

BEEM-UP Building Energy Efficiency for Massive market Uptake:

Methodology, Calculations and Results

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GENERAL

Project overview (Methodology)

WP1 tool:

- Screen buildings for refurbishing measures
- Develop methodology for assessment and finding renovation strategy
- Tool to find optimum between economical and ecological renovation solutions

Project Partners

the Netherlands

DVBD-Dura Vermeer
Eneco
EREA
MU-Maastricht University
OTB-TuDelft
Woonbron

Spain

Acciona
B&W
ITA
MPLIFTS
SOLINTEL

Portugal

ISA

Sweden

Ahem-Alingsåshem
Europrofil
Skanska
SP
Sundolitt
Switchpower

Germany

BASF
LuWoCo

Switzerland

ETH Zürich
Siemens

France

BIOFLUIDES
ICF Novedis
Nobatek

Real Buildings, Real Challenge: 3 Completely Different Building Types



Paris (F)
Solid Wall



Alingsås (S)
Frame structure

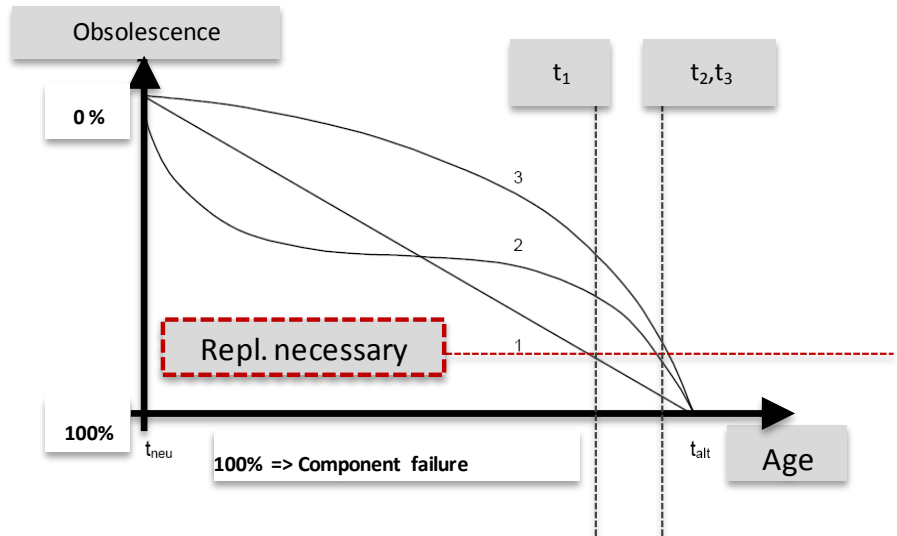
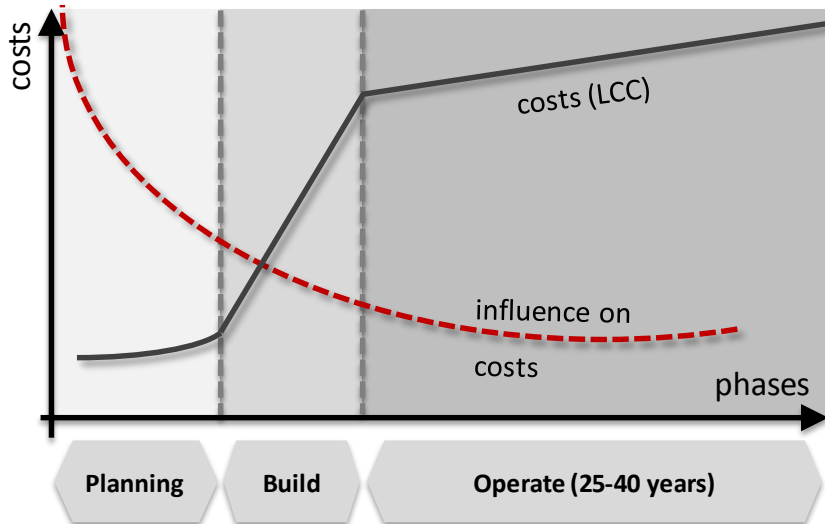


Delft (NL)
Cavity Wall

ECONOMIC – INDICATORS AND VALUES TO BE INCLUDED

WP1 Project overview

Lifecycle costs for retrofitting of residential buildings



- Indicators and values to be included
- Investment costs (Planning, Build)
- Regular maintenance costs within the observation period (Operate)
- Irregular maintenance costs within the observation period (Operate)
- Energy costs within the observation period (Operate)

STAKEHOLDER AND PROCESS

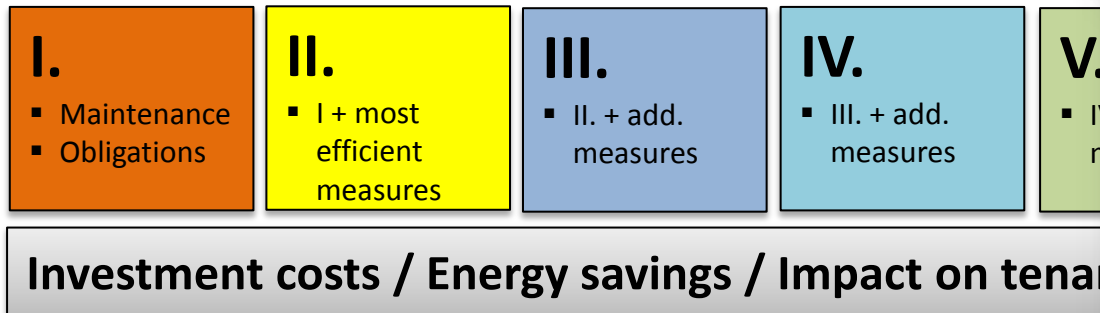
WP 1 Project overview



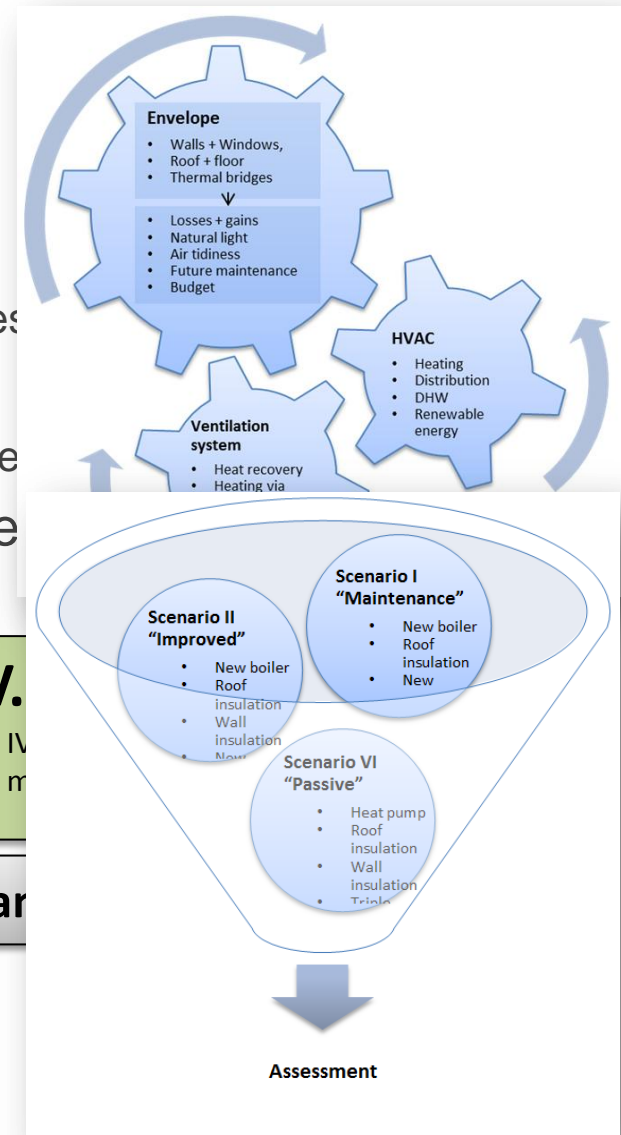
PROCEDURE

WP 1 Project overview

1. Analysis of status quo
 - Evaluation of the building envelope and HVAC
2. Input from Building site owner (ICF)
 - Restrictions, decision making factors (KPIs, objectives)
3. Development of reasonable measures
 - Energy savings, investment costs, costs of saved energy
4. Setting up scenarios / combination of measures



5. Evaluation of scenarios



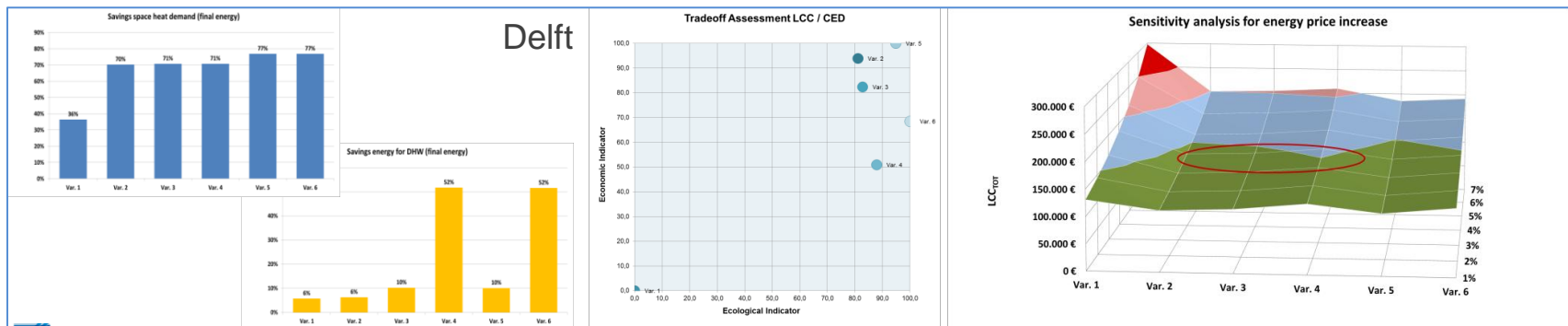
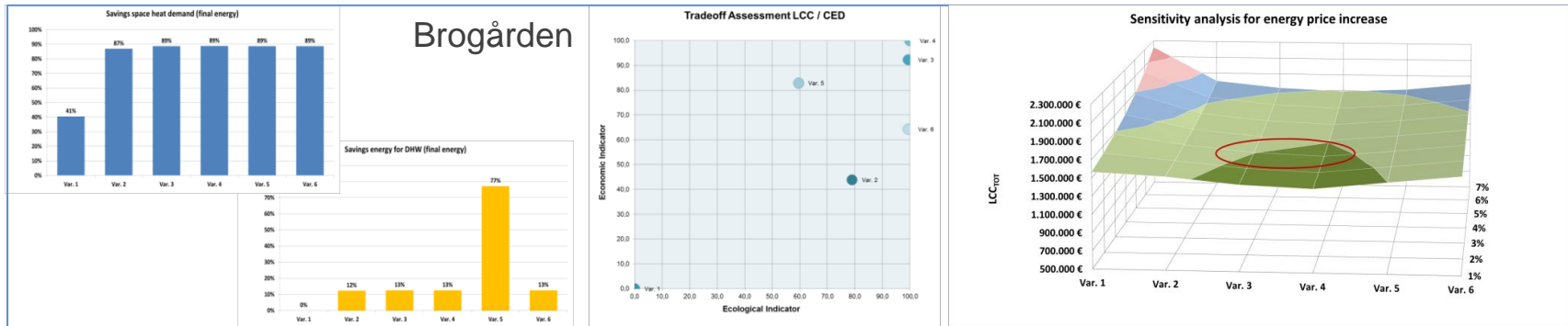
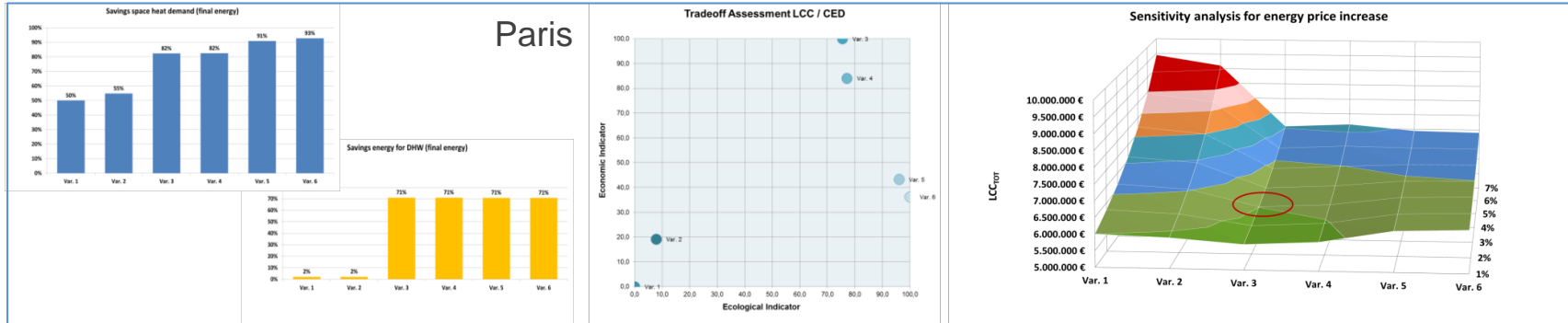
ASSESSMENT OF SCENARIOS OVERVIEW

WP 1 Project overview of all 3 sites

Energy savings

Eco efficiency

Life cycle costs





Status quo and proposed variants



Variant Component	Var. 1 Maintenance	Var. 2 Improve	Var. 3 II + New front	Var. 4 High performance insulation	Var. 5 III + heat recovery	Var. 6 Maximum
Flat roof	Maintenance, 12 cm PUR (not ventilated)	16 cm PUR (non-ventilated)	24 cm PUR (non-ventilated)	24 cm PUR (non-ventilated)	24 cm PUR (non-ventilated)	24 cm PUR (non-ventilated)
Roof terrace	Maintenance	12cm PUR 025 (non-ventilated)	16cm PUR 025 (non-ventilated)	16cm PUR 025 (non-ventilated)	16cm PUR 025 (non-ventilated)	16cm PUR 025 (non-ventilated)
Ceiling cellar	Status quo	Maintenance	Spray insulation 15cm	Ceiling insulation 20cm EPS	Ceiling insulation 20cm EPS	Ceiling insulation 20cm EPS
External wall front	Maintenance	Maintenance	Front EIFS EPS 20cm	Front EIFS Aerogel 10cm	Front EIFS EPS 20cm	Front EIFS EPS 20cm
External wall yard	Maintenance: Yard EIFS EPS 15cm	Maintenance: Yard EIFS EPS 15cm	Yard EIFS EPS 20cm	Yard EIFS EPS 20cm	Yard EIFS EPS 20cm	Yard EIFS EPS 20cm
External wall passage	Passage maintenance	Passage maintenance	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm
External wall ground floor	Maintenance	Maintenance	RDC curtain wall 14cm EPS	EIFS Aerogel 10cm	RDC curtain wall 14cm PUR	RDC curtain wall 14cm PUR
External wall penthouse	Maintenance	Maintenance	Ph. EIFS EPS 20cm	Ph. EIFS EPS 20cm	Ph. EIFS EPS 20cm	Ph. EIFS EPS 10cm
Ceiling passage	Maintenance	Maintenance	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm	Passage EIFS EPS 10cm
Windows front	Maintenance (PVC double glz.)	Maintenance (PVC double glz.)	PVC double glz. ins. layer	PVC double glz. ins. layer	PVC double glz. ins. layer	PVC triple glz. ins. layer
Windows yard	Maintenance (new PVC double glz.)	Maintenance (new PVC double glz.)	PVC double glz. ins. layer	PVC double glz. ins. layer	PVC double glz. ins. layer	PVC triple glz. ins. layer
Windows front balconies	Maintenance (new PVC double glz.)	Maintenance (new PVC double glz.)	Balc. PVC double glz. ins. layer	Balc. PVC double glz. ins. layer	Balc. PVC double glz. ins. layer	Balc. PVC triple glz. ins. layer
Ventilation	1.2: Exh.air	1.2: Exh.air	1.2: Exh.air	1.2: Exh.air	1.3: Exh. + supply air central	1.3: Exh. + supply air central
Heating + DHW	1.2: H: Cent. cond. boiler W/decent.elec.	1.2: H: Cent. cond. boiler W/decent.elec.	1.5: H: Cent. cond. boiler W:central + waste water	1.5: H: Cent. cond. boiler W:central + waste water	1.5: H: Cent. cond. boiler W:central + waste water	1.5: H: Cent. cond. boiler W:central + waste water
ICT	0,00%	0,00%	11,00%	11,00%	11,00%	11,00%



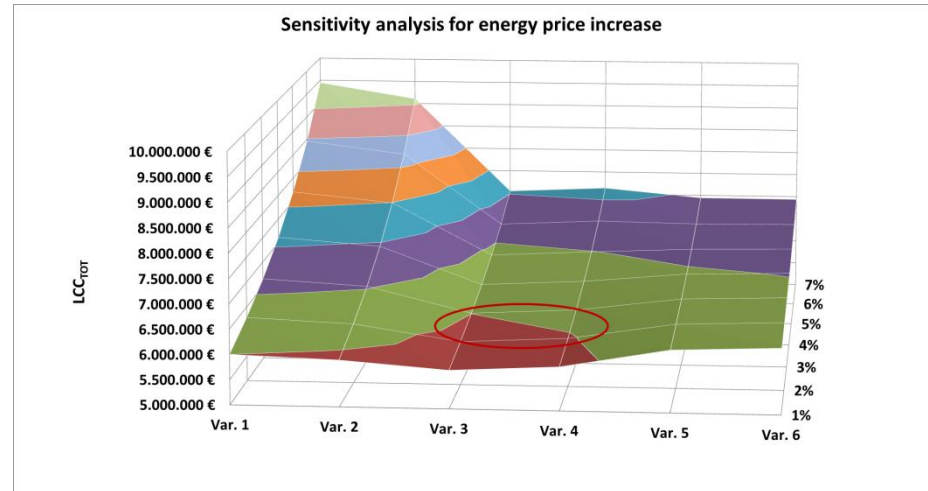
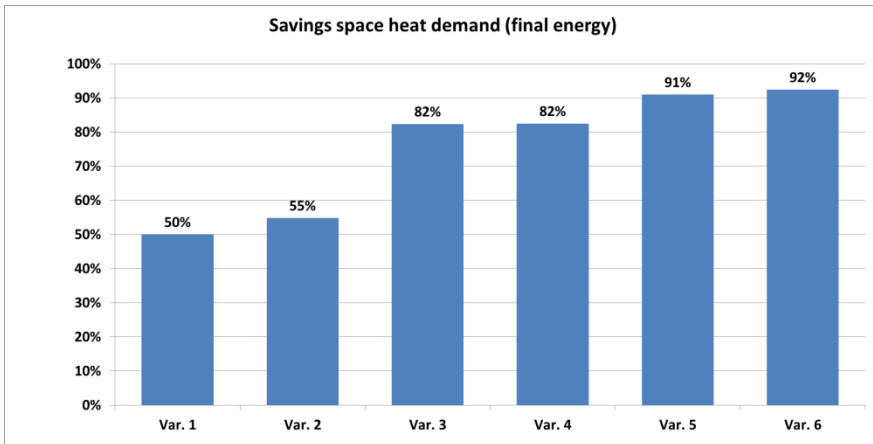
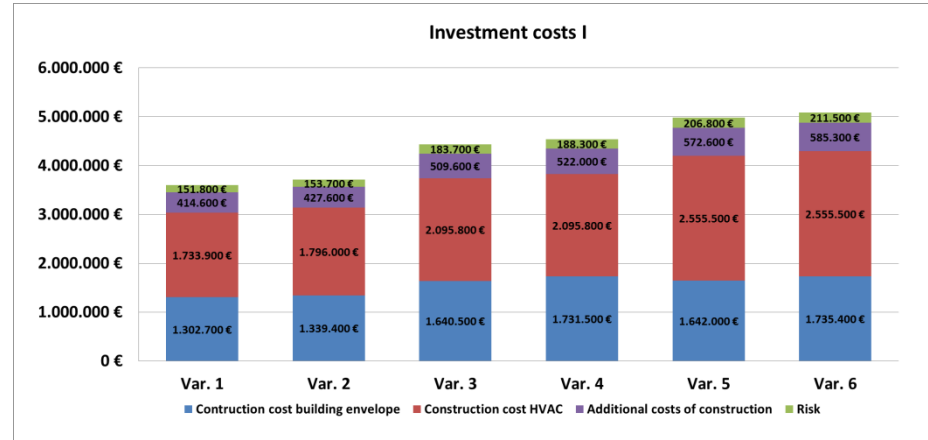
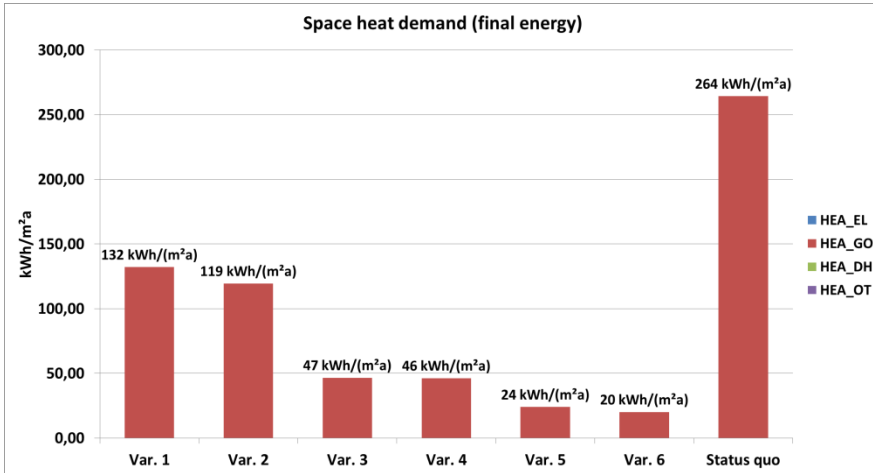
RESULTS FOR PARIS



Energy savings

and

costs





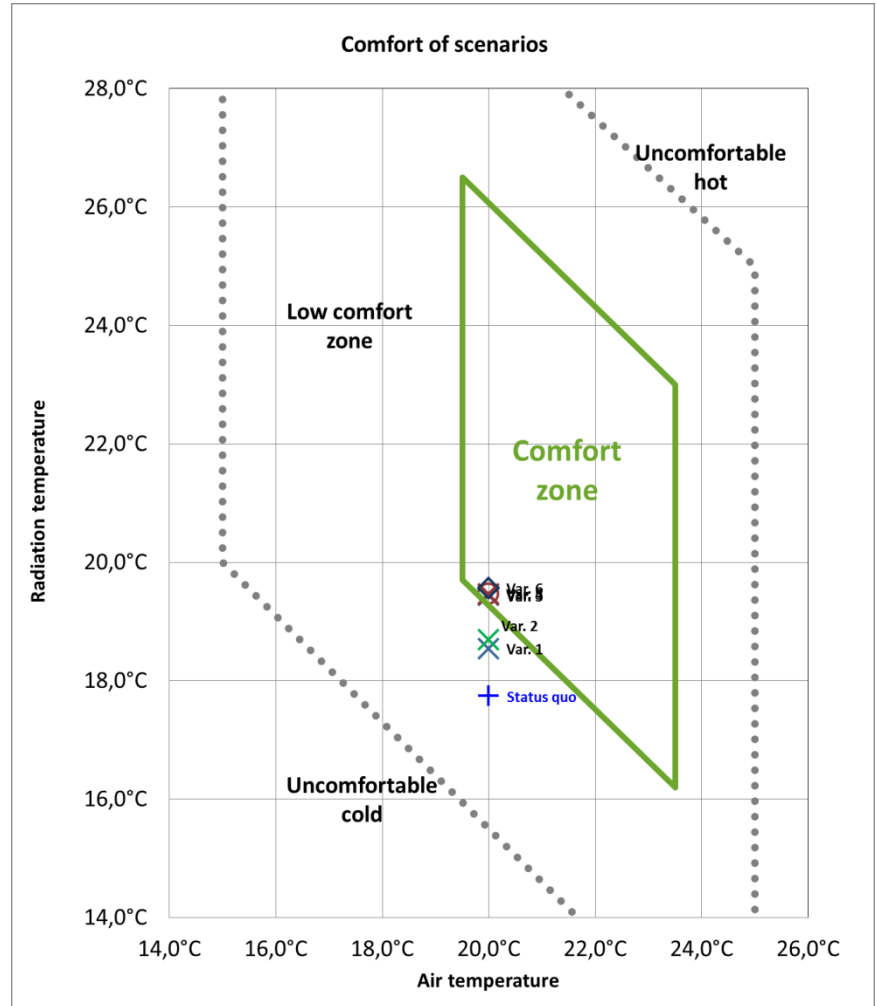
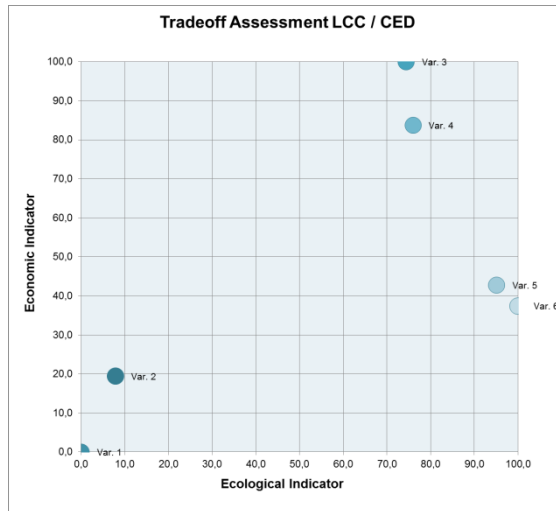
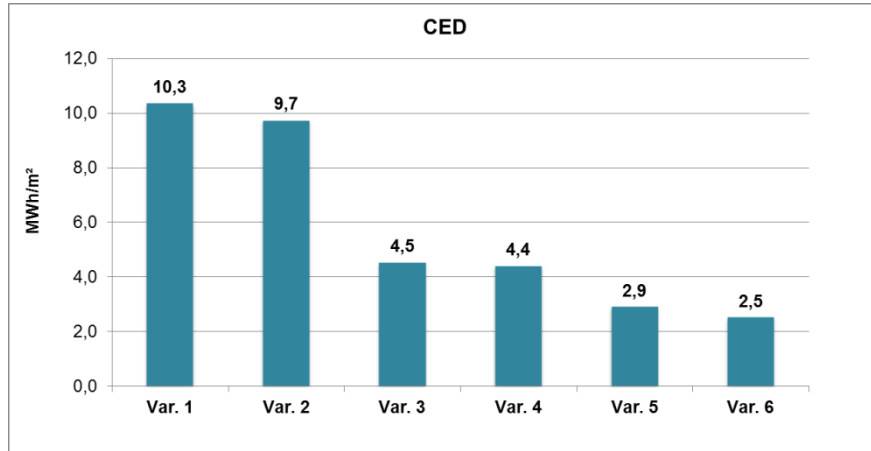
RESULTS FOR PARIS



Eco efficiency

and

comfort





Status quo and proposed variants



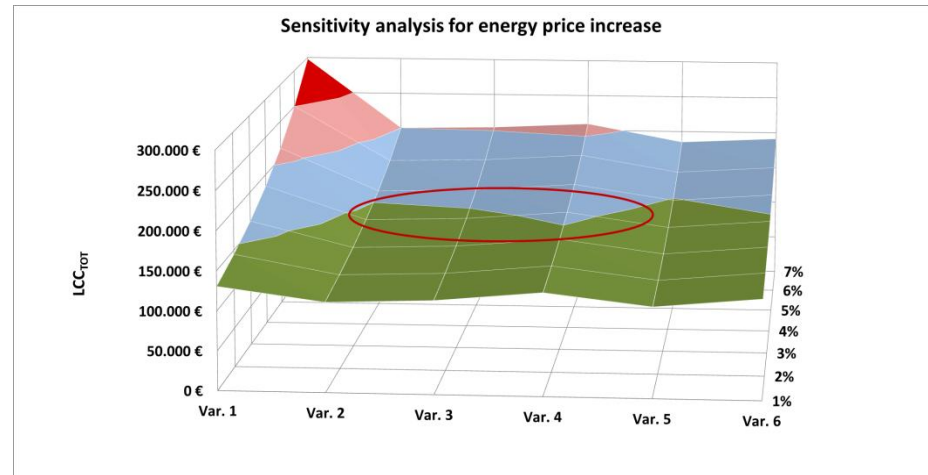
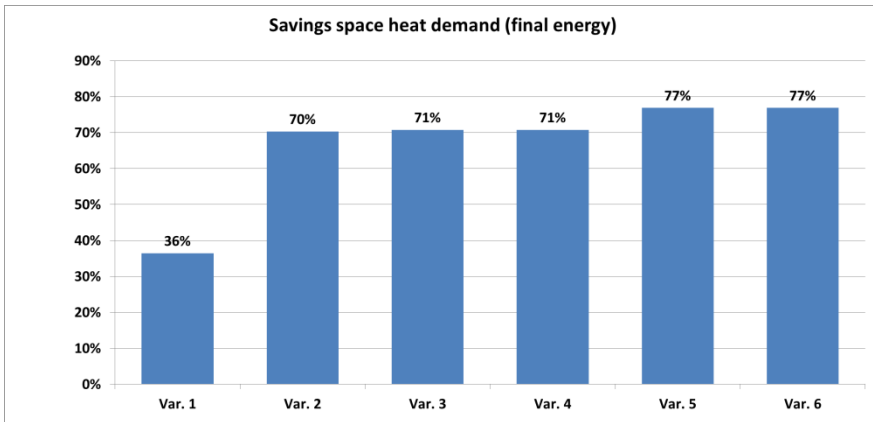
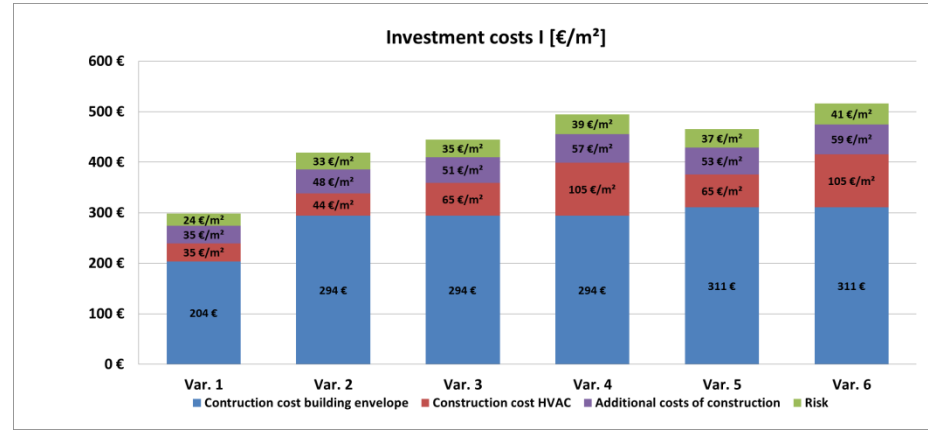
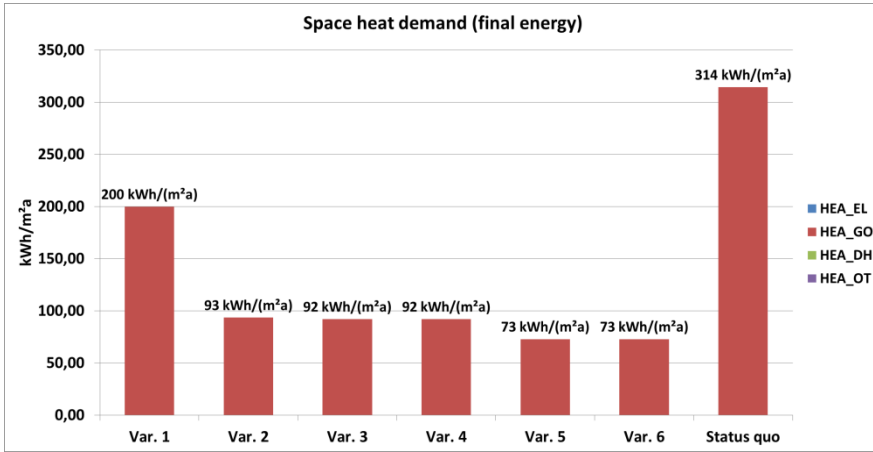
Variant Component	Var. 1 Maintenance	Var. 2 Improved envelope	Var. 3 Improved envelope+boiler	Var. 4 I. e.+boiler+solar	Var. 5 I. e.+boiler+floor	Var. 6 I. e.+boiler+fl.+solar
External wall	Maintenance (hydrophobation)	Maintenance (hydrophobation)	Maintenance (hydrophobation)	Maintenance (hydrophobation)	Maintenance (hydrophobation)	Maintenance (hydrophobation)
Loggia ceiling	Maintenance	Insulation +10cm EPS	Insulation +10cm EPS	Insulation +10cm EPS	Insulation +10cm EPS	Insulation +10cm EPS
Loggia floor	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance
Sus. floor	Maintenance	Maintenance	Maintenance	Maintenance	Reflective foil insulation	Reflective foil insulation
Ceiling entrance	Maintenance	10cm EPS	10cm EPS	10cm EPS	10cm EPS	10cm EPS
Roof	Maintenance	Insulation between rafters 120mm	Insulation between rafters 120mm	Insulation between rafters 120mm	Insulation between rafters 120mm	Insulation between rafters 120mm
Dividing wall	Status quo	Status quo	Status quo	Status quo	Status quo	Status quo
Dormer Wall	Sandwich construction 100mm EPS	Sandwich construction 100mm EPS	Sandwich construction 100mm EPS	Sandwich construction 100mm EPS	Sandwich construction 100mm EPS	Sandwich construction 100mm EPS
Dormer roof	Sandwich construction 150mm EPS	Sandwich construction 150mm EPS	Sandwich construction 150mm EPS	Sandwich construction 150mm EPS	Sandwich construction 150mm EPS	Sandwich construction 150mm EPS
Win. type 1 ori. wood / single glz.	Wood frame with HR ++ glass for type 1	Wood frame with HR ++ glass for type 1	Wood frame with HR ++ glass for type 1	Wood frame with HR ++ glass for type 1	Wood frame with HR ++ glass for type 1	Wood frame with HR ++ glass for type 1
Windows Type 2 later alu frames single glazing	Wood frame with HR ++ glass for type 2	Wood frame with HR ++ glass for type 2	Wood frame with HR ++ glass for type 2	Wood frame with HR ++ glass for type 2	Wood frame with HR ++ glass for type 2	Wood frame with HR ++ glass for type 2
Windows Type 3 later alu frames double glazing	Wood frame with HR ++ glass for type 3	Wood frame with HR ++ glass for type 3	Wood frame with HR ++ glass for type 3	Wood frame with HR ++ glass for type 3	Wood frame with HR ++ glass for type 3	Wood frame with HR ++ glass for type 3
Ventilation	1.2: Maintenance: window ventilation	1.2: Maintenance: window ventilation	1.2: Maintenance: window ventilation	1.2: Maintenance: window ventilation	1.2: Maintenance: window ventilation	1.2: Maintenance: window ventilation
Heating + DHW	1.2: Maintenance existing boiler	1.2: Maintenance existing boiler	1.3: Condensing boiler	1.4: Condensing boiler + solar	1.3: Condensing boiler	1.4: Condensing boiler + solar
ICT	0,00%	15,00%	15,00%	15,00%	15,00%	15,00%



Energy savings

and

costs

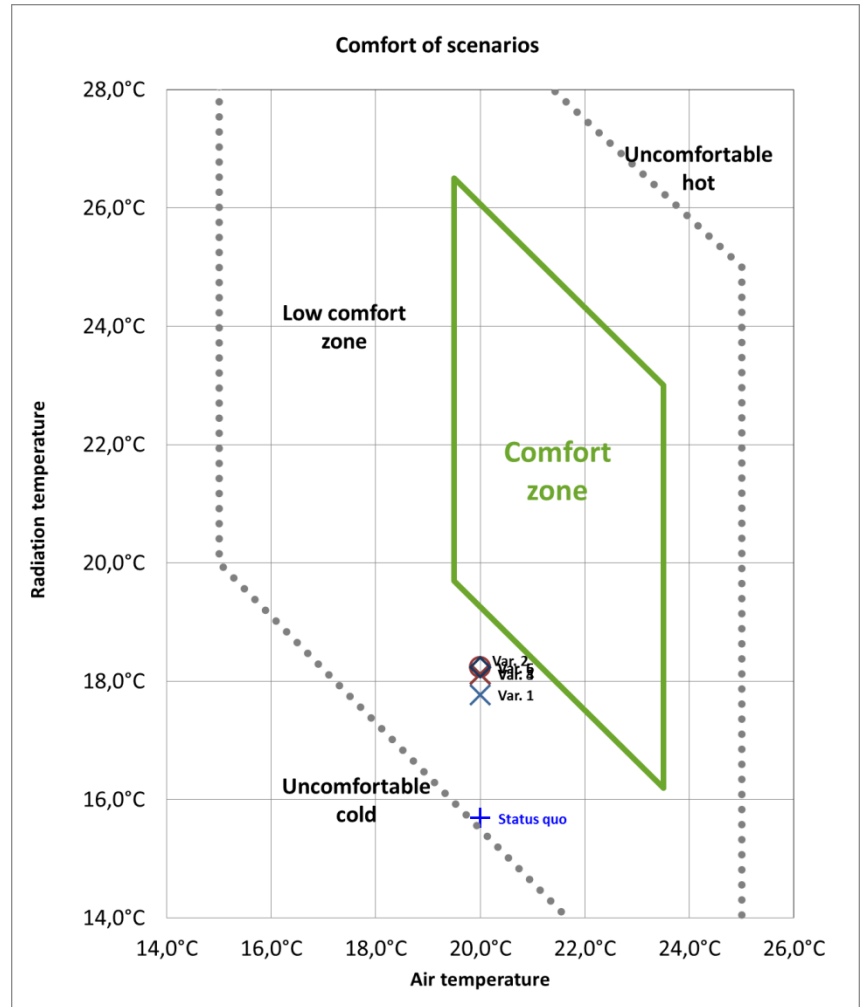
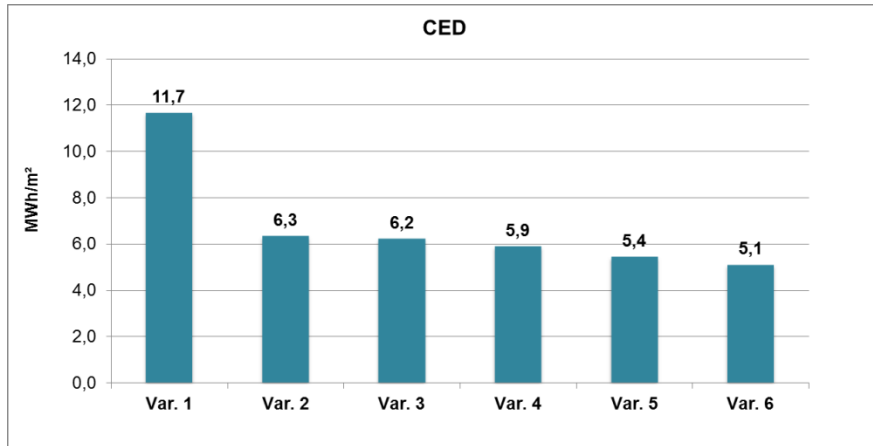




Eco efficiency

and

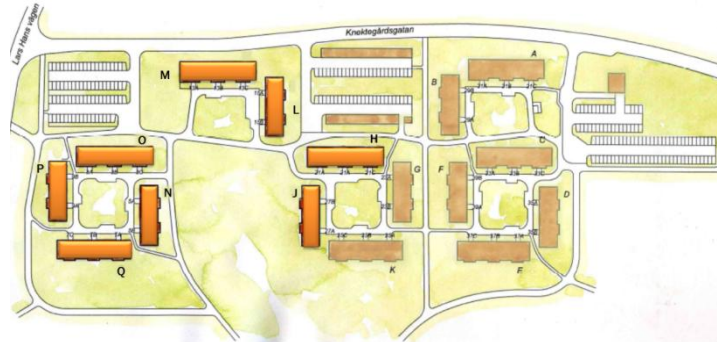
comfort



RESULTS FOR BROGÅRDEN



Status quo and proposed variants



Variant Component	Var. 1 Maintenance	Var. 2 Improve	Var. 3 Pilot	Var. 4 Alternative pilot	Var. 5 Pilot + grey water	Var. 6 Pilot + photovoltaic
External wall	Maintenance	EIFS: add. insul., no demolition	Pilot: Lightweight constr. wall MW	Alternative pilot: Wall constr. with EPS core	Pilot: Lightweight constr. wall MW	Pilot: Lightweight constr. wall MW
External wall concrete	Maintenance	EFIS (add. insul., partial demol.)	Pilot: attached façade (add. ins., partial demol.)	Pilot: attached façade (add. ins., partial demol.)	Pilot: attached façade (add. ins., partial demol.)	Pilot: attached façade (add. ins., partial demol.)
Roof	Status quo	Status quo	Status quo	Status quo	Status quo	Status quo
Upper ceiling	Maintenance	Insulation on upper ceiling EPS 300mm	Pilot: 2 layer mineral wool	Pilot: 2 layer mineral wool	Pilot: 2 layer mineral wool	Pilot: 2 layer mineral wool
Floor slab common spaces	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance
Floor slab appartments	Maintenance	Pilot B: PIR on floor slab	Pilot B: PIR on floor slab	Pilot B: PIR on floor slab	Pilot B: PIR on floor slab	Pilot B: PIR on floor slab
External wall perimeter	Maintenance	Pilot: perimeter insulation XPS	Pilot: perimeter insulation XPS	Pilot: perimeter insulation XPS	Pilot: perimeter insulation XPS	Pilot: perimeter insulation XPS
Ceiling cellar	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance
Windows	Maintenance	Pilot: triple glazing	Pilot: triple glazing	Pilot: triple glazing	Pilot: triple glazing	Pilot: triple glazing
Doors	Maintenance	New door	New door	New door	New door	New door
Ventilation	1.3: Maintenance: exhaust air system	1.2: Pilot: Central vent. + heat rec.	1.2: Pilot: Central vent. + heat rec.	1.2: Pilot: Central vent. + heat rec.	1.2: Pilot: Central vent. + heat rec.	1.2: Pilot: Central vent. + heat rec.
Heating + DHW	1.4: Maintenance: District heat +cent. DHW (normal heat load)	1.4: Maintenance: District heat +cent. DHW (normal heat load)	1.2: Pilot: district heat and central DHW	1.2: Pilot: district heat and central DHW	1.6: Pilot: 1.2 + Greywater	1.3: Pilot: 1.2 + PV
ICT	0,00%	15,00%	15,00%	15,00%	15,00%	15,00%

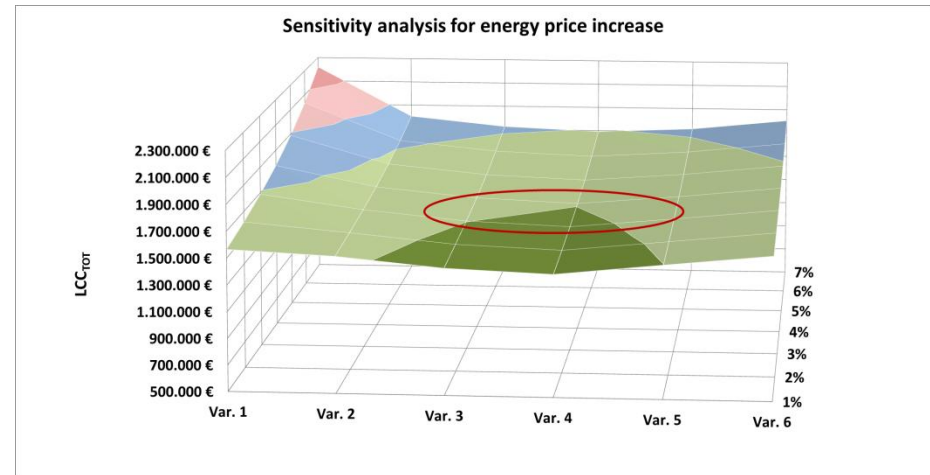
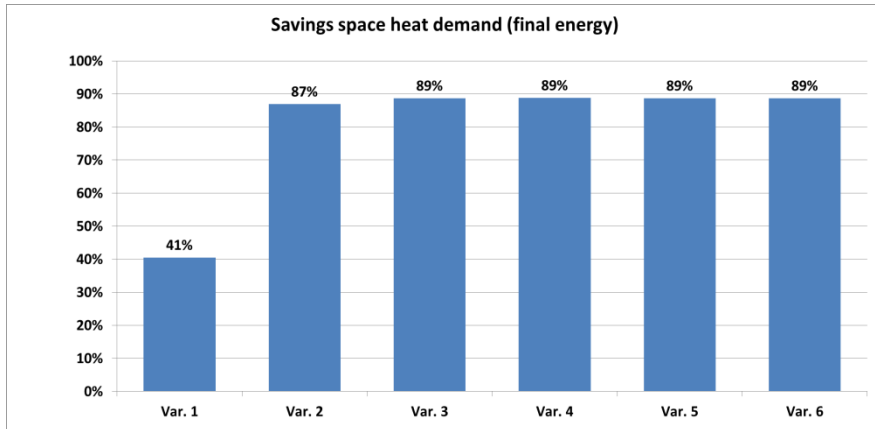
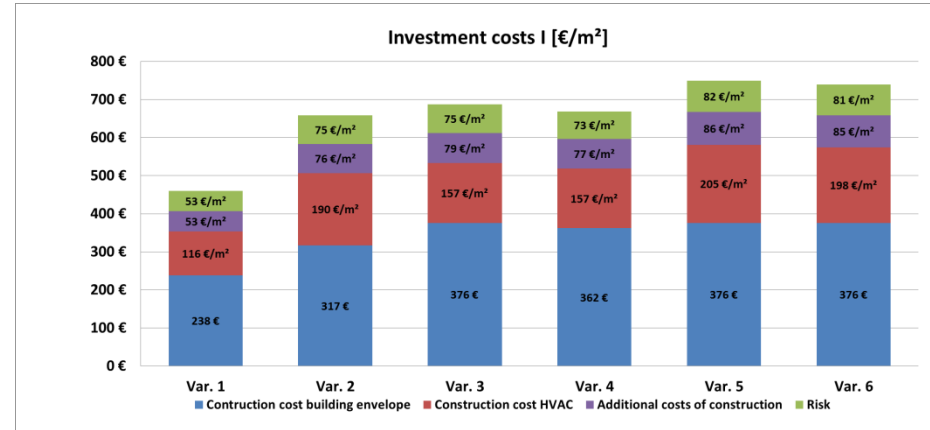
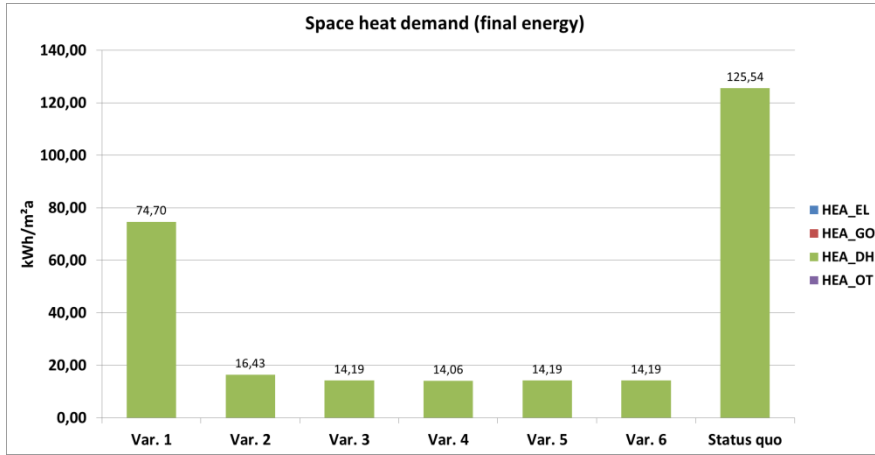
RESULTS FOR BROGÅRDEN



Energy savings

and

costs



RESULTS FOR BROGÅRDEN

Eco efficiency

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