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

CENTER FOR CLIMATE CHANGE AND SUSTAINABLE ENERGY POLICY

CENTRAL EUROPEAN UNIVERSITY

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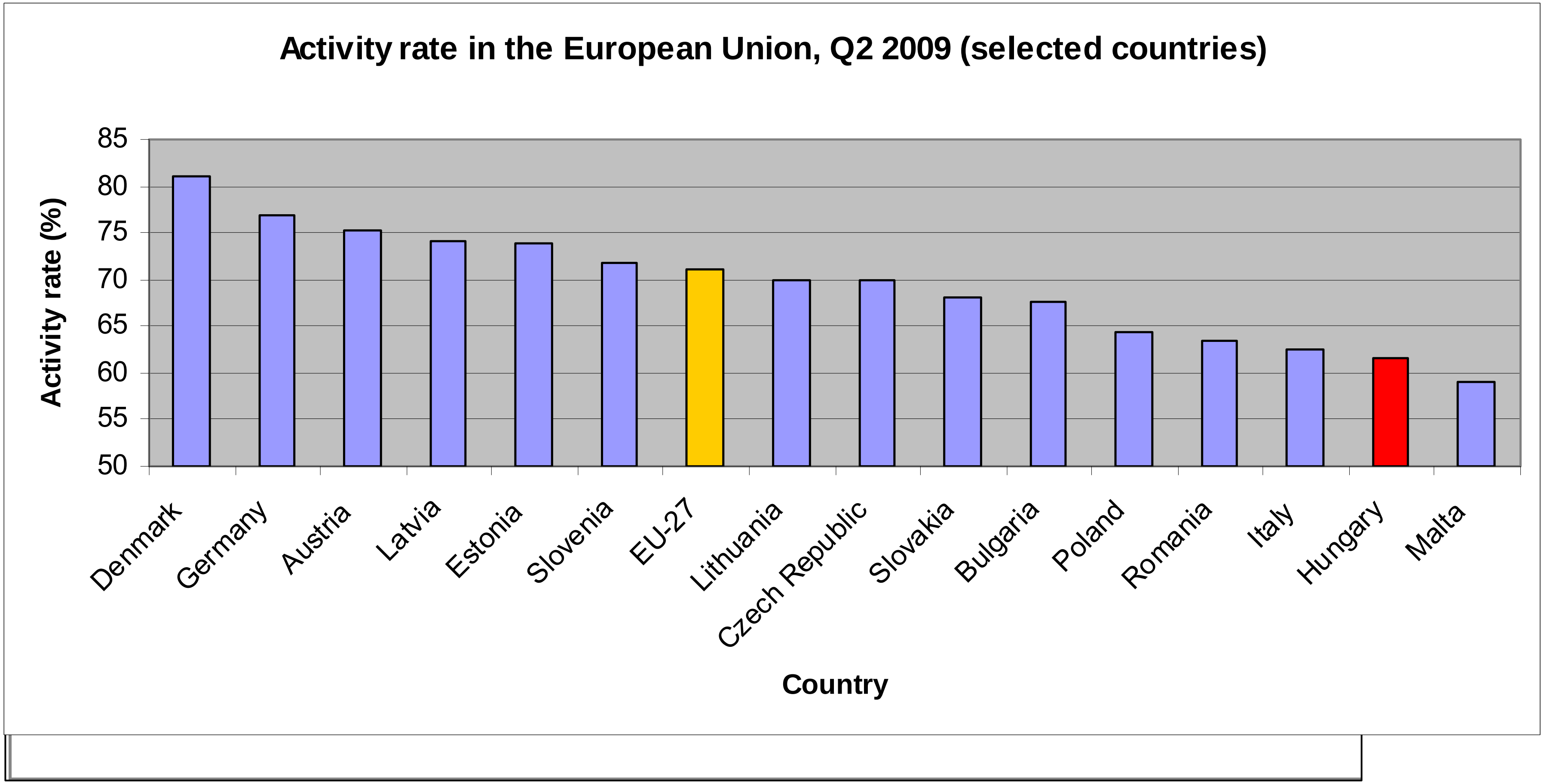
Background



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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The project in a nutshell

- **Objective**: to gauge the net employment impacts of a large-scale deep building energy-efficiency renovation programme in Hungary
- **Scope of the research**:
  - Type of buildings: residential and public buildings (no industrial or commercial)
  - Type of renovation: reduce demand for heating (no appliances)
  - Employment effects: direct, indirect and induced
- **Expected results**:
  - Non-employment results: investments involved, reduction in energy consumption and CO2 emissions, energy cost savings
  - Net impacts on Hungarian labour market
- **Two phases**:
  - Preliminary results: 22 March 2010
  - Final report: June 8 2010 (revised results)

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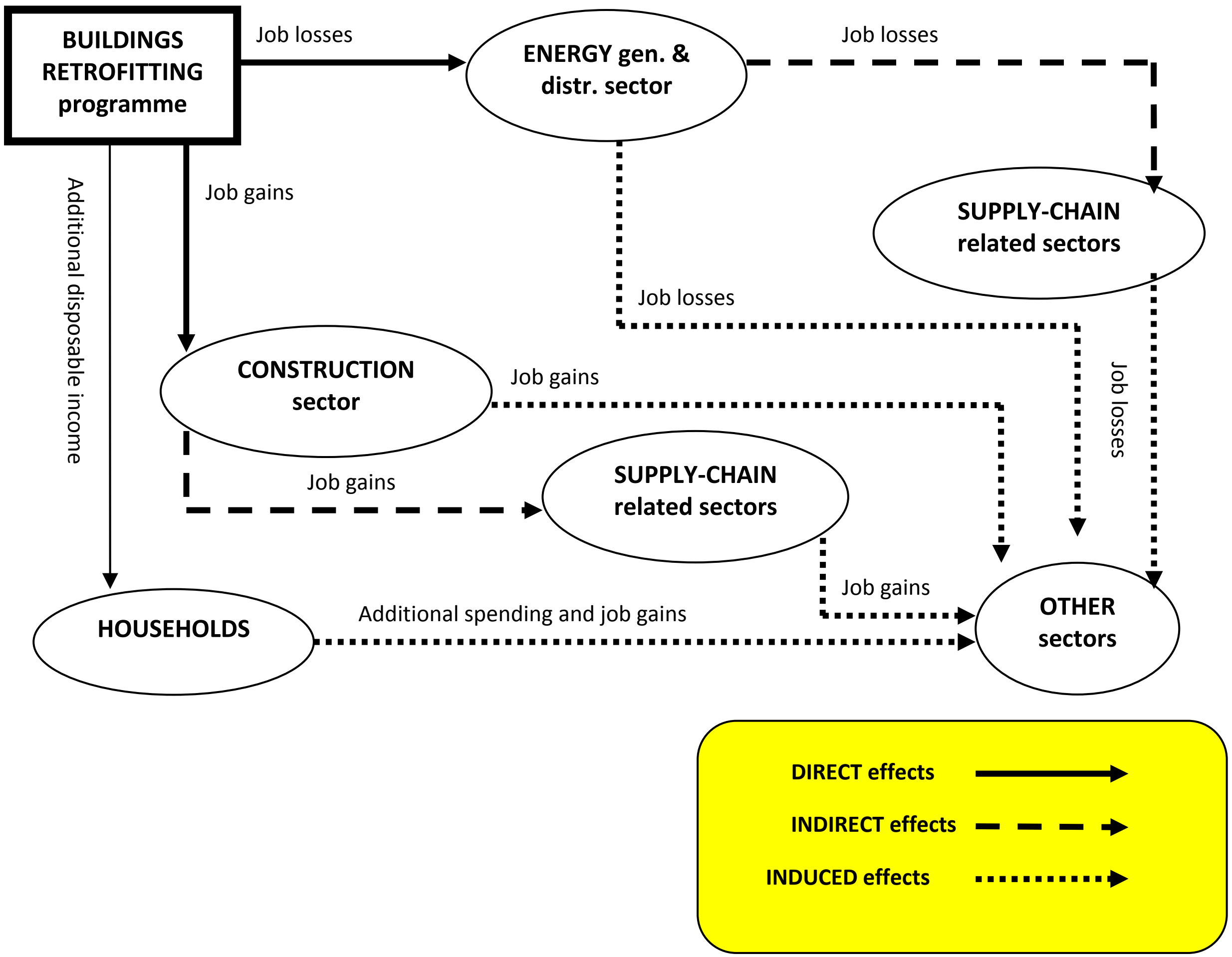
Employment Effects: Overview



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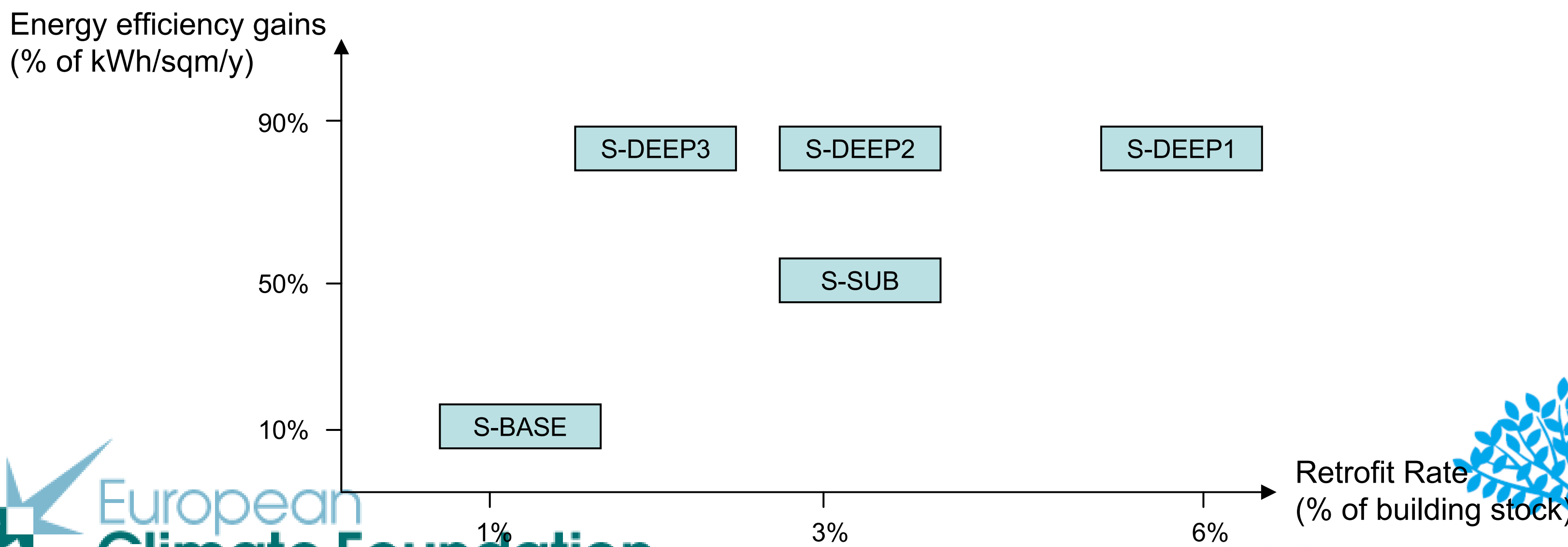
Scenarios considered

Scenario	Description	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	18 years
S-DEEP2	Deep retrofit with medium implementation rate	Around 12 million square meter (equivalent to 150,000 dwellings) per year	Deep retrofits	28 years
S-DEEP3	Deep retrofit with slow implementation rate	Around 8 million square meter (equivalent to 100,000 dwellings) per year	Deep retrofits	41 years
S-SUB	Suboptimal retrofit with medium implementation rate	Around 12 million square meter (equivalent to 150,000 dwellings) per year	Suboptimal retrofits	28 years

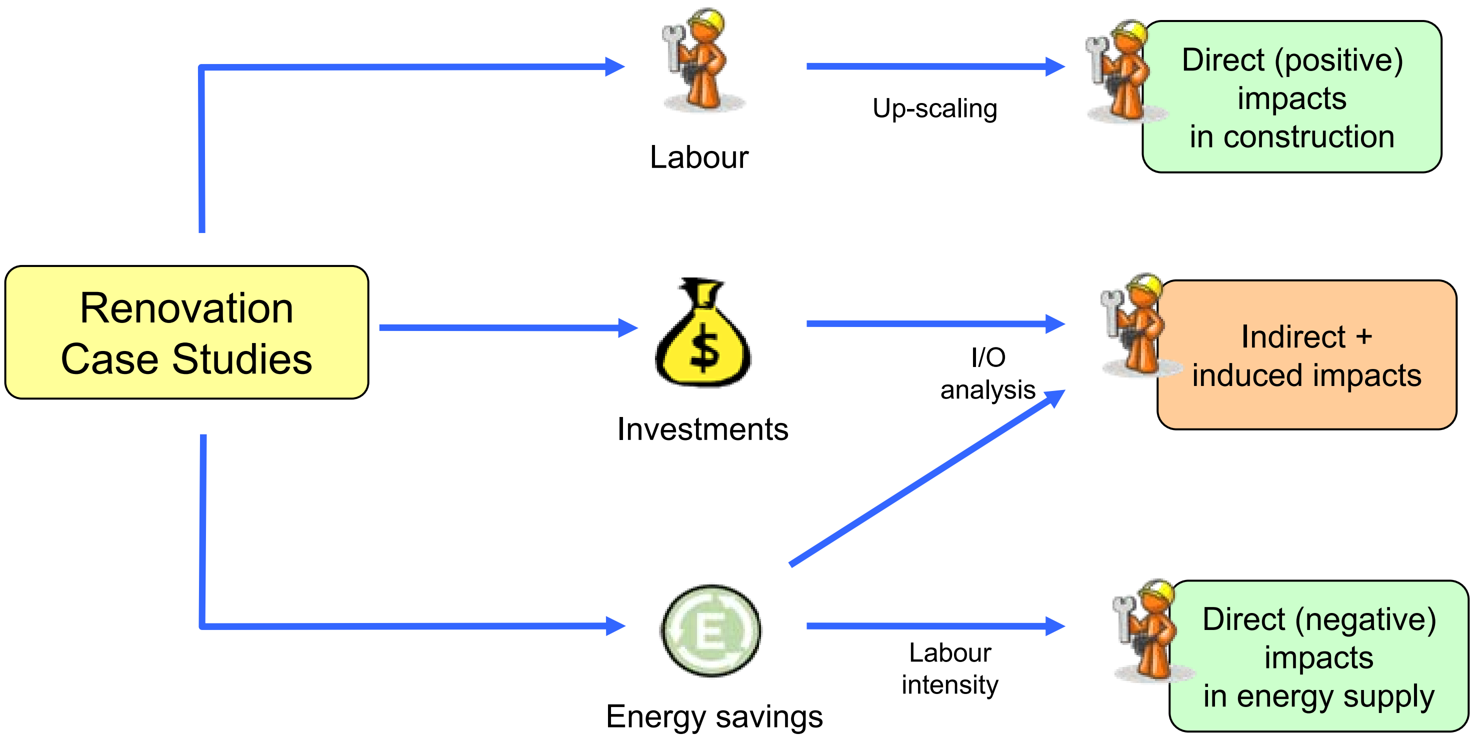


Methodology: building stock model

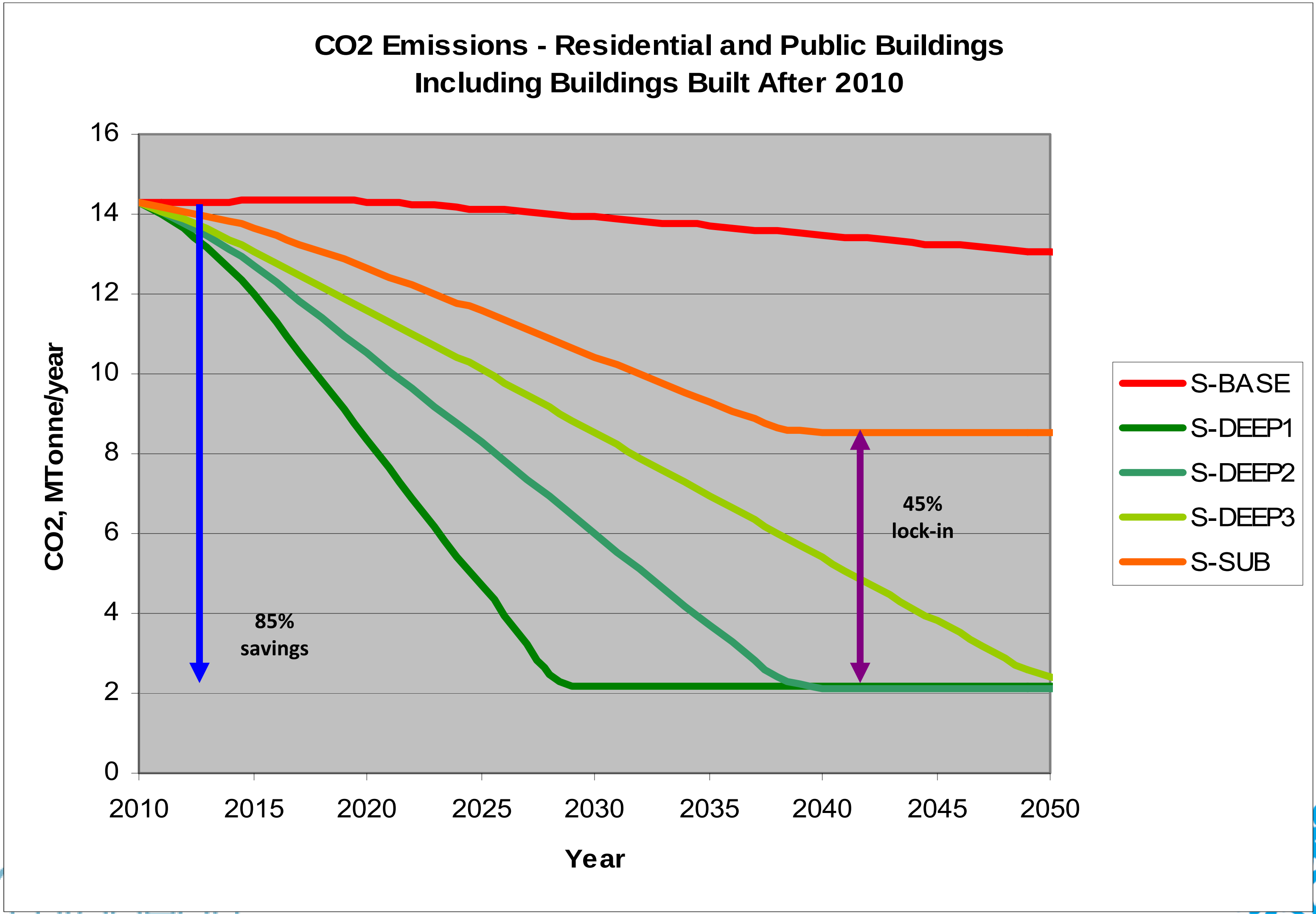
- Data on the building stock
  - # units, size, specific energy consump. for heating
  - Novikova (2008), Korytarova (forthcoming)
  - *Ramp-up* period: progressive implementation rates
- Costs of suboptimal and deep renovations
  - Lit. review, case studies
  - Best-case approach for deep (e.g., SOLANOVA)
  - Decreasing cost for deep renovations: learning factors
- Energy prices
  - Increase in real energy prices estimated from KSH and IEA.

Methodology: employment impacts

- Mixed: Up-scaling + Input-Output analysis



Scenario results: CO2 emission reductions until 2050: 45% locked in by S-SUB scenario



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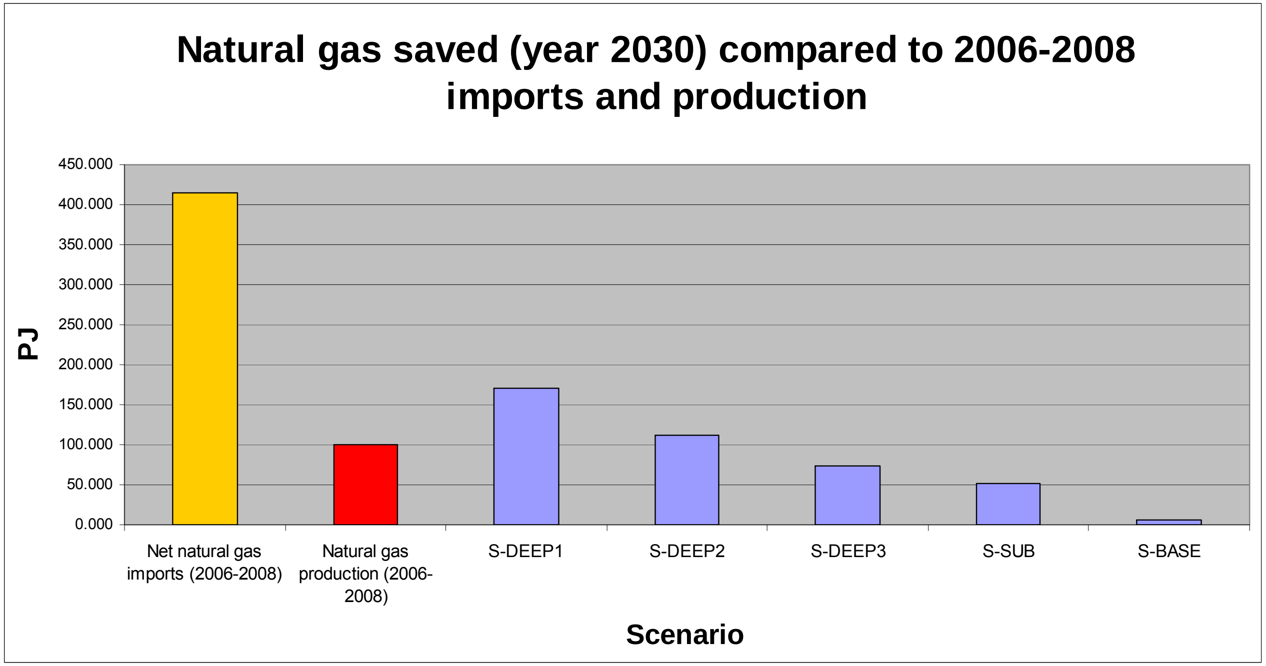
Energy security benefits

- Reduced import of natural gas (NG)
  - At the end of their implementation, the deep renovation scenarios can save up to 39% of the NG imports in Hungary (2006-2008 levels).
  - The natural gas saved in 2030 is the same order of magnitude as Hungary's NG production (2006-2008 levels**)**



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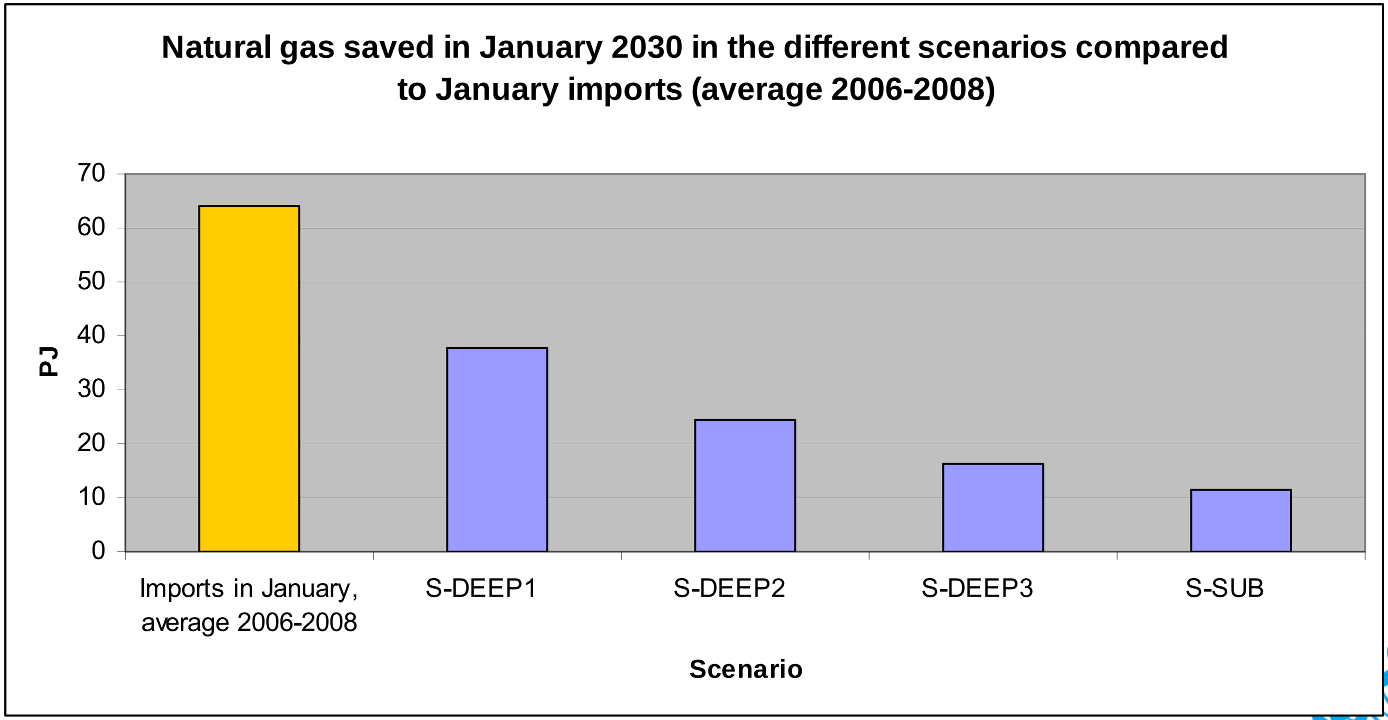
Energy security benefits (2)

- 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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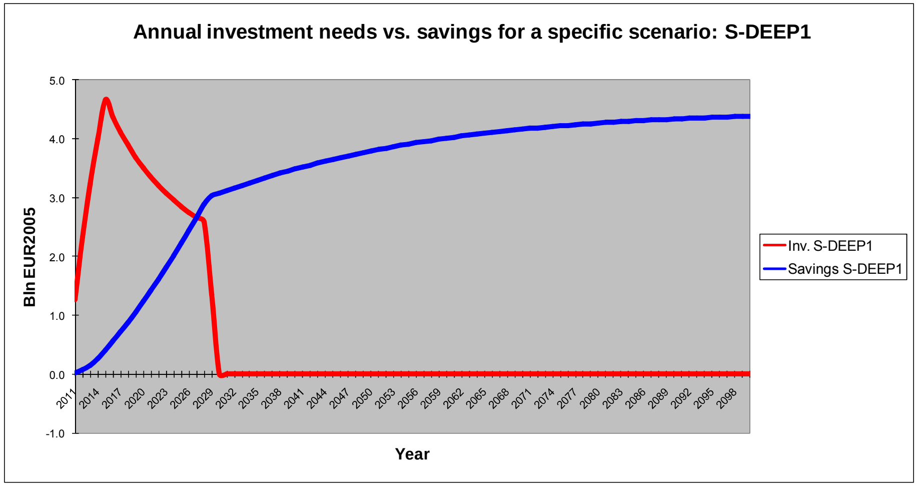
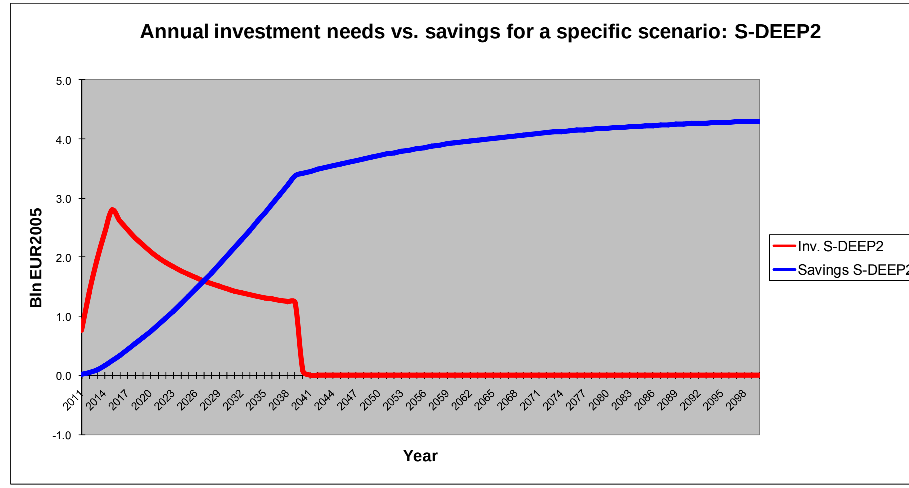
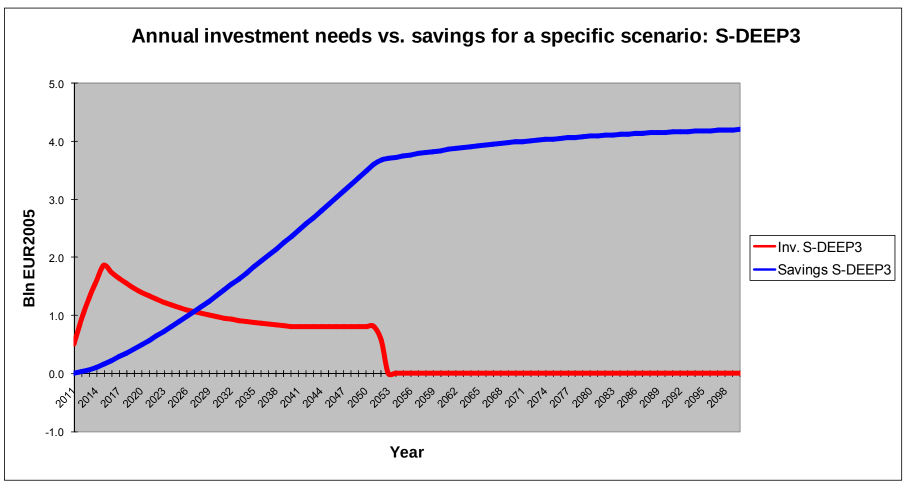
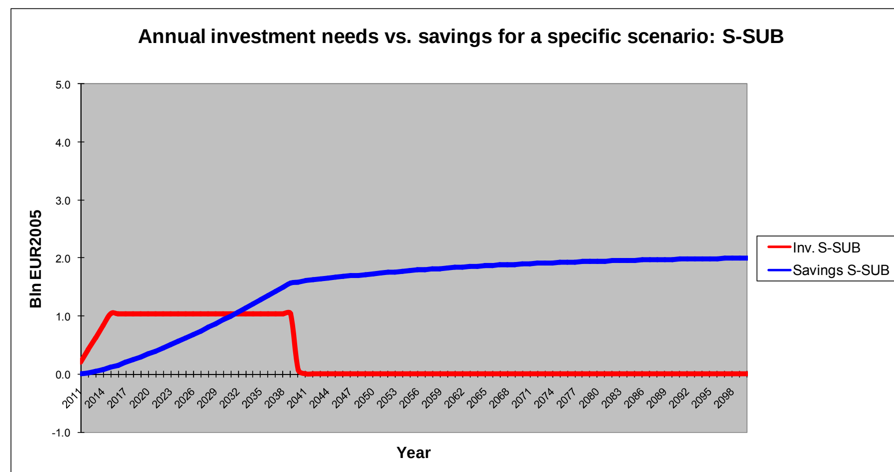
Scenario results: annual investment needs vs. energy cost savings









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

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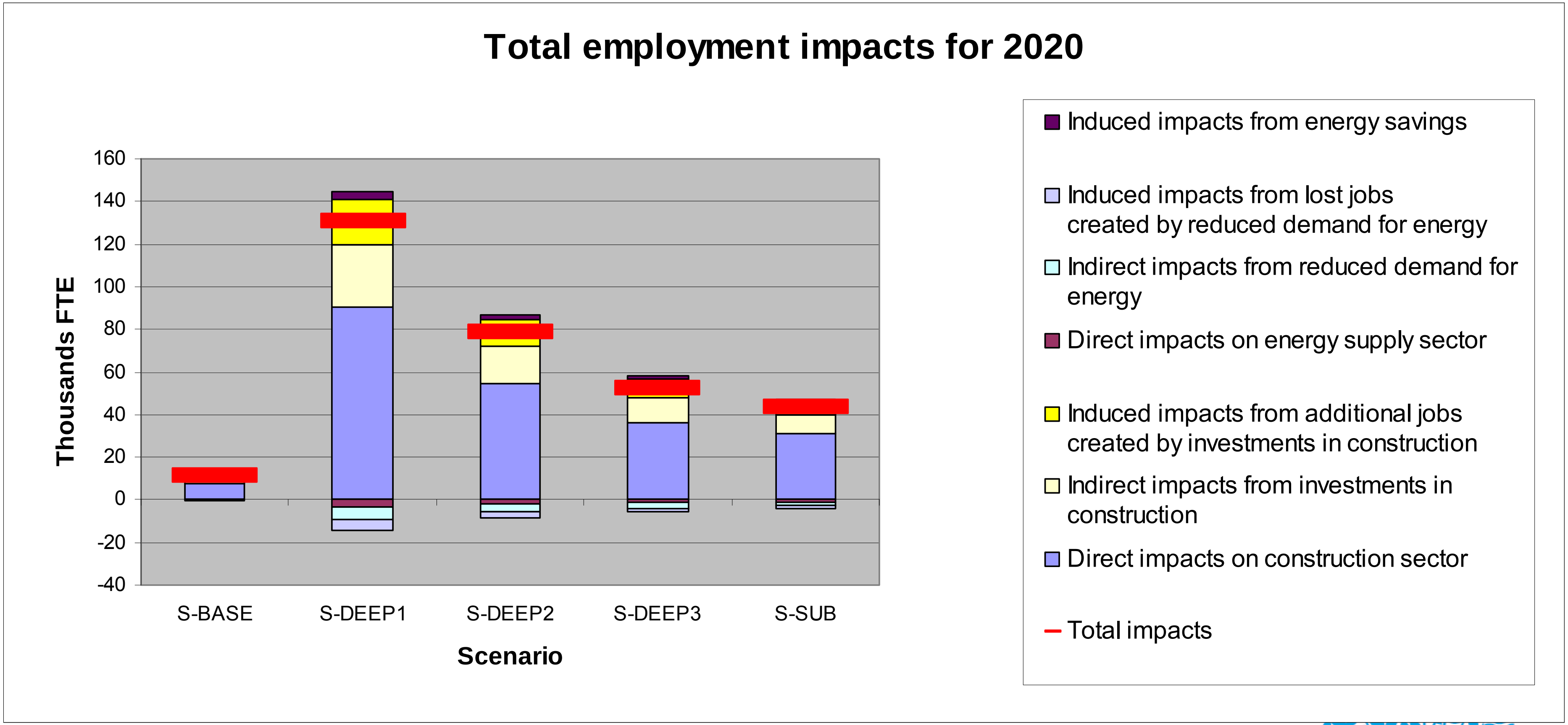
Total net employment impacts: snapshot in 2020

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



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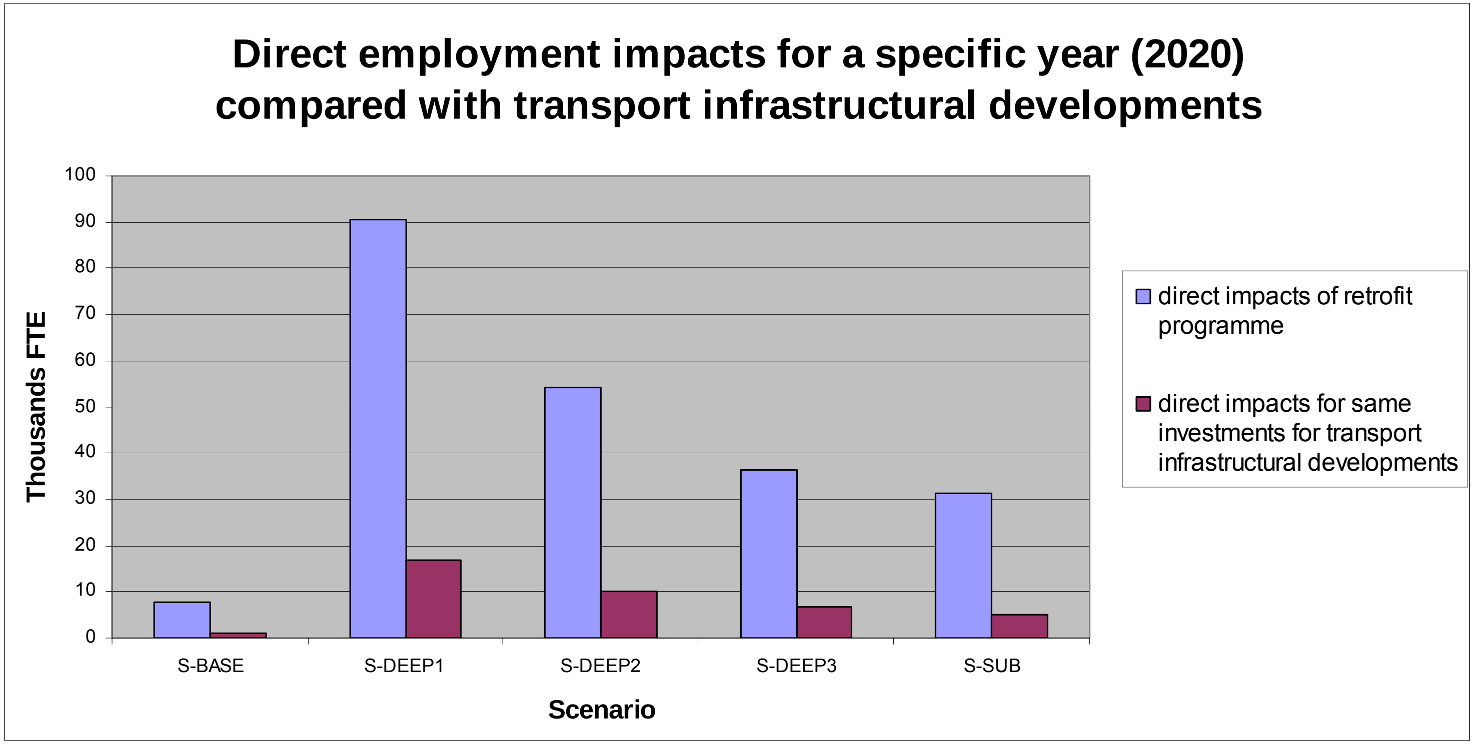
Direct employment impacts: comparison with other investments



- Labour intensity in renovations is 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 or similar infrastructures

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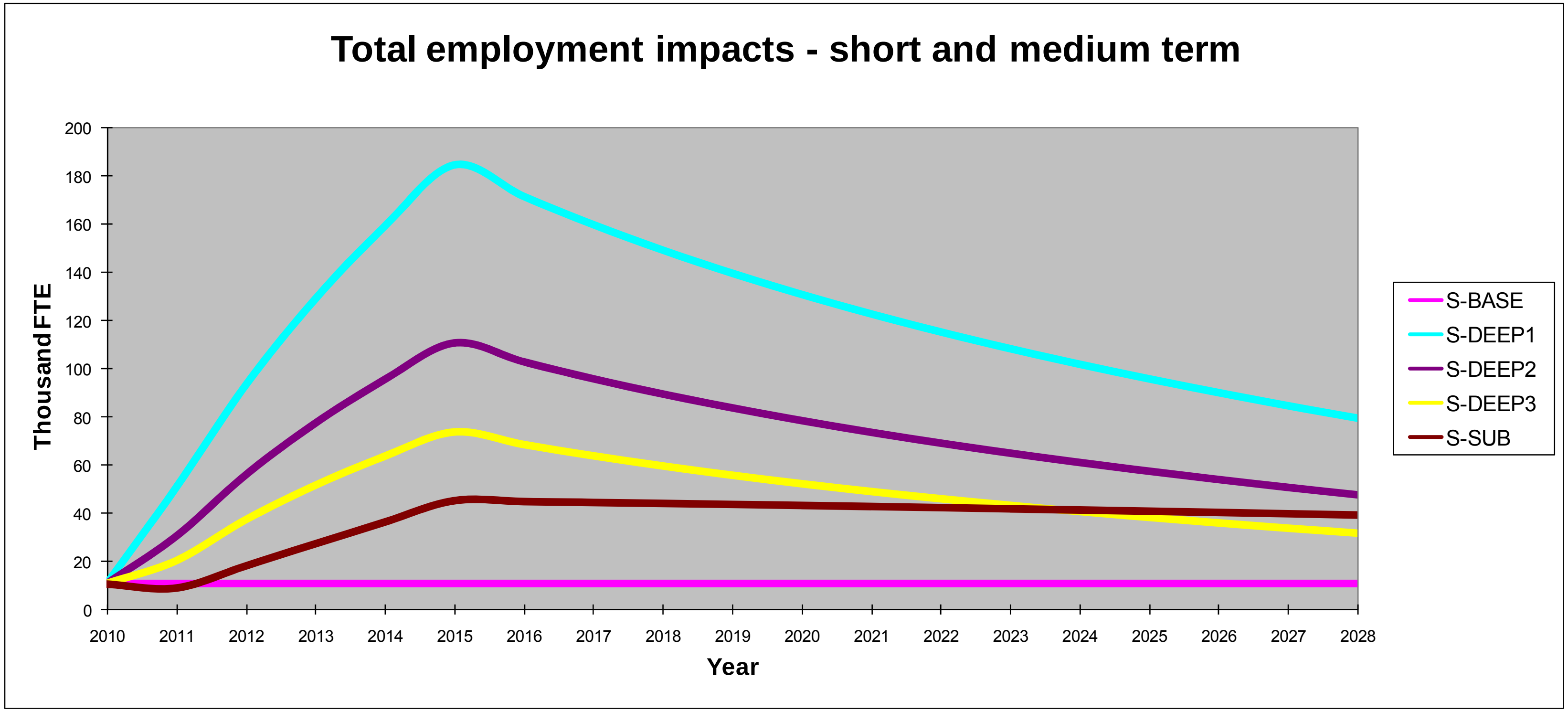
Net employment impacts in construction: medium-term view



- 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: **rebound effect**

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)

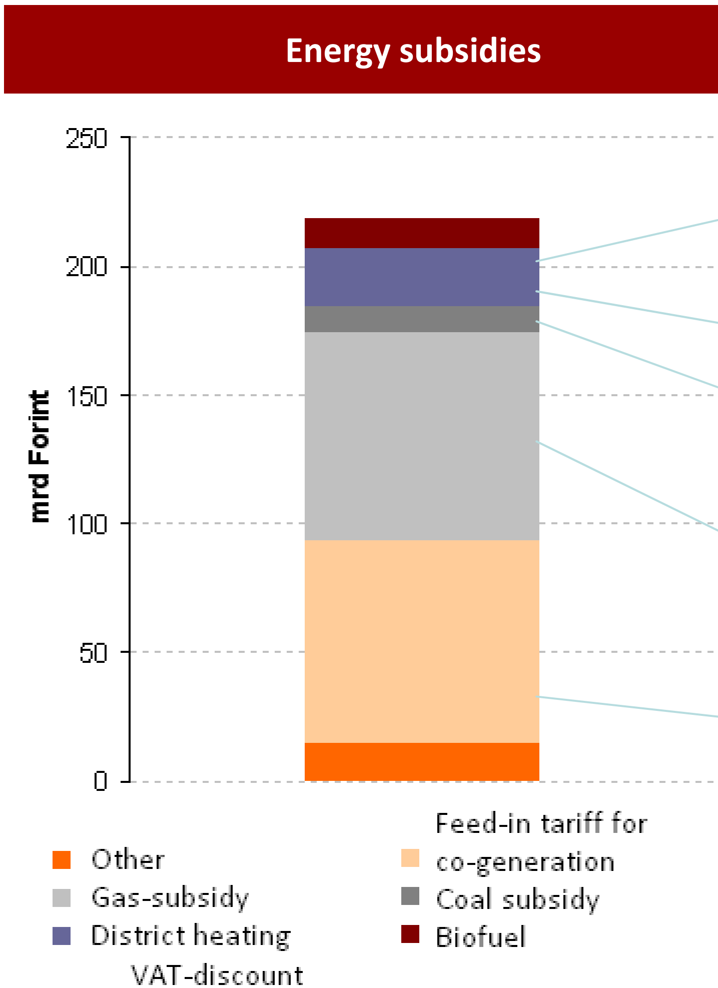
- **Grey labour**
  - Opportunity for the State to **increase the control** on grey labour in construction
- **Fuel poverty**
  - Such a programme has the potential of **eradicating** fuel poverty
  - Great attention has to be put in financing, especially for the lower income households
- **Real estate**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

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:
  - **EU funds** (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

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

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Summary of results: conclusions

- **Deep renovation** scenarios deliver **higher climate and energy benefits** as compared to suboptimal renovation scenarios
  - Deep retrofit scenarios can save 85% of energy use and relative carbon emissions
  - A suboptimal scenario locks in 45% of 2010 heating-related emissions
  - 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)
  - A suboptimal scenario will reduce imports of 10% only (18% in January)
  - The construction sector has the opportunity of learning new techniques which will inevitably be state-of-the-art in a few years
- **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,* 43,000 in *S-SUB*
    - 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**
  - The renovation programmes would have a high impact on the state's budget (up to 13% for S-DEEP1, 8% for S-DEEP2, 5% for S-DEEP3)
  - However, a large amount of money (up to 1 billion Euros) can come from the EU or from redirecting current energy subsidies (e.g. to gas and district heating)
  - Part of the initial investment costs can be financed by a pay-as-you-save financing scheme

Summary of results: recommendations

- To promote a **deep renovation** program with a **less ambitious rate of renovation**
  - e.g. *S-DEEP3* –(2.3% of the floor area, 100,000 dwellings-equivalent)
  - 52,000 jobs created by 2020
  - Less than 2 Billion Euros of peak annual investment, 1 bln in later progam phases
- The **employment 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
- The **public administration** should be **involved** in **planning** and **financing**
  - To assure that deep renovations and thus savings are achieved
  - To reduce potential supply bottlenecks

From research to policy-making…

- **Timeframe** of the project
  - March-June 2010 (comissioned by ECF Feb. 2010)
  - General elections in Hungary: April 11-25, 2010
  - New government formed on May 29, 2010.
  - Presentation of results: June 8, 2010
- **Policy impact**
  - Late June 2010: the new Hungarian governmnent announces a new, more ambitious renovation programme for the residential sector:
    - 100,000 units per year, increasing up to 150-200,000 units per year
    - *Complex* renovations: 70-80% target energy savings (previously up to 50%)
    - Hungary taking leadership in advanced EE solutions for the buildings sector

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Thank you for your attention

http://3csep.ceu.hu/

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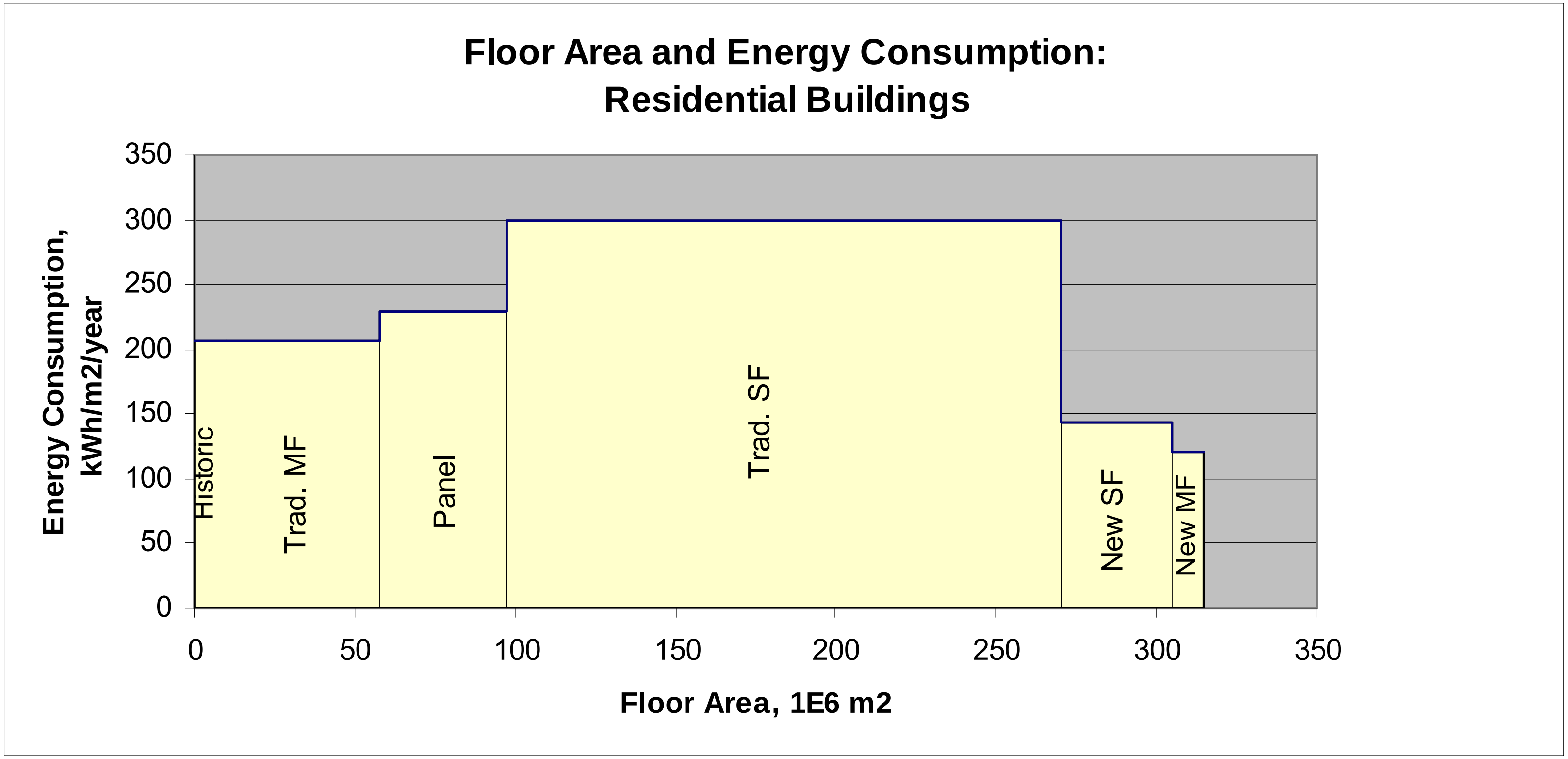
Residential Building Stock Current Characteristics



Total Energy Consumption: 58 TWh/year

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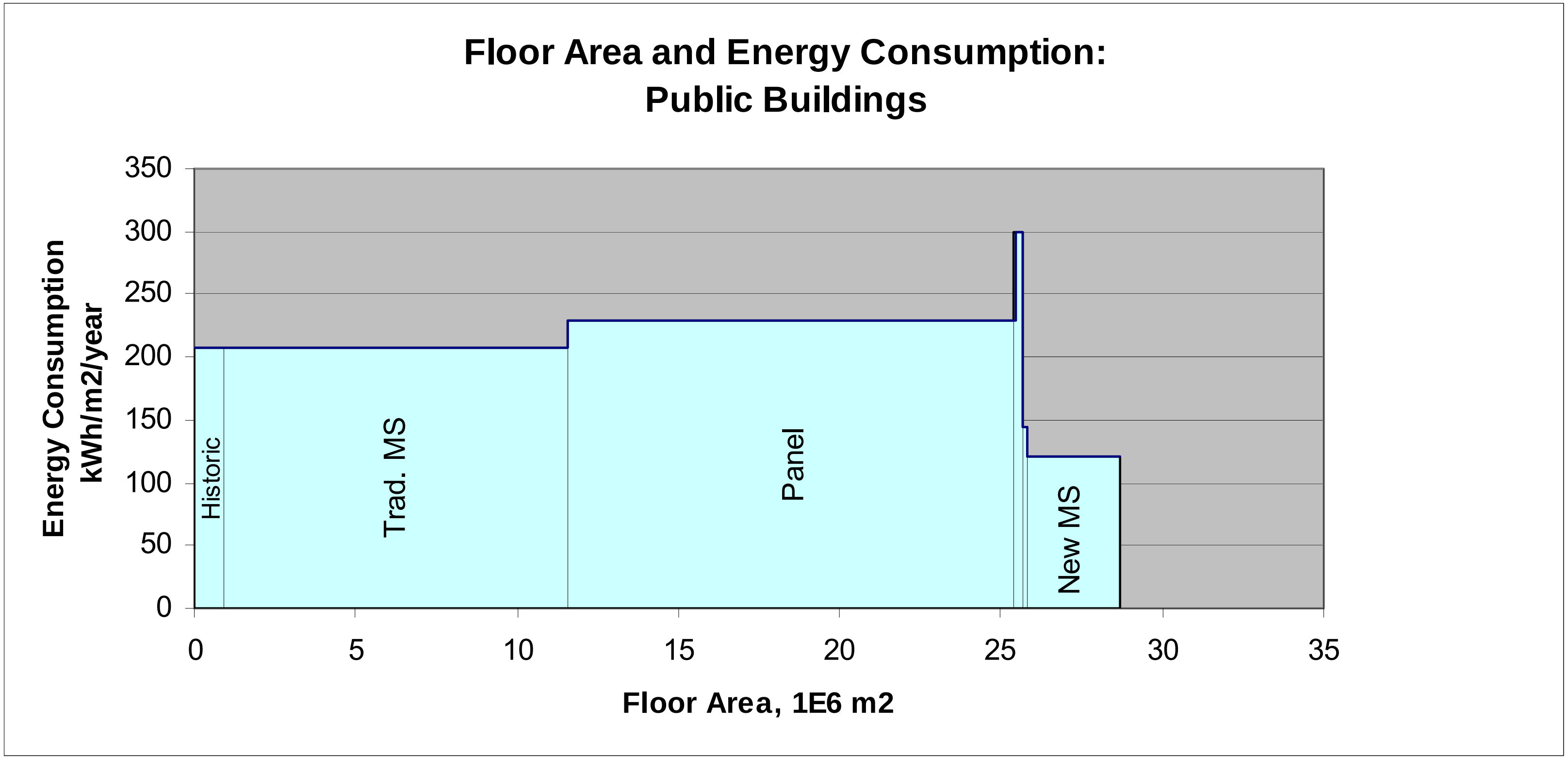
Public Building Stock
Current Characteristics



Total Energy Consumption: 5 TWh/year

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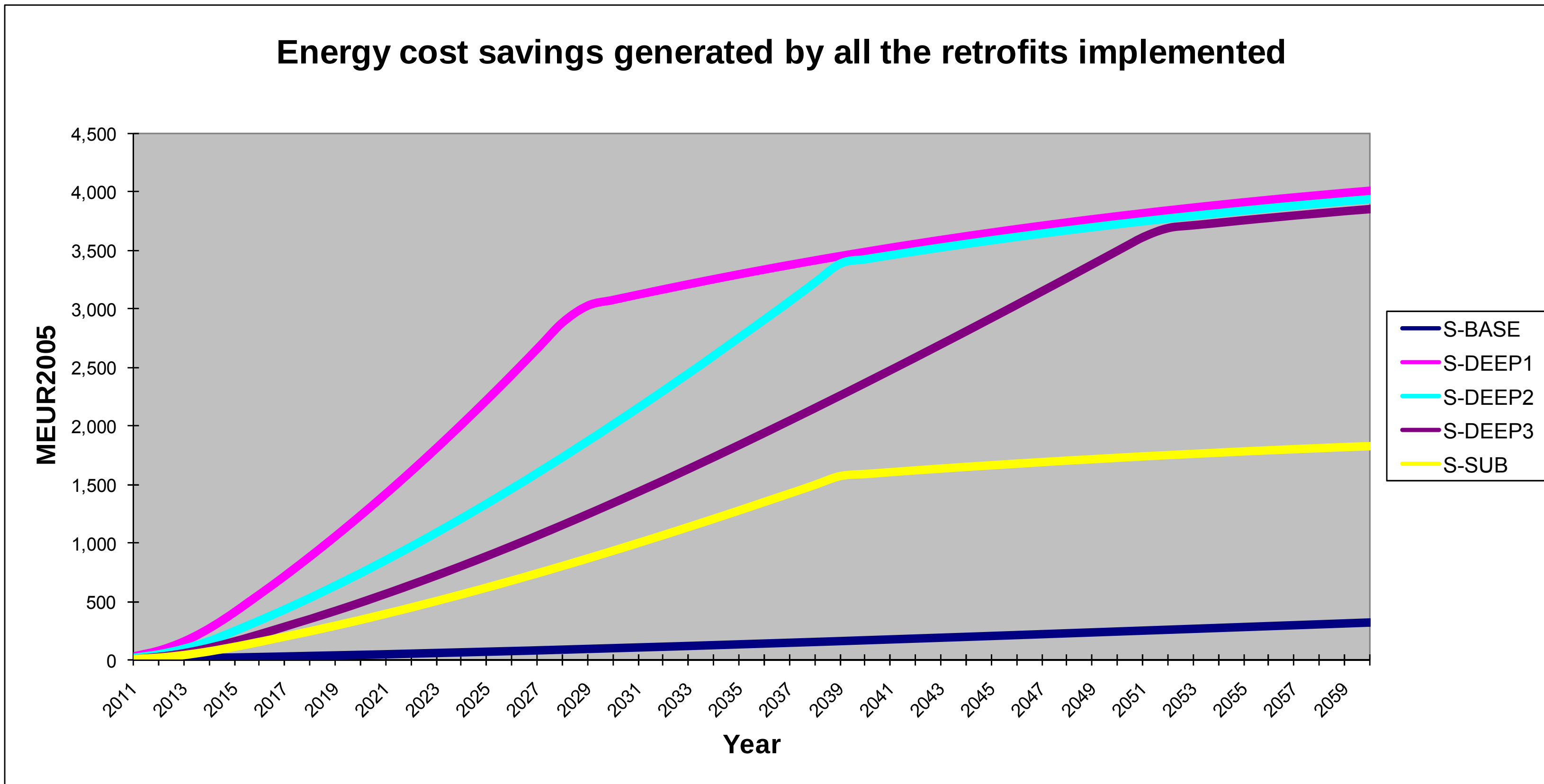
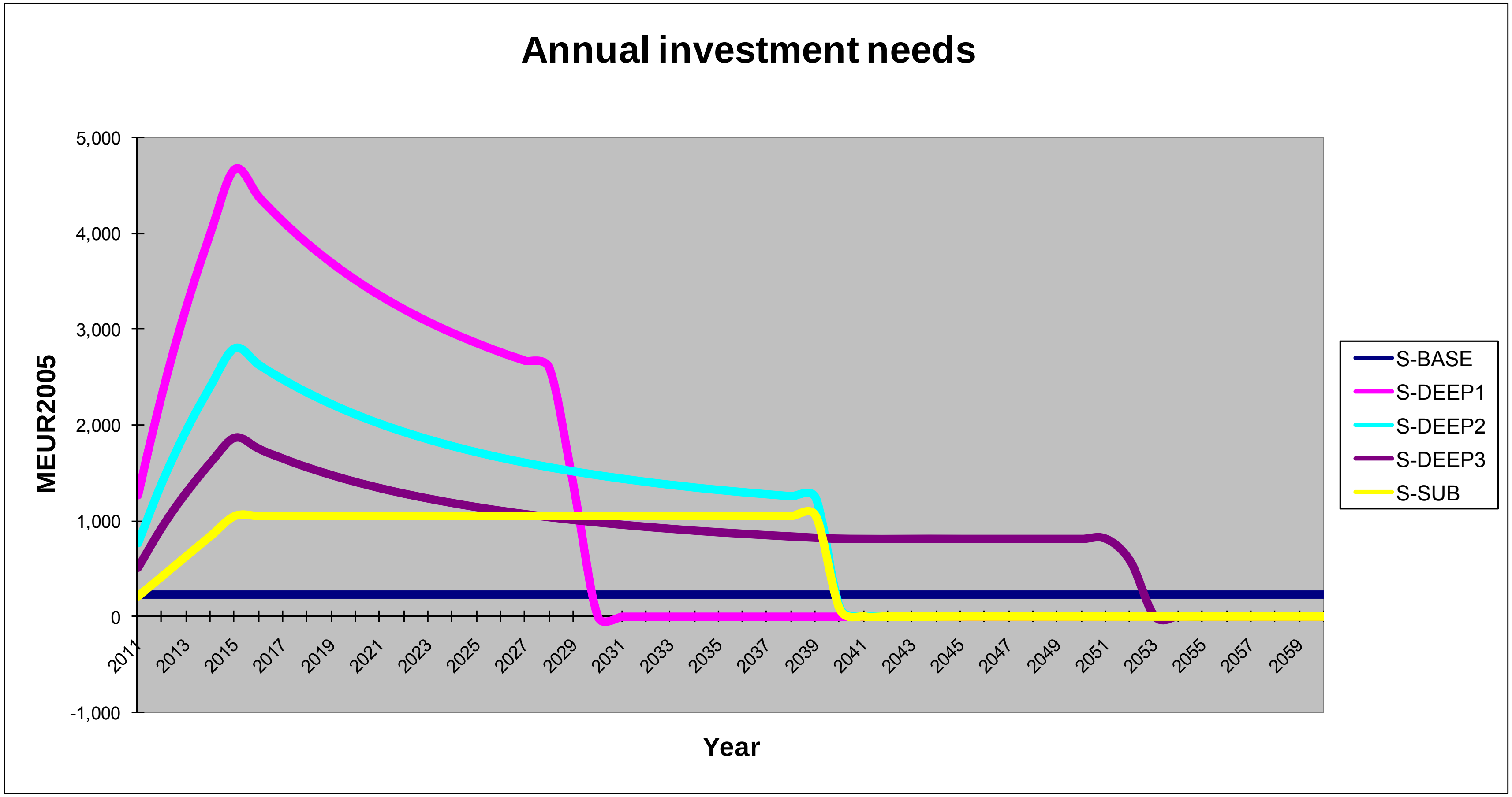
Scenario results: energy cost savings

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



Scenario results: Investments for the programme



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

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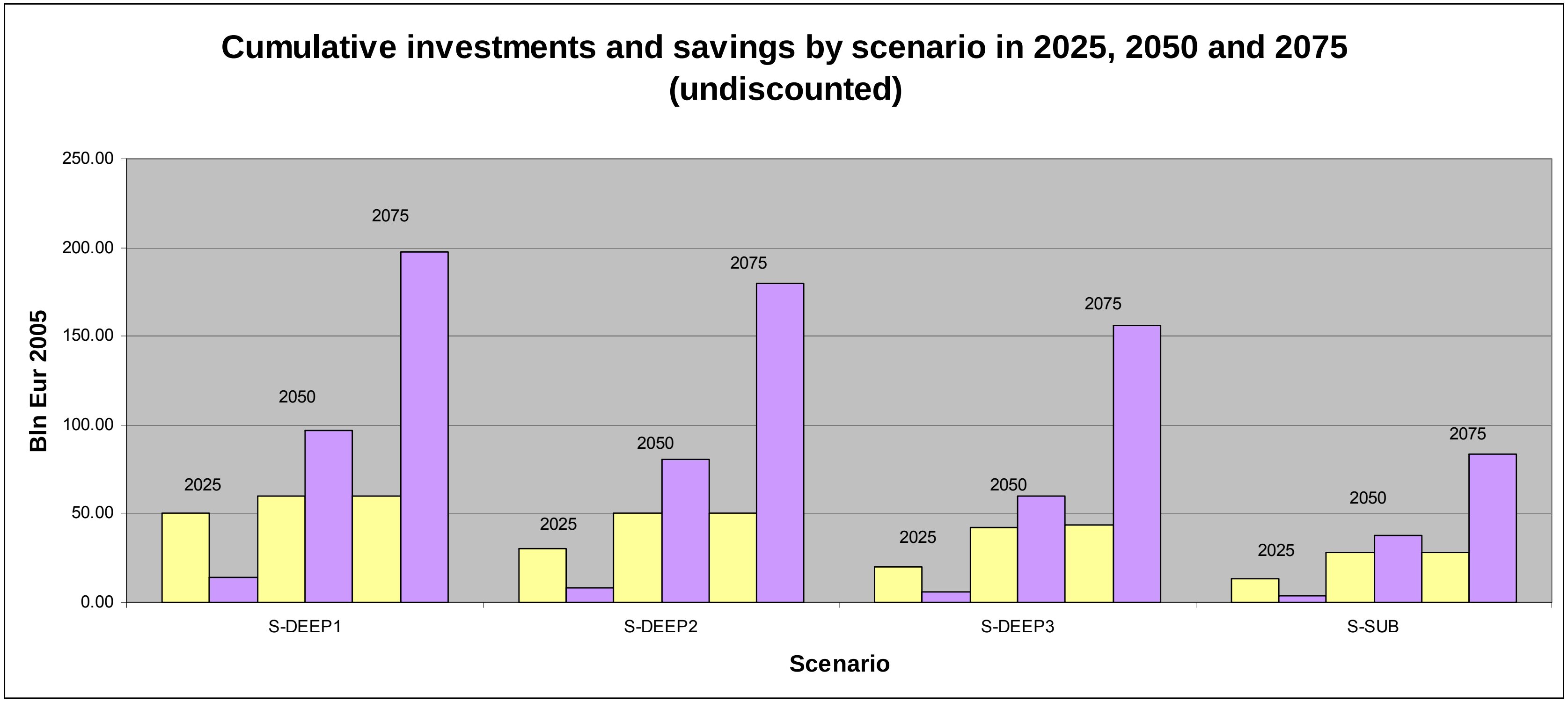
Cumulative investments and savings (undiscounted)



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Employment effects: available methodologies

Scaling-up of case studies

- *Bottom-up* method
- Based on case-study data

Input-Output analysis

- *Top-down* method
- Based on input-output tables

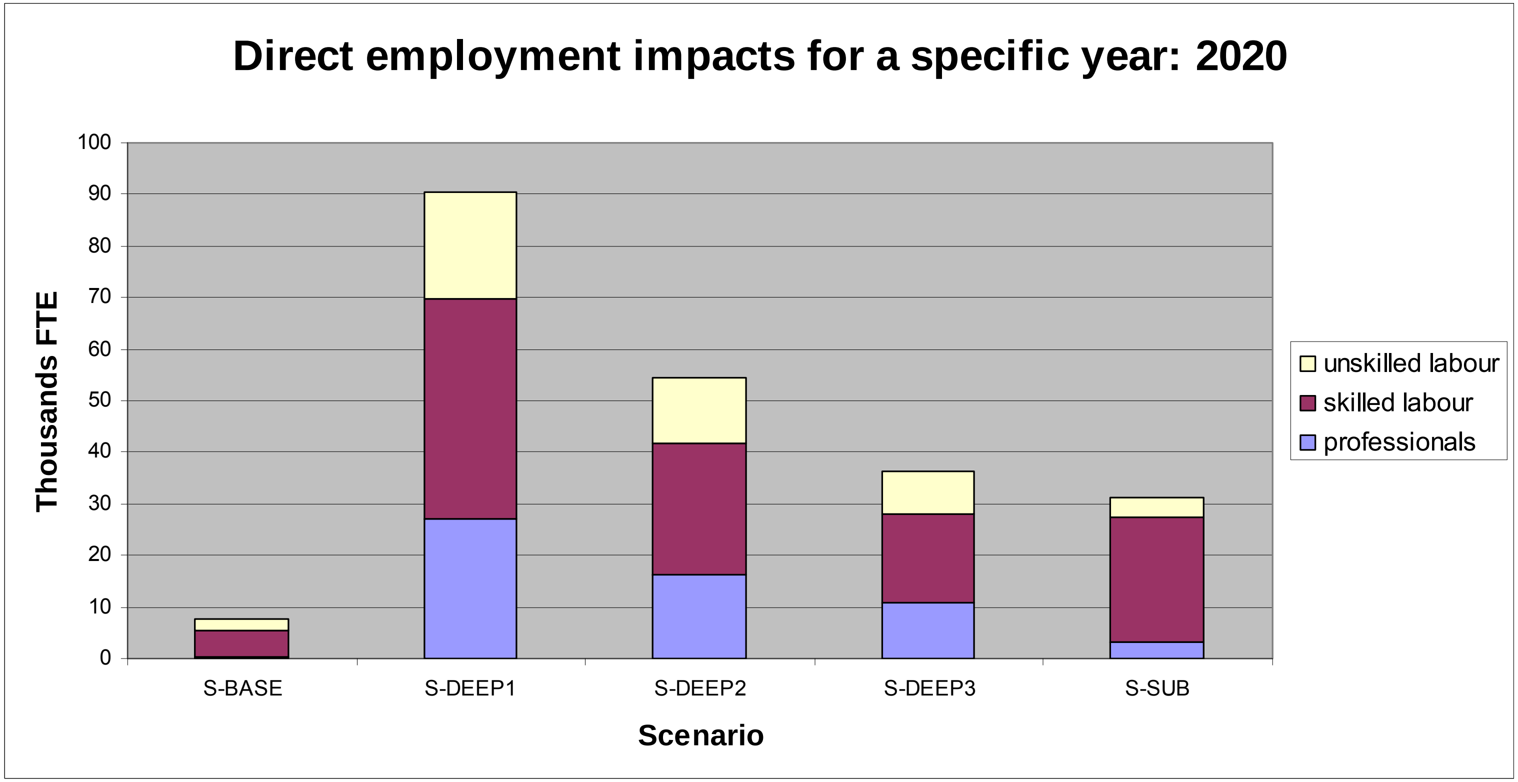
CGEM (Computable general equilibrium models)

- More complex
- Adds dynamics to I/O method
- Can model international exchanges

Results transfer

- Useful if data is lacking (e.g. developing countries)
- Subject to uncertainties

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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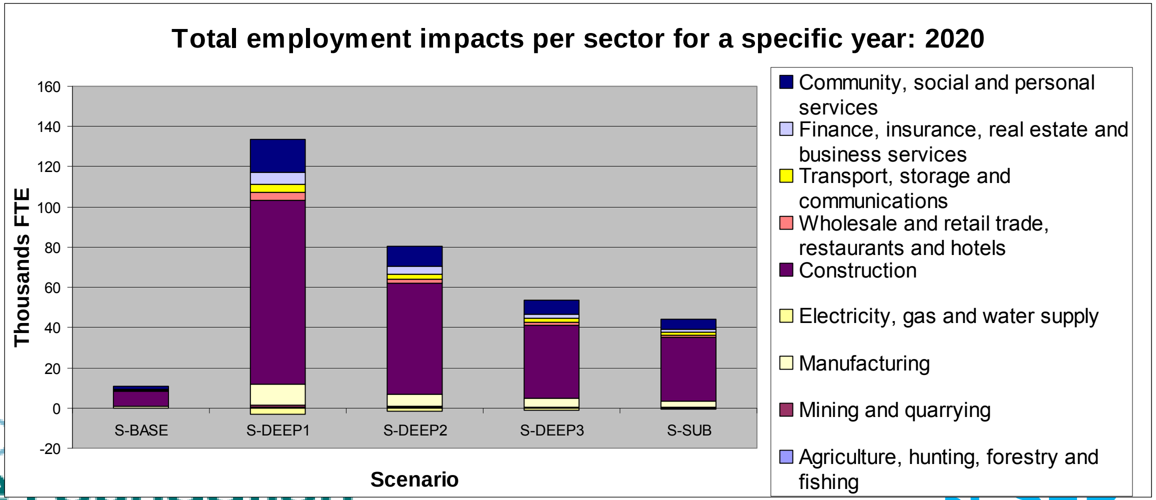
Total net employment impacts divided by sector: snapshot in 2020

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



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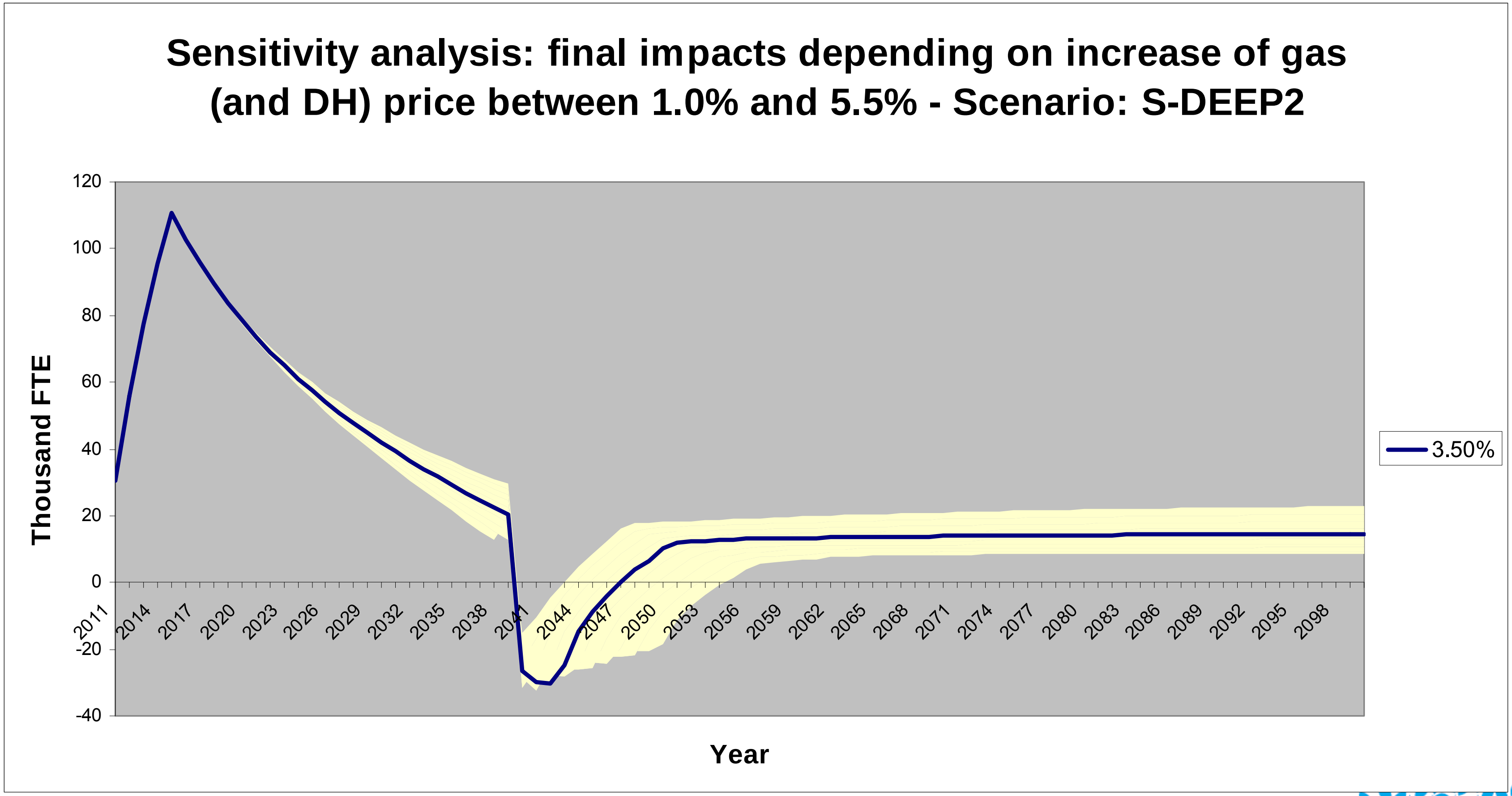
Sensitivity analysis: variation of increase of energy prices



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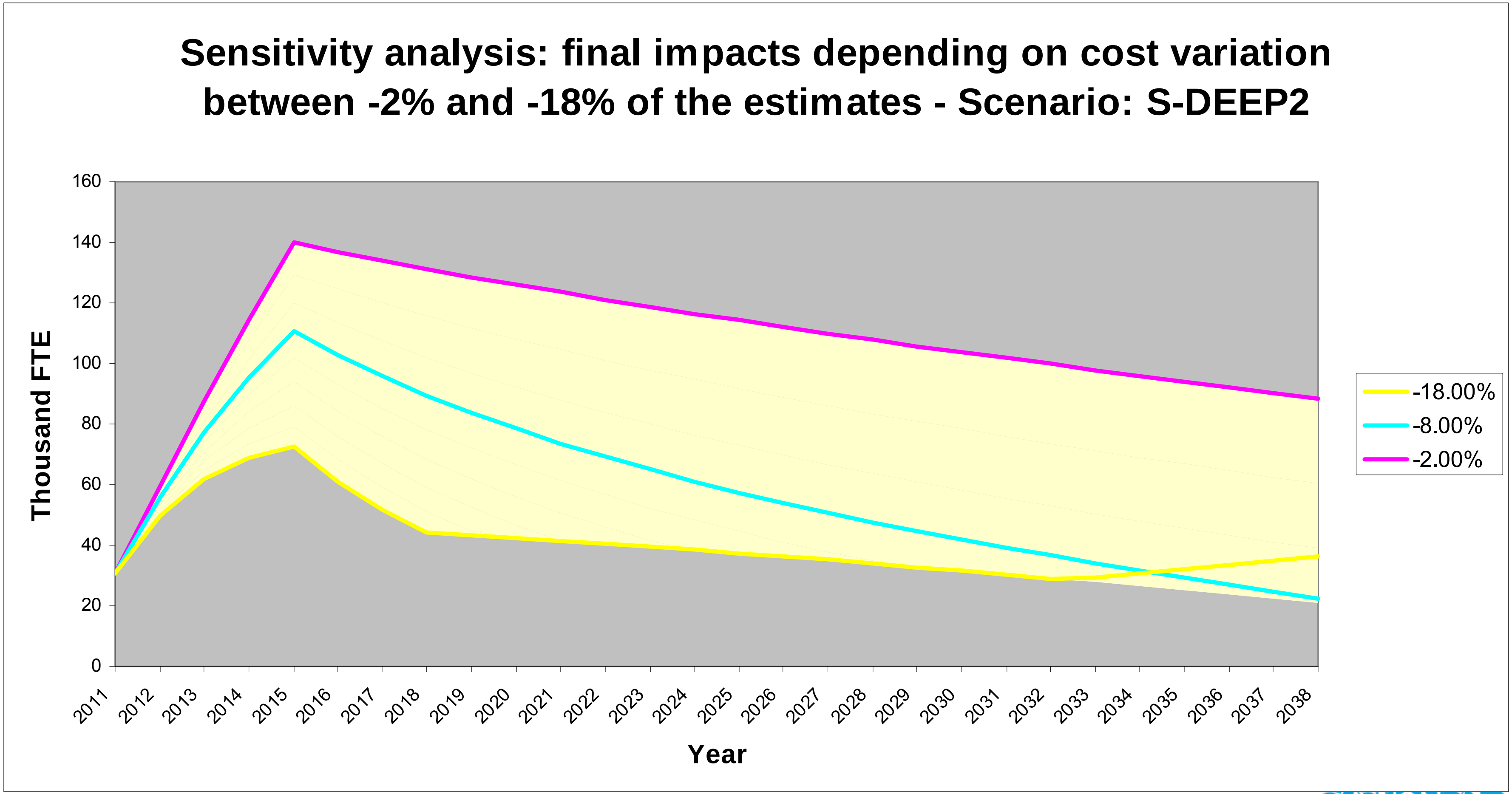
Sensitivity analysis: variation of learning factor



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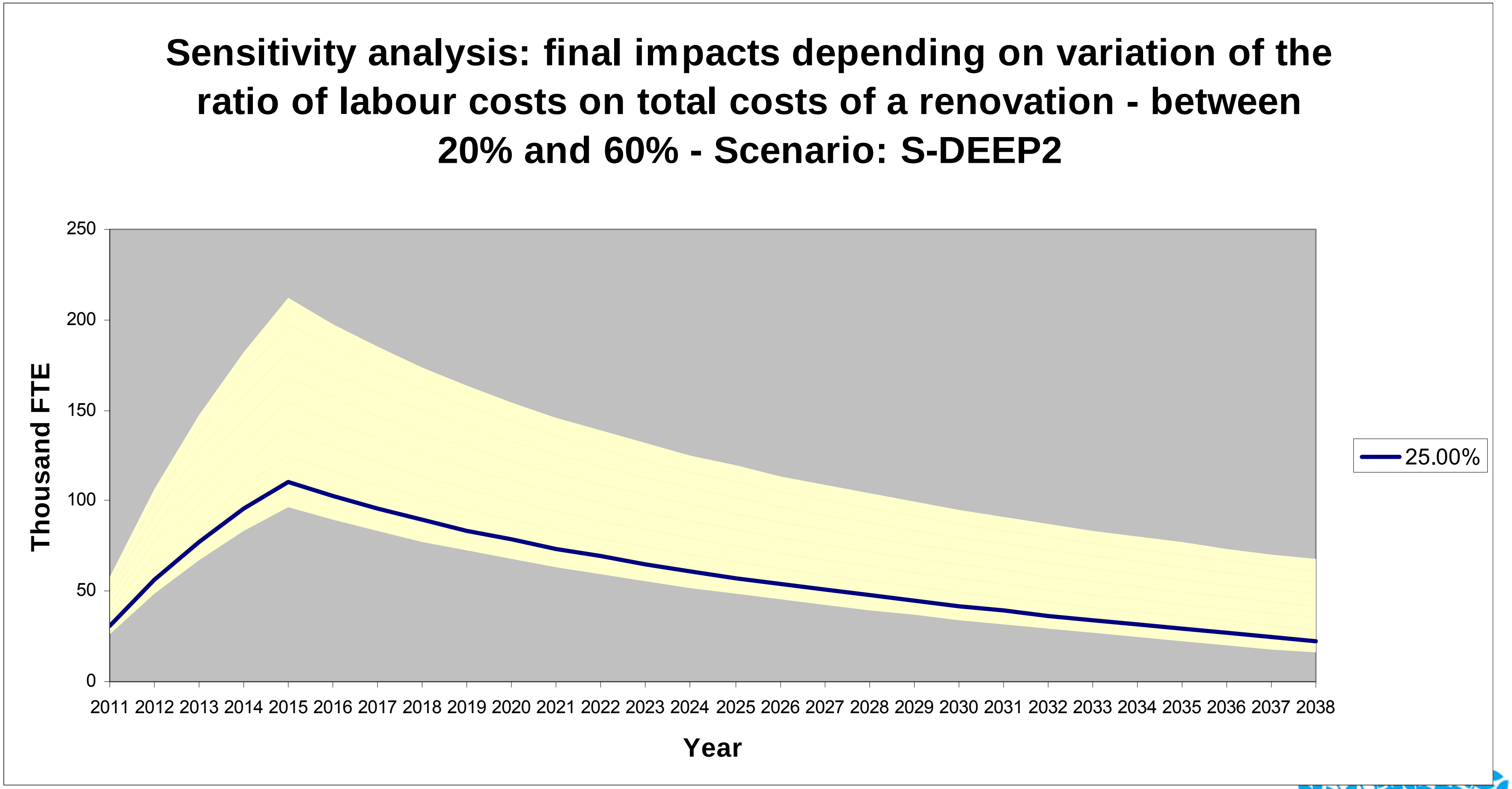
Sensitivity analysis: variation of ratio labour costs / total costs



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Results compared with other investment initiatives

- The scenarios have an average FTE generated (direct + indirect + induced) per Million Euro invested much higher than the studies reviewed

Deep renovation scenarios	FTE generated (direct + indirect + induced) per M€ invested in 2020
S-DEEP	37.3
Studies reviewed	
Energy effciency/Bldgs. retrofit	17.07
Other mitigation	15.56
Non-energy related activities	21.64