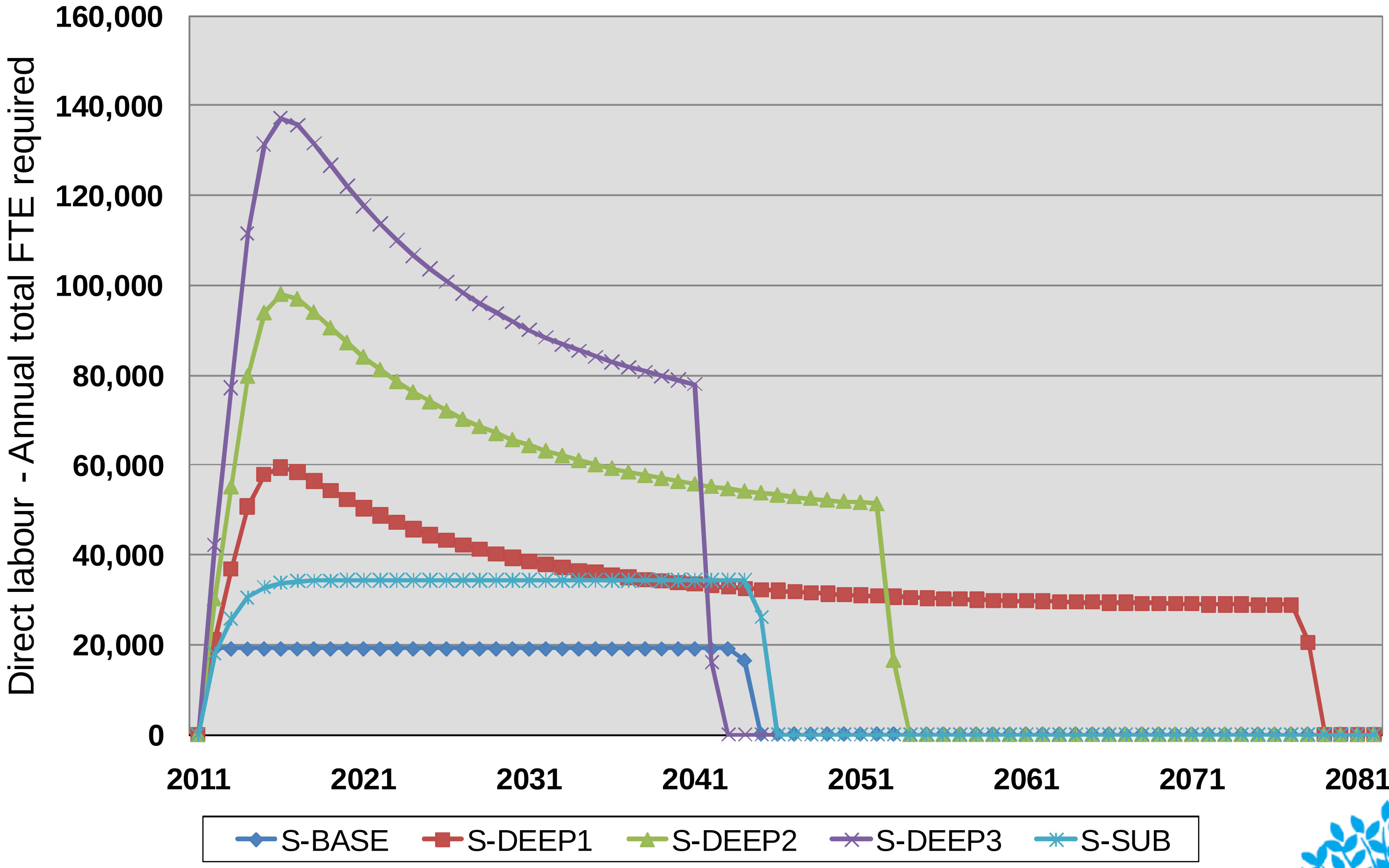
Evolution of direct employment impact in Polish construction sector



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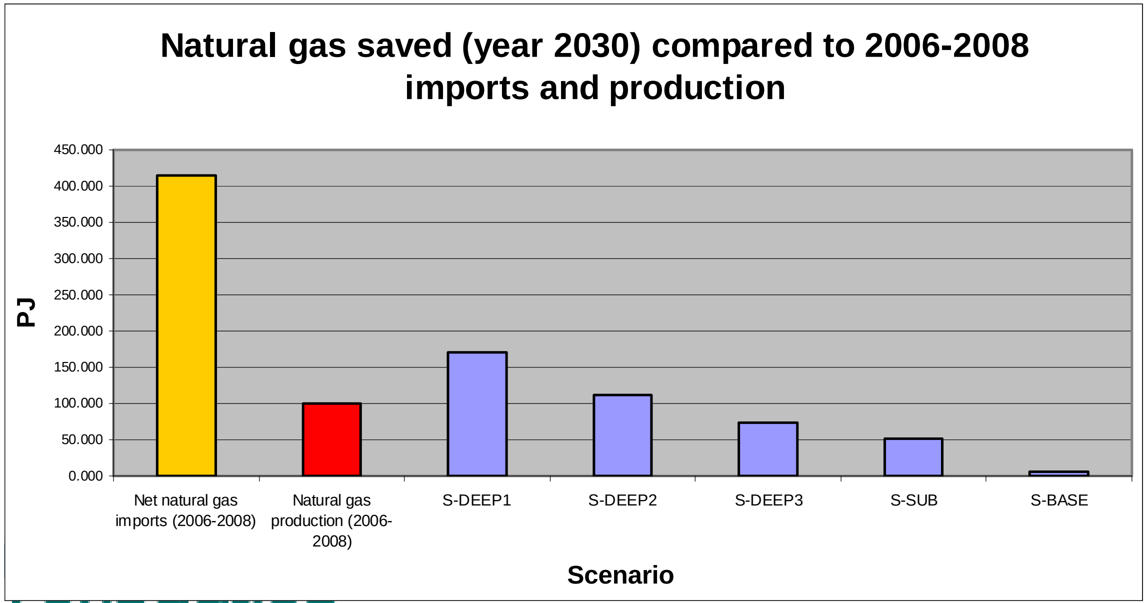
Study impact

- The Energy Efficiency Building Program's policy targets for the 2011-2020 period:
- .reconstruction of at least 50,000 traditionally built houses and 30,000 panels, and building of 22,000 new energy-efficient homes. renovation of 3.2 thousands public buildings on average annually.
- the average investment rate of energy savings should be at least 60 % in the case of new buildings the aim of the incentives is to encourage more energy efficient constructions than it is written down in the prescriptions, the target is 25 kWh/m2 year
- The buildings' energy performance plays a key role amongst the energy efficiency measures as these measures represent the greatest possible savings. The improvement of the buildings' energy efficiency will probably create 60-70 thousand of new jobs.

Energy Security Benefits

- Reduced import of Natural Gas
  - At the end of their implementation, the deep renovation scenarios can save up to 39% of the current natural gas imports
  - The natural gas saved in 2030 is the same order of magnitude as Hungary’s NG production (2008 levels)



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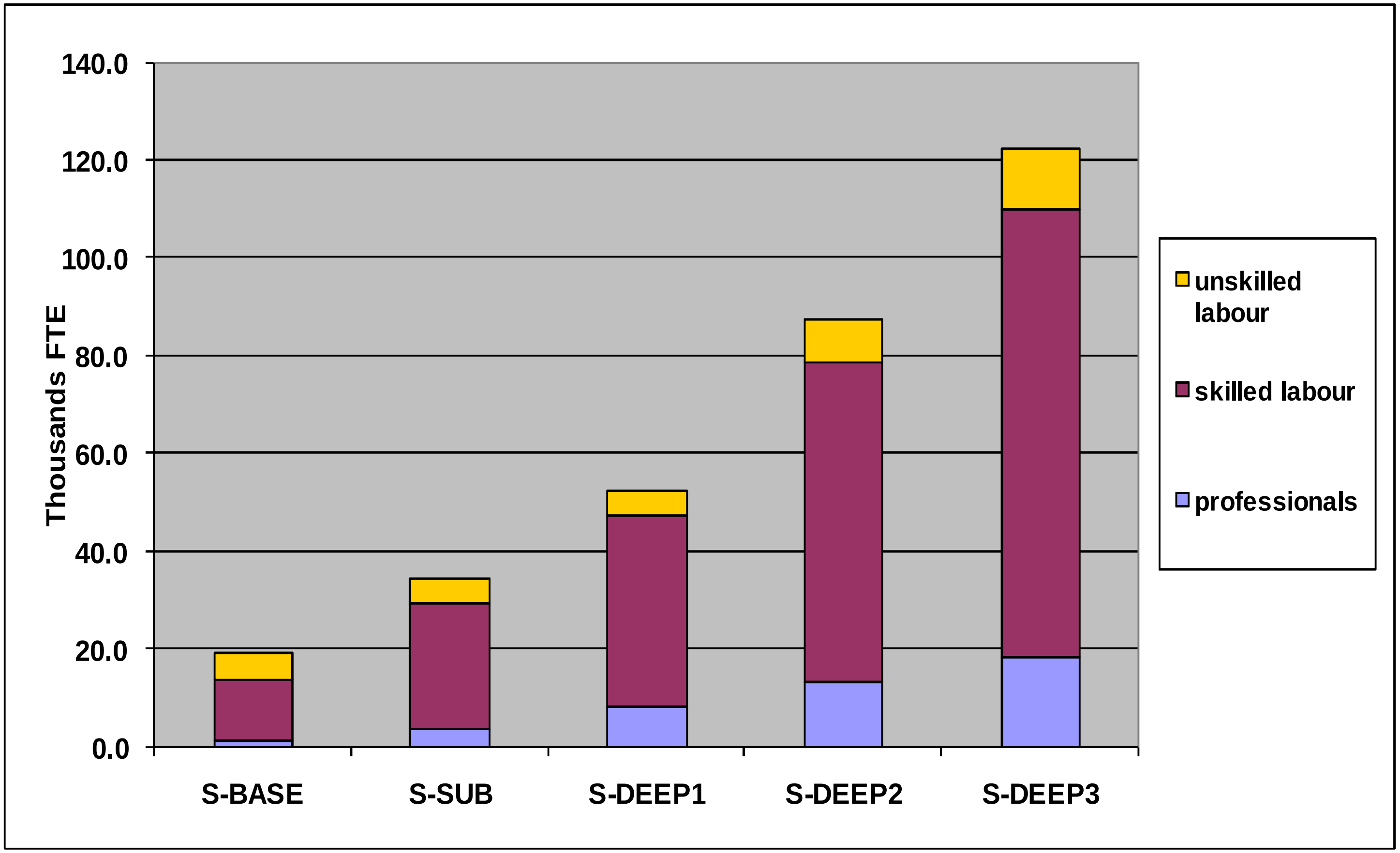
Poland



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