

# **Energy Concept Adviser**

A new internet-based tool for  
decision makers and their technical staff

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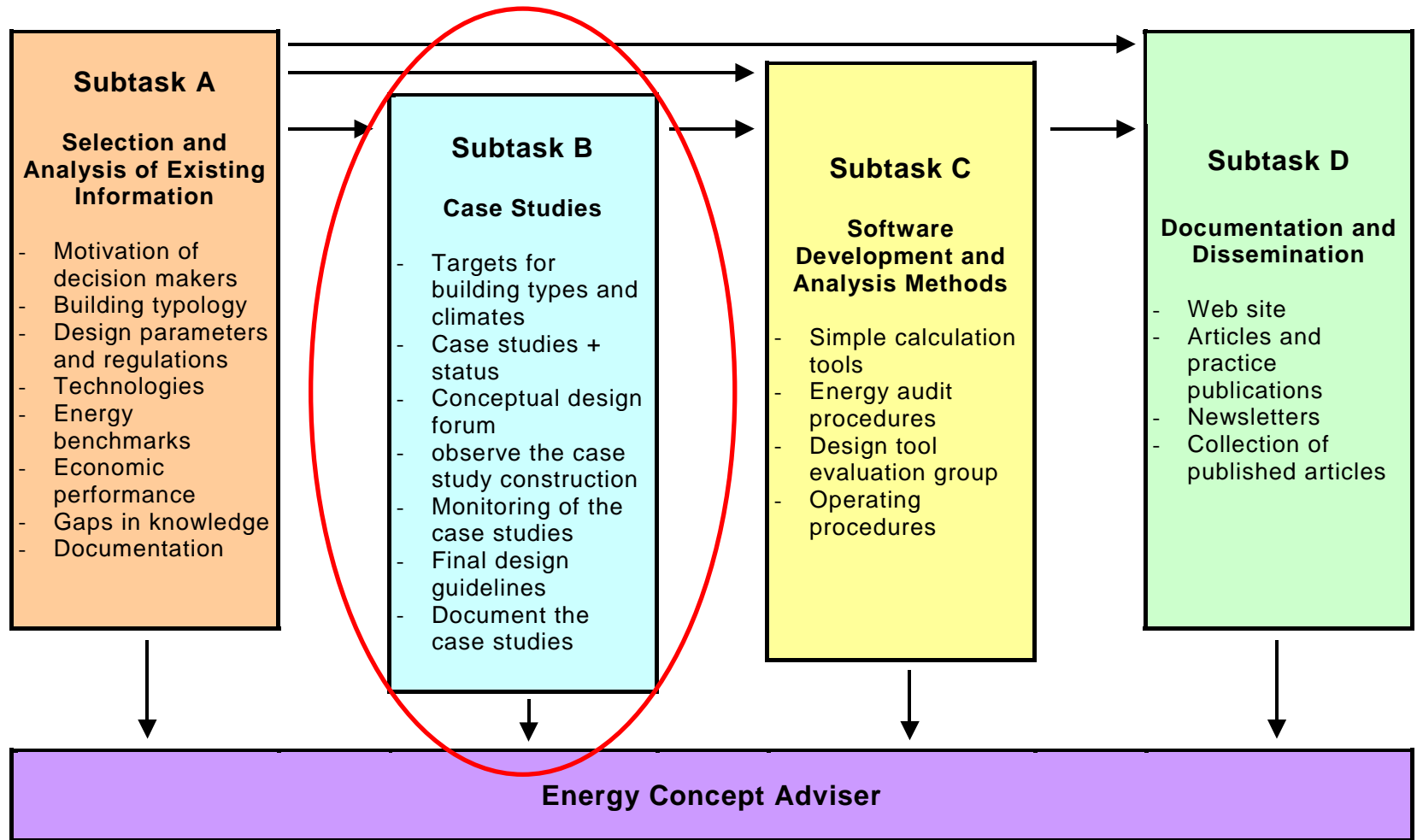
# Report Documentation Page

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# Structure of Annex 36



# 25 Case Studies from 10 Countries

View	country	case study
	Germany	D1: Exemplary Retrofitting of a school in Stuttgart (EROS) D2: Bertolt-Brecht-School in Dresden D3: Paul-Robeson-School in Leipzig D4: University of Stuttgart D5: University of Ulm
	Denmark	DK1: Egebjerg School, Ballerup DK2: Enghøjskolen, Hvidovre DK3: Vridsløselille School, Albertslund
	Finland	SF1: Elementary School of Oulujoki SF2: Vihasitenkari Day Care Centre
	France	FR1: Louise Labe secondary school FR2: Gambetta professional high school

View	country	case study
	Greece	GR1: Chemical Engineering building NTUA, Athens GR2: University of Ionnina
	Norway	N1: Kampen School
	Poland	PL1: Secondary School Swarzedz PL2: Poznan University of Technology
	UK	UK1: William Parker Community Secondary School UK2: Hadley Junior School UK3: Grove House Refurbishment UK4: George Tomlinson School, Bolton, Lancashire UK5: Ketley Town Junior School
	USA	US1: Wausau West High School, Sullivan County, TN US2: University of New Hampshire

# Energy Technologies by Case Study Overview

Energy technologies		Total
Building envelope	Windows	15
	Insulation materials & systems	13
	Over-cladding systems	1
	Doors	6
Heating systems	Heating installations	8
	Domestic hot water installations	5
	Energy sources	11
	Control systems	14
Ventilation systems	Natural ventilation systems	10
	Mechanical ventilation systems	8
	Hybrid ventilation systems	7
	Control & information systems	12

# Energy Technologies by Case Study Overview

Energy technologies		Total
Solar control & cooling	Shading & glare protections	8
	Cooling systems	5
	Air-conditioning systems	3
	control systems	5
Light & electrical appliances	Lighting systems	11
	Electrical appliances	7
	Daylight technologies	8
	Control systems	10
Management	Energy audit techniques	6
	Commissioning	1
	Education & training	2
	Non-investment measures	2

# Project aims

## Project aims can be divided into 3 main groups:

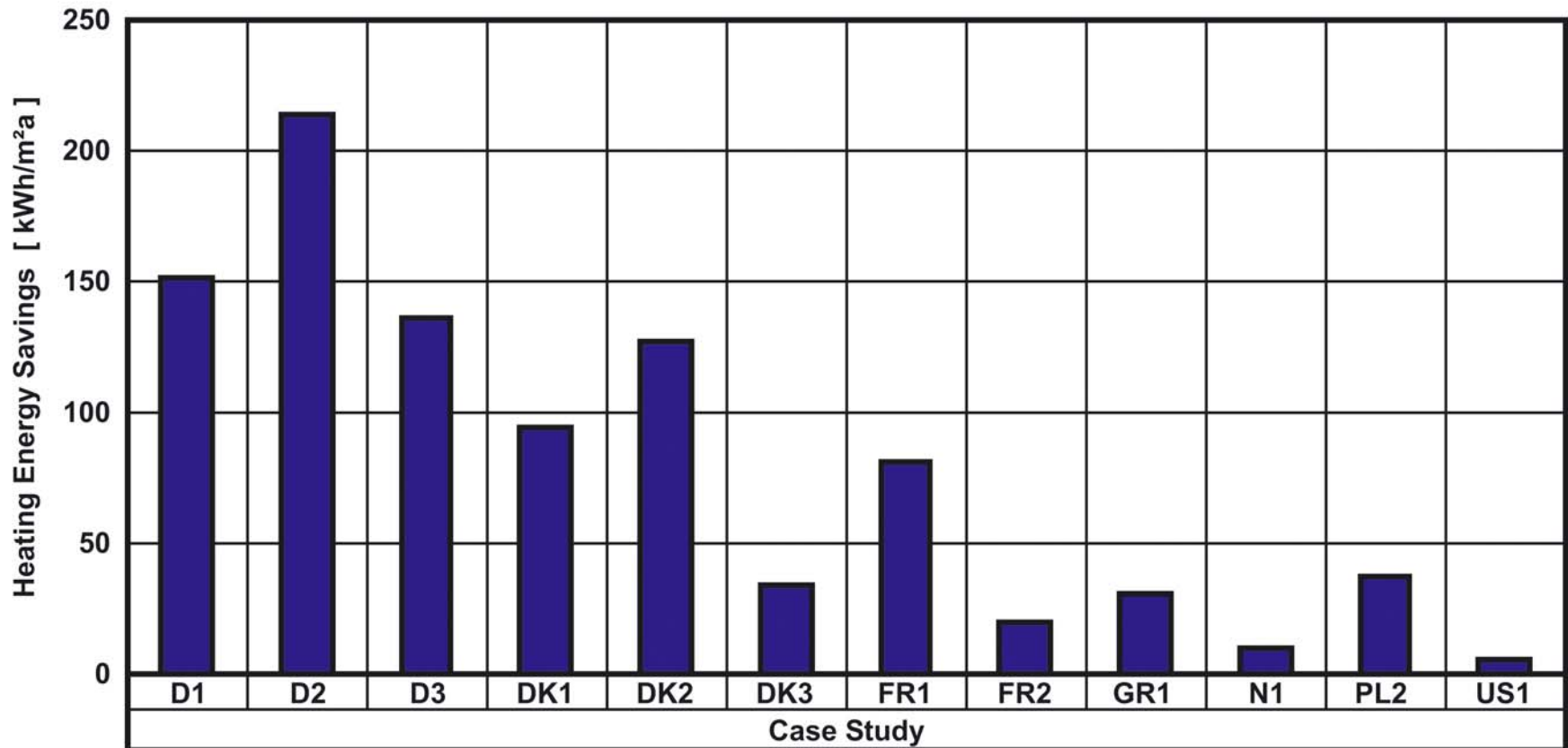
- holistic approach with several implemented energy saving technologies, high energy savings and less focus on short payback times
- cost-effective approach with fewer technologies and smaller savings
- focus on existing problems like indoor comfort, air-quality, lighting comfort. Energy savings as a positive side effect

## Energy savings:

- as high as 75 % heating (German and Danish projects with 200-280 kWh/m<sup>2</sup>a before and 50-90 kWh/m<sup>2</sup>a after the retrofit) and 100 % electricity (Greek case study with PV-panels)
- UK and US projects with rather modest savings (8-20 % heating and 15 % electricity) but short paybacks

# Energy Savings

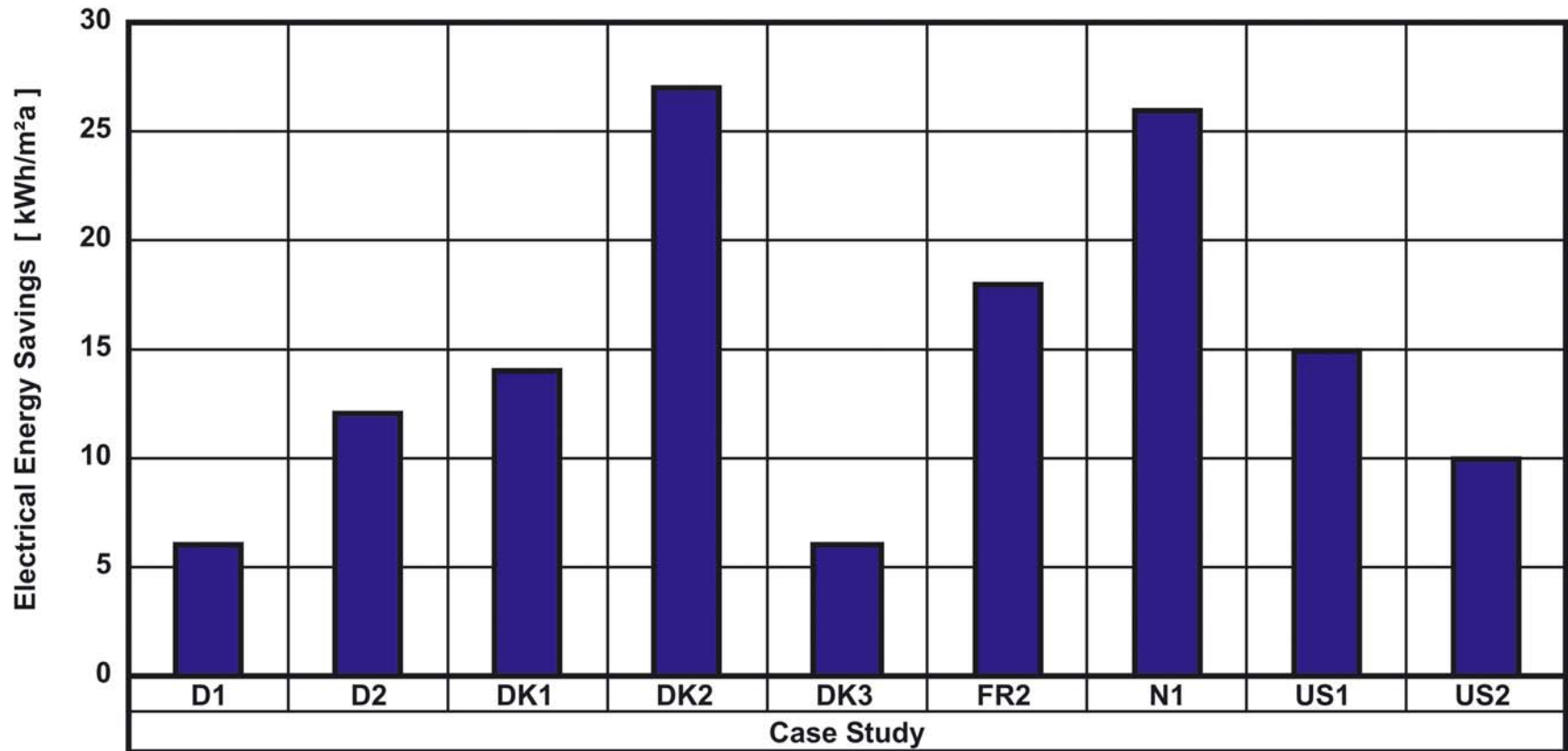
## Heating Energy Savings












# Energy Savings

## Electrical Energy Savings



# Ventilation Strategies

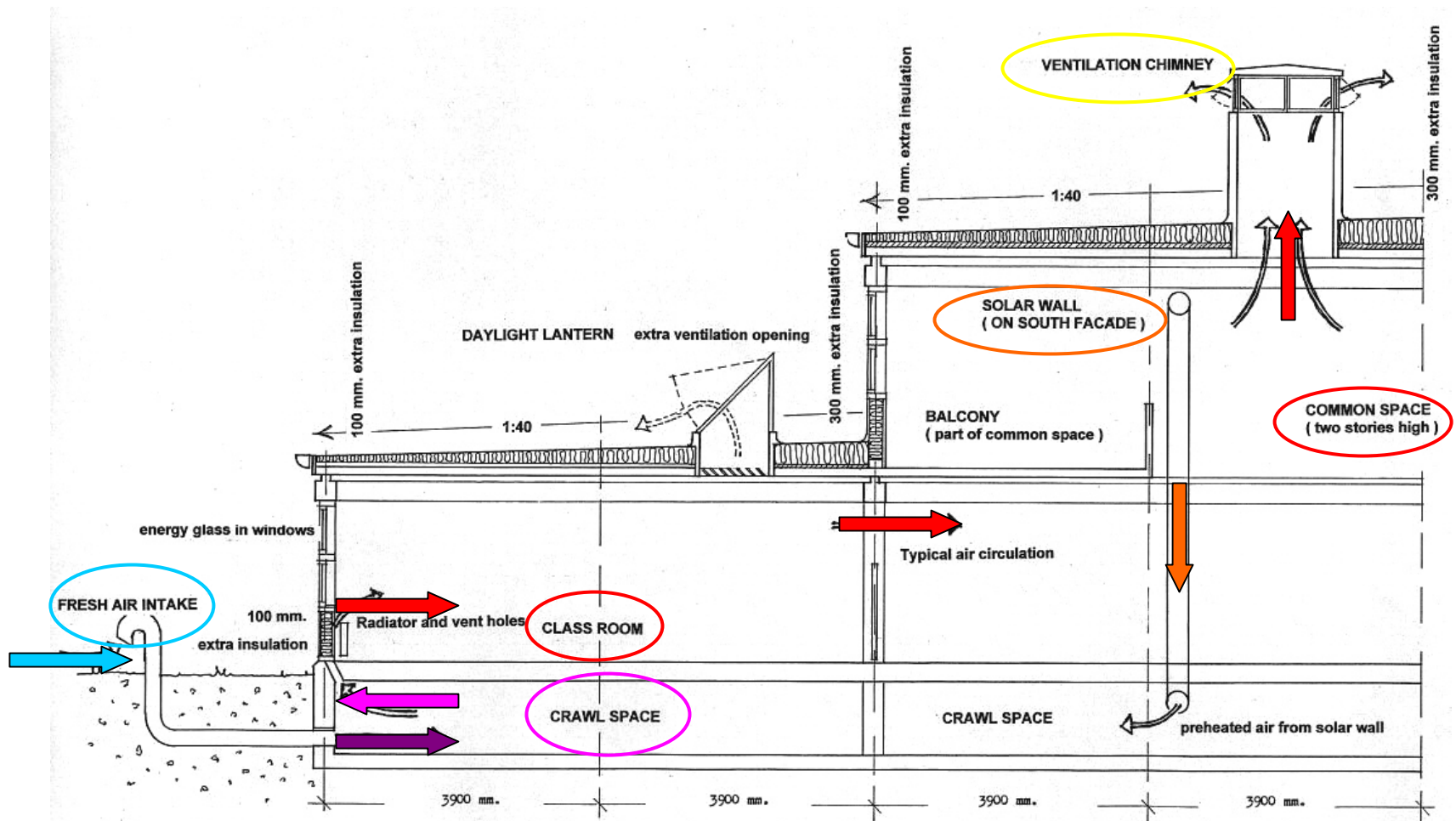
Different countries follow different ventilation strategies in the projects. Comparison of school projects:

	Finland	Focus on indoor air quality, mechanical ventilation with heat recovery
	Norway Denmark	Tendency to remove mechanical ventilation and replace it with natural hybrid ventilation, supported by fans if necessary
	Germany	<ul style="list-style-type: none"> <li>- natural ventilation by opening the windows, can be supported by an indoor air quality visualisation</li> <li>- natural ventilation with pre-heating/pre-cooling by atria</li> <li>- natural ventilation through shafts into the classrooms and from there to corridors, supported by fans</li> </ul>
	France	<ul style="list-style-type: none"> <li>- minimum air-change rate provided by a mechanical ventilation system</li> <li>- natural ventilation by opening the windows</li> </ul>
	Poland	Ventilation by opening the windows
	UK	Retrofit projects dealt not with ventilation strategies, but schools are mainly ventilated by opening the windows with sometimes mechanical ventilation by fans or draft support
	US	Ventilation through the windows, in one case additional mechanical ventilation system with heat recovery

# Example: Egebjerg School, Ballerup, Denmark



# Example: Egebjerg School, Ballerup, Denmark



# Example: Egebjerg School – Air Intake



# Example: Egebjerg School – Air Distribution in the Classrooms



# Example: Egebjerg School – Common Space



# Example: Egebjerg School – Ventilation Chimney





# Example: Egebjerg School – Preheated Air by Solar Wall

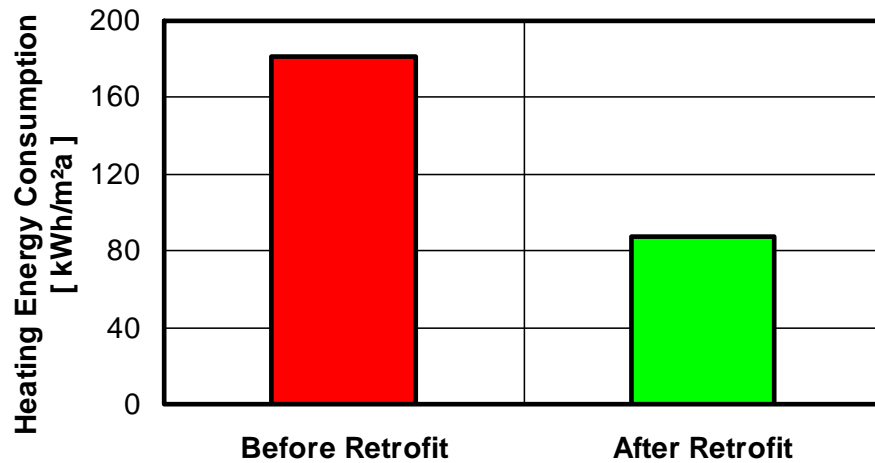


# Example: Egebjerg School – Daylight Lanterns

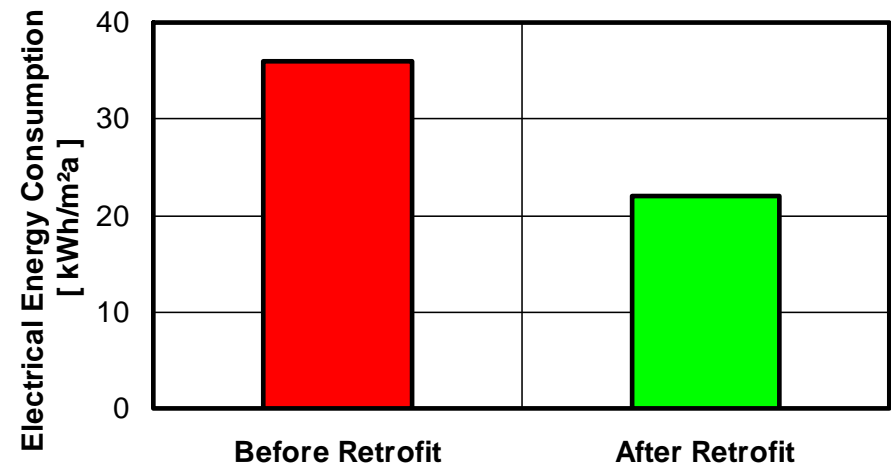


# Example: Egebjerg School - Energy Savings

## Heating Energy Consumption

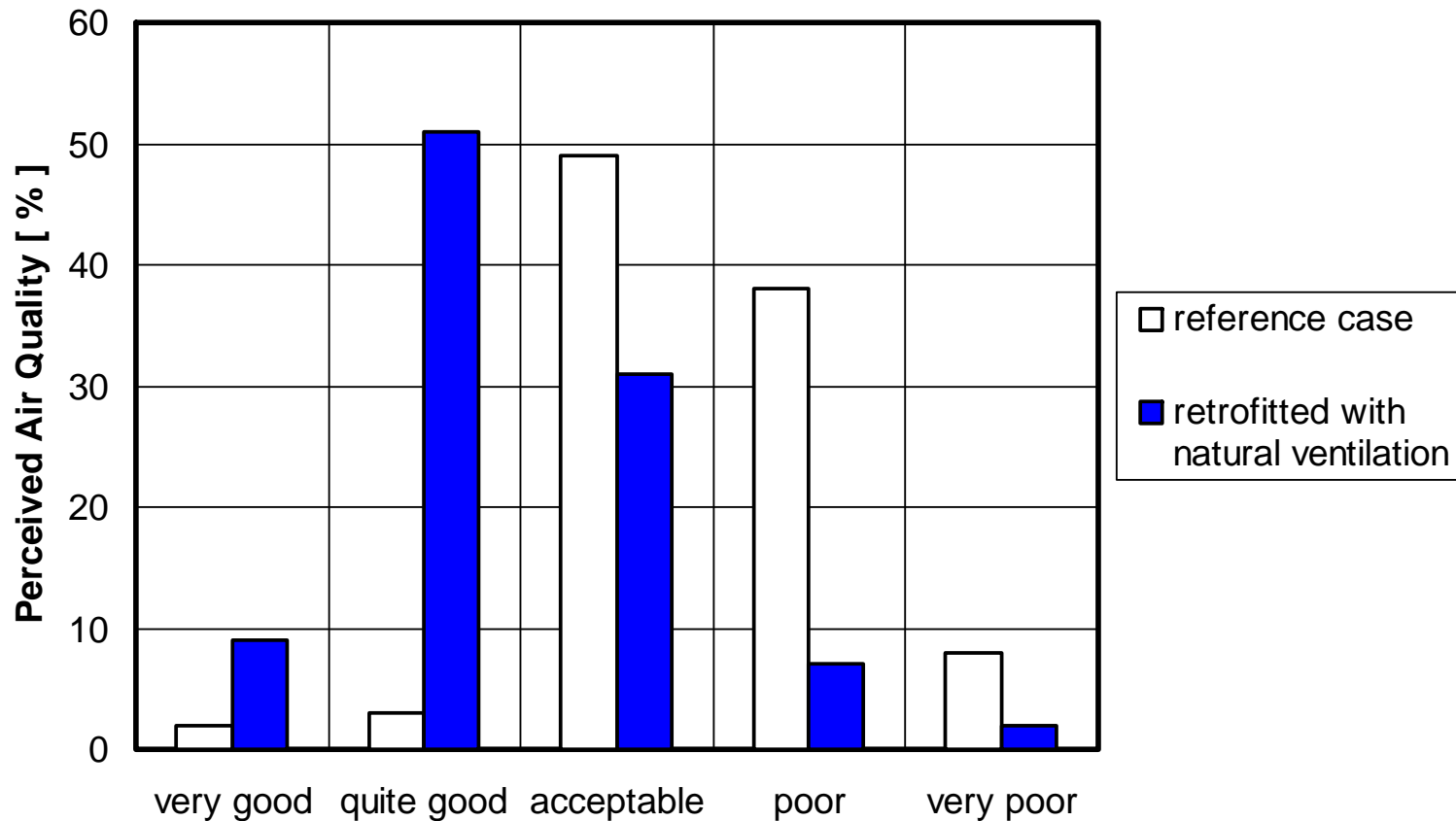


## Electrical Energy Consumption



# Example: Egebjerg School – User Evaluation

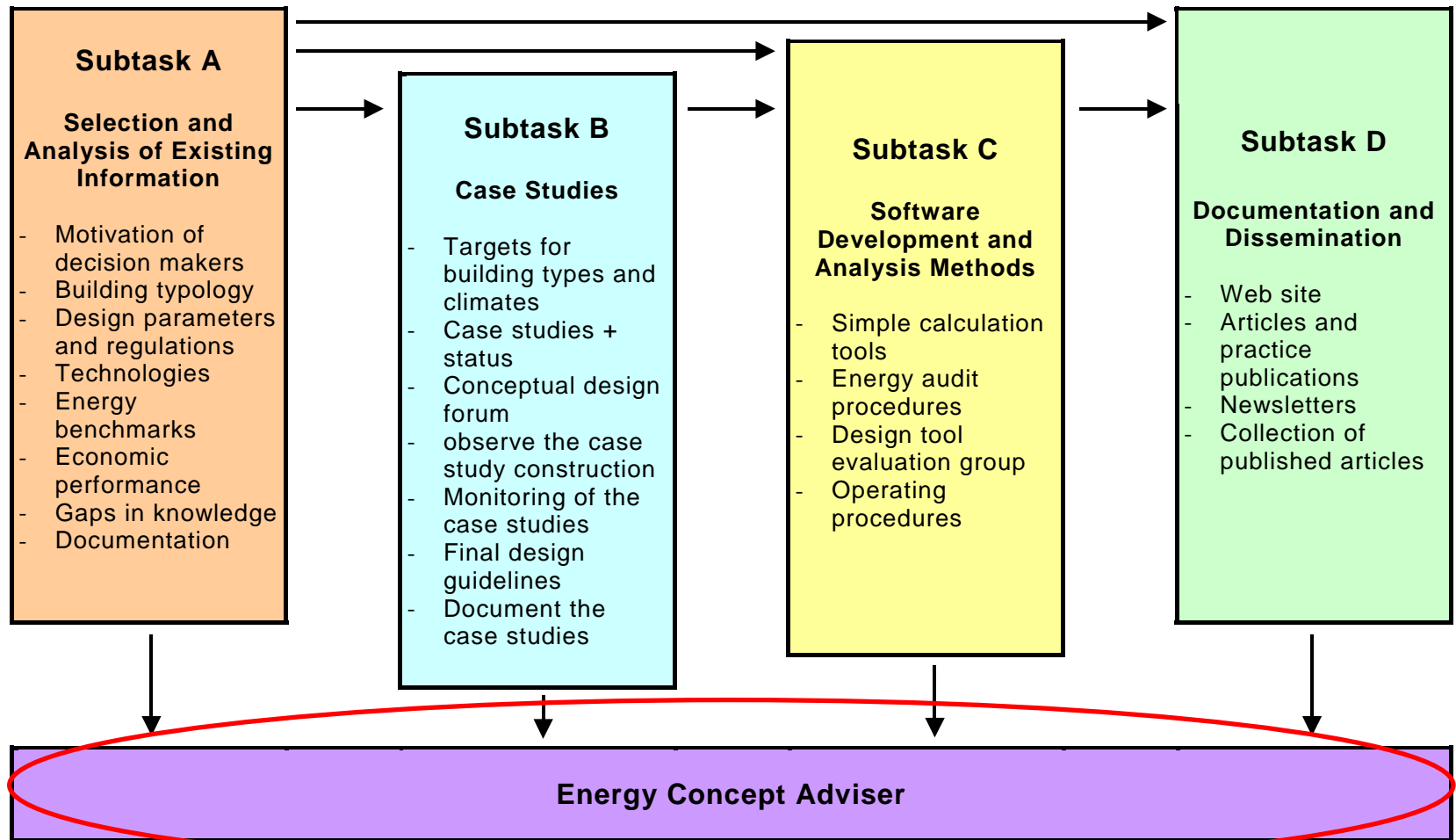
## Evaluation of Air Quality



# Example: Natural Ventilation – IAQ Visualisation



# Structure of Annex 36



# What are the reasons why the Energy Concept Adviser was developed?

- high energy consumption in educational buildings (nursery schools, schools, universities,...)
- decision makers are often not qualified enough informed
- many different factors for a high energy consumption building itself, heating system, ventilation, lighting, controls, (cooling)
- an estimation of investment costs and the potential of energy savings not possible without tools

# ECA - Structure

## Recommendations

Solutions for existing problems  
e.g. IAQ, glare, high energy consumption

## Case Study Viewer

Collection of exemplary retrofittings of educational buildings sorted by country and building type

## Retrofit Measure Viewer

Collection and description of retrofit measures

## Benchmarking

Comparison of the consumption of the own building with the typical average consumption of the country

## Retrofit Concept Development

Starting with a building type you are able to analyze different retrofit measures on your own building. You can create different concepts and look on the energy relevant results as well as on the economic calculations

## Auditing & Monitoring

Kulu and Auditing report





# REDUCE Retrofitting in Educational Buildings

INTERNATIONAL ENERGY AGENCY

Energy Conservation in  
Buildings & Community  
Systems Programme



## ENERGY CONCEPT ADVISER for Technical Retrofit Measures

country-  
specific-  
data:



IEA ECBCS Annex 36:  
Retrofitting in Educational  
Buildings - REDUCE  
Energy Concept Adviser for  
Technical Retrofit Measures

IEA ECBCS Annex 36  
Energy Concept Adviser



Fraunhofer  
Institut  
Bauphysik



# REDUCE Retrofitting in Educational Buildings



## What is the Energy Concept Adviser?

The Energy Concept Adviser (ECA) is an electronic tool assisting in the design of renovations/retrofits focusing on energy savings of educational buildings (schools, university buildings and nursery schools). It will provide a potential list of solutions to specific energy related problems associated with the building shell, lighting or HVAC systems. The ECA contains more than 30 descriptions of exemplary retrofit/renovation projects and provides a wide and varied selection of retrofit technologies and strategies. The ECA will energy rate an existing educational building versus the national average for varied energy sources. Additionally, a calculation tool will provide energy savings and costs for retrofit technologies/strategies selected to be considered for improving the energy efficiency of the educational building.

## Who is the target group of the Energy Concept Adviser?

The ECA was developed for educational building decision-makers and their staff, responsible for programming, planning and accomplishing the retrofit/renovation of existing facilities. With the use of the ECA, the energy saving potential within an existing building will be better understood during the development of a retrofit/renovation projects and therefore reduce the energy consumption of an existing building. The decision-makers will be provided with reliable information on conventional and innovative strategies and technologies and thereby gain improved planning reliability.

## Who has developed the Energy Concept Adviser?

The Adviser was developed in the framework of the International Energy Agency (IEA) in the project Annex 36 of the Energy Conservation in Buildings and Community Systems division. Experts from 9 European countries and the USA brought in their national expertise, case studies and retrofit technologies to promote energy savings in the retrofit/renovation of existing buildings. See also [Info & Contact](#).

## How to operate the Energy Concept Adviser?

The user-interface is developed for intuitive use; the information paths shall be recognized intuitively. Additional information in the retrofit concept development part is provided under [I](#) ; [?](#) is for help functions. The main navigation bars are reached by clicking on the project logo on the upper left side of each page.

[Start](#)



# **REDUCE** Retrofitting in Educational Buildings



## **ENERGY CONCEPT ADVISER** for Technical Retrofit Measures

obtain recommendations for specific problems in your building

**Recommendations**

study more than 30 retrofitted buildings and retrofit measures

**Case Studies  
&  
Retrofit Measures**

compare your building's consumption to national data

**Performance Rating**

develop an energy efficient retrofit concept for your building

**Retrofit Concept**

programs and methods to analyse your building performance

**Utilities**

any questions

**Info & Contact**



## Problem Related Recommendation



General Information

**This knowledge based list of recommended measures may fit only partly to your building.**  
**Select your problem in the left column and in the right column it is possible to group the measures in main groups. Select the useful measures manually and read detailed description in the lower part.**

Select the existing problem

### General Problems

- Heating energy consumption is high**
- Electrical energy consumption is high
- Water consumption is high
- Indoor air quality problems

### Specific Problems

- Building envelope not airtight
- Humidity or moisture problems
- Windows need replacement
- Roof covering needs replacing
- Heating controls need upgrading
- Pipework needs replacing
- Boiler or burner needs replacement
- Building fabric insulation is poor
- Pipework needs insulating
- Ventilation uncomfortable due to draughts
- Heating inadequate in winter; rooms too cold

Group measures by

No grouping

Possible measures

**Close off open chimneys to prevent ventilation losses an...**

Payback time: **Very short Term (less than two years)**

**Close off unused air grilles behind radiators.**

Payback time: **Very short Term (less than two years)**

**Weather strip windows and doors and seal gaps in buildi...**

Payback time: **Very short Term (less than two years)**

**Install manual swimming pool cover.**

Payback time: **Very short Term (less than two years)**

**Replace existing gas or oil-fired boilers with condensing...**

Select the existing problem

- General Problems**
  - Heating energy consumption is high
  - Electrical energy consumption is high
  - Water consumption is high
  - Indoor air quality problems
- Specific Problems**
  - Building envelope not airtight
  - Humidity or moisture problems
  - Windows need replacement
  - Roof covering needs replacing
  - Heating controls need upgrading
  - Pipework needs replacing
  - Boiler or burner needs replacement
  - Building fabric insulation is poor
  - Pipework needs insulating
  - Ventilation uncomfortable due to draughts
  - Heating inadequate in winter; rooms too cold

Group measures by

- Building envelope
  - No grouping
  - Building envelope**
  - Heating systems
  - Ventilation systems
  - Lighting and electrical appliances
  - Management

Payback time: **Very short Term (less than two years)**

**Close off unused air grilles behind radiators.**  
Payback time: **Very short Term (less than two years)**

**Weather strip windows and doors and seal gaps in building envelope.**  
Payback time: **Very short Term (less than two years)**

**Management of blinds and curtains**  
Payback time: **Very short Term (less than two years)**

**Fit closures to external doors.**

Selected Measure

**Weather strip windows and doors and seal gaps in building envelope.**

Payback-time:  
**Very short Term (less than two years)**

Weather-strip and caulk around windows, doors, conduits, piping, exterior joints, or other areas of infiltration where it is worn, broken or missing.

**Can be carried out with routine maintenance**

Selected Measure

**Install cooking sensor controls on the kitchen hood fans**

Payback-time:

**Very short Term (less than two years)**

Kitchen extract fans extract large volumes of heated air and should only be on when required

**Can be carried out with routine maintenance**

Related Information

**Retrofit Measure Viewer**



**Lighting and electrical appliances - Control systems**

**Case Study Viewer**



**Exemplary Retrofitting of a School (EROS) in Stuttgart, Germany**



**University of Stuttgart**



**University of Ulm**



# Case Studies & Retrofit Measures

Sorting of:

Case Studies by

Retrofit Measures by

Country	Retrofit Measures		Case Studies					
		✓	✓			✓		
		✓	✓					
			✓	✓	✓			
		✓	✓			✓	✓	
						✓		



## Case Studies & Retrofit Measures

Sorting of:

Case Studies by

Retrofit Measures by

Country	Retrofit Measures ↓ Case Studies	Building Envelope			
		Windows	Insulation materials & systems	Over-cladding systems	Doors

### Pre 1930



### 1930-1950








## Case Study Viewer

## Revnovation of Wausau West High School - Wausau, Wisconsin, United States

Download of REPORT as PDF

<b>General Data</b>	<b>General Data</b>		
<b>Site, Typology</b>			
<b>Before Retrofit</b>	Address of project	Wausau West High School, 1200 West Wausau Ave, Wausau, Wisconsin 54401, United States of America	
<b>Retrofit Concept</b>	Year of construction	1968	
<b>Energy Savings</b>	Year of renovation	1998-2001	
<b>User Evaluation</b>	Total floor area	25548 m <sup>2</sup>	
<b>Renovation Costs</b>	Number of pupils	1850	
<b>Lessons Learned</b>	Numer of classrooms	65	
<b>Additional Information</b>	Typical classroom	65 m <sup>2</sup> 25 pupils	
	<b>Project Summary</b> This school building HVAC System resulted in complaints regarding Indoor Air Quality and energy inefficiency. The Local Public Health Department had received complaints and had investigated. The complaints included hot and cold rooms, poor ventilation and poor IAQ. In addition, the lighting systems needed upgrading. The project objective was to improve the IAQ, comfort, and overall energy efficiency of the building.		
	<b>Retrofit features</b> The heating system was converted from steam to hot water boilers. Three 9 million BTU boilers were replaced with seven 2 million BTU hot water boilers. The domestic hot water was changed from steam to direct fired natural gas. The dishwasher hot water booster was changed from electricity to gas. Ten pieces of kitchen equipment were changed from electricity to natural gas. Green house changed from propane to natural gas. Lighting was upgraded from T-12 flourscents with magnetic ballasts to T-8 with electronic ballasts. The HVAC was upgraded using a new concept using existing technologies resulting in 100% outdoor fresh air being introduced into the classrooms.		

Wausau West High School



## Retrofit Measure Viewer

### Solar control and cooling systems

Download of  
REPORT as  
PDF

Introduction

**Shading & glare prot.**

Cooling systems

Air-conditioning

Control systems

#### Shading systems and glare protections

To choose a solar control device we need to consider: the site latitude, the orientation of the facade, the orientation of the openings, the aesthetic of the facade, the glazing type of the window, the need for daylight, the solar control devices.

The overall thermal and optical performance of a solar control device in respect to solar radiation impinging on it is based on the phenomena: primary transmission, reflected transmission, diffuse transmission, solar absorption.

The global shading efficiency of a device is the result of all these direct and indirect transmission processes.



Shading systems and glare protections

Shading devices are also essential to avoid glare situations. If their luminous transmittance is too high, the risk of glare is significant. Several types of shading devices are sufficient to avoid glare from the sky: screens, reflective film, ionised film, sealed blinds.

Designers and decision makers must be conscious that the performance of the shading assembly might be different in the actual application conditions



## Performance Rating



### Building Information

The building is a: educational building(general) ▾

It has a heated floor area of: 5000,00 ◀ ▶

Reference climate zone: mean climate

[Click here to get further Information about the climate zones](#)

### Consumption of electrical energy:

Includes heat energy consumption

Unit of the consumption: kWh/m<sup>2</sup>a ▾

Consumption: 56,00 ◀ ▶

### Consumption of heat energy:

Energy source: oil ▾

Unit of the consumption: kWh/m<sup>2</sup>a ▾

Consumption: 233,00 ◀ ▶

### Consumption of water:

Unit of the consumption: l/m<sup>2</sup>a ▾

Consumption 174,00 ◀ ▶

Consumption of water:

Unit of the consumption:

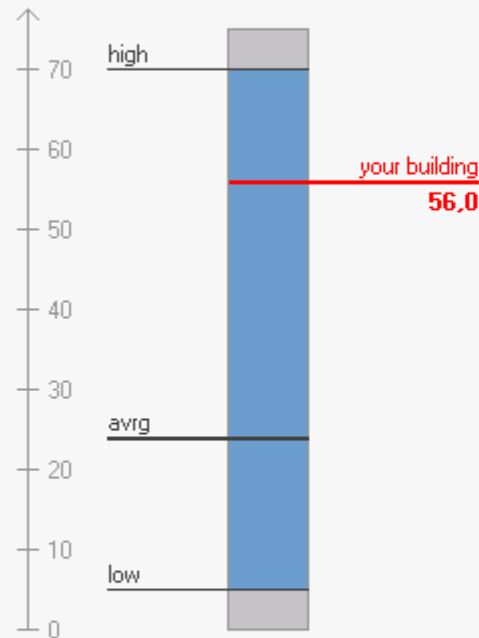
l/m<sup>2</sup>a

Consumption

174,00

**Attention! All energy consumptions are shown in kWh/m<sup>2</sup>a resp. water consumption in l/m<sup>2</sup>a.**

Consumption of electrical energy [kWh/m<sup>2</sup>a]



**National survey:**

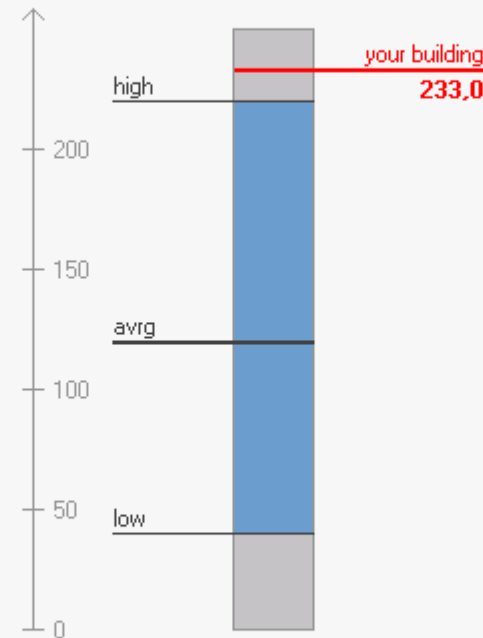
Highest consumption: 70,0

Average consumption: 24,0

Lowest consumption: 5,0

**Energy saving retrofit is recommended!**

Consumption of oil [kWh/m<sup>2</sup>a]



**National survey:**

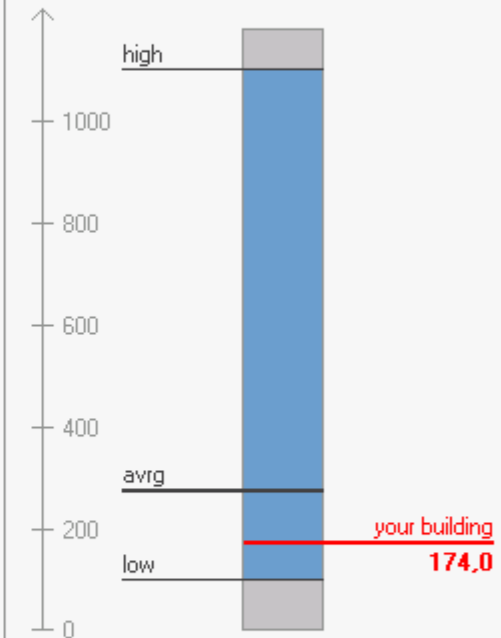
Highest consumption: 220,0

Average consumption: 120,0

Lowest consumption: 40,0

**Energy saving retrofit is highly recommended!**

Consumption of water [l/m<sup>2</sup>a]



**National survey:**

Highest consumption: 1100,0

Average consumption: 277,0

Lowest consumption: 100,0

**The water consumption is at a usual level!**



**Your consumption is compared to the results of a survey of Annex 36 about the energy consumption of educational buildings!**



## Retrofit Concept Development



### General Information

The development part is structured in the below listed sectors. A sector can be opened or closed by clicking on its bar. For all needed informations (values, costs, etc..) defined values from national studies are deposited, but could be changed individually by the user, so please check the deposited values for your confidence. If you need help, click on , for background information click on .

Describe the existing building

? +

Select one retrofit measure for each building element

? +

Create and compare energy saving concept

? +

Summary and Report

? +

## How to use this part

The building, for which the possibilities for a energy efficient should be analysed, is defined in this section.

By choosing the basic values, a default building is created.

This building can be further defined in the lower part of this section

**If there was already a further definement, changes in the basic parts sets all the values back to default!**

## Define key values for a default building

Basic Data

Building Type: school

Construction year: pre 1950

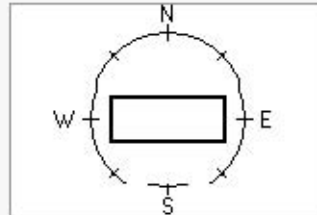
Type of Roof: pitched (heated attic)

Type of basement: slab on ground

Total floor area [m<sup>2</sup>]: 6180,00

Number of storeys: 3

Orientation:



Click on diagram to select orientation

Example buildings

Typology: multi-storey school

Click on picture to have a look at the case study!



Wausau West High School, Wisconsin  
USA

Consumption of heat energy:

Energy source: Oil

Consumption: 374,00 kWh/m<sup>2</sup>a

## Further Refinement of the building

## Further Refinement of the building

### Location

### Geometry and Elements of Building Envelope

Heated volume:

33372,0

Floor area:

6180,0 m<sup>2</sup>

Ratio A/V:

0,32 1/m

Area of thermal envelope:

10815,0 m<sup>2</sup>

Switch through the different envelope elements:



external wall

pitched roof

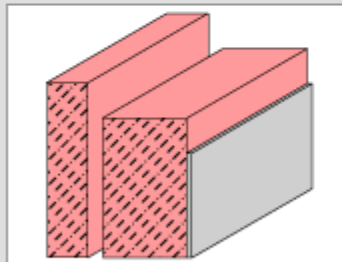
ground plate

window north

window east



#### external wall



Name:

external wall

Area[m<sup>2</sup>]:

3955,20

Maintenance Costs:

4,00

€/m<sup>2</sup>a

Structure:

double layered brickwork with 24 cm brick, 4 cm air, 11,5 cm brick and interior plaster

Existing U-Value:

30 cm light brickwork with interior and exterior plaster  
30 cm concrete stone with pumice brickwork with interior and exterior plaster  
30 cm brickwork with interior and exterior plaster  
double layered brickwork with 24 cm brick, 4 cm air, 11,5 cm brick and interior plaster  
concrete sandwich construction: interior plaster, 20 cm concrete, 4 cm insulation, 11,5  
30 cm limestone brickwork, 4 cm insulation, interior and exterior plaster

Does this component have to be retrofitted anyway?

in a minor refurbishment

in a major refurbishment

### Heat and ventilation plant

**Further Refinement of the building** -

**Location** ? +

**Geometry and Elements of Building Envelope** ? +

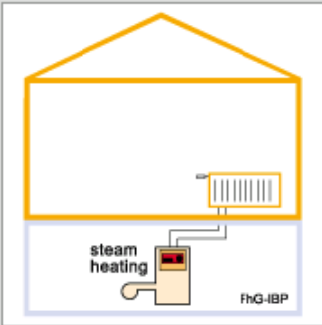
**Heat and ventilation plant** ? -

Choose the existing plant

**The heat energy is generated by:** steam heating

**The type of ventilation is:** natural ventilation

Details of selected plant



steam heating  
FHG-IBP

**Detailed description of the chosen plant:**

steam boiler, steam heating, 105 °C, cast iron heating elements, no room regulations, natural ventilation

**Adjusted setback modes:** no setback

**Used energy source:** Oil

Does this component have to be retrofitted anyway?  in a minor refurbishment  in a major refurbishment

---

**Lighting** ? -

Classrooms

<b>Fraction of total floor area:</b>	75,0	%	<b>Installed System:</b>	Incandescent
<b>Fraction Area window/facade:</b>	50,0	%	<b>Lighting control:</b>	Switch with manual control
<b>Mean room depth:</b>	7,50	m	<b>Maintenance Costs:</b>	2,60 €/m²a

Does this component have to be retrofitted anyway?  in a minor refurbishment  in a major refurbishment

**Cost data** ? +



<b>Further Refinement of the building</b>		-
<b>Location</b>		? +
<b>Geometry and Elements of Building Envelope</b>		? +
<b>Heat and ventilation plant</b>		? +
<b>Lighting</b>		? +
<b>Cost data</b>		? -
General values		
<b>Inflation rate:</b>	<input type="text" value="6,00"/> %	<b>Period of analysis:</b> <input type="text" value="50"/> years
<b>Interest rate:</b>	<input type="text" value="6,00"/> %	
Energy prices		
	<b>Basic Price:</b>	<b>Consumption Price:</b>
<b>Electrical energy</b>	<input type="text" value="95,00"/> €/a	<input type="text" value="11"/> Ct/(kWh*a)
<b>Oil</b>	<input type="text" value="0,00"/> €/a	<input type="text" value="3"/> Ct/(l*a)
<b>Gas</b>	<input type="text" value="15,00"/> €/a	<input type="text" value="5"/> Ct/(m³*a)
<b>Coal</b>	<input type="text" value="0,00"/> €/a	<input type="text" value="4"/> Ct/(kg*a)

## Select one retrofit measure for each building element



### How to use this part



This part is for the selection of retrofit measures for each building element, that is relevant for the consumption of energy. The measure with the best cost benefit value is automatically selected. The selection can be changed with the checkbox 'Select this measure as chosen retrofit measure for this element!'

**Select a Component:** Choose an element of the building

**Select a Retrofit Measure:** Shows all retrofit measures. Change the selection of the chosen measure here.

**Overview:** Shows the results of the retrofit measures for this element. All values are related to the unretrofitted building!

### Select a component



### Select a retrofit measure



### Overview



How to use this part +

Select a component -

Main Group	Building envelope	Element	external wall
Existing Structure	double layered brickwork with 24 cm brick, 4 cm air, 11,5 cm brick and interior plaster		
Existing U-Value:	1,47 W/m <sup>2</sup> K		

Select a retrofit measure -

1	internal insulation with 6 cm polystyrene, vapour barrier and gypsum board (mind thermal bridges, follow-up costs and sp			
improved U-Value:	0,46 W/m <sup>2</sup> K	Investment costs:	50,00	€/m <sup>2</sup>
		Maintenance costs:	4,00	€/m <sup>2</sup> a
<input checked="" type="radio"/> Select this measure as choosen retrofit measure for this element				
2	external insulation with 12 cm mineral wool and plaster			
improved U-Value:	0,25 W/m <sup>2</sup> K	Investment costs:	80,00	€/m <sup>2</sup>
		Maintenance costs:	4,00	€/m <sup>2</sup> a
<input type="radio"/> Select this measure as choosen retrofit measure for this element				
3	external insulation with 20 cm mineral wool and plaster			
improved U-Value:	0,17 W/m <sup>2</sup> K	Investment costs:	100,00	€/m <sup>2</sup>
		Maintenance costs:	4,00	€/m <sup>2</sup> a

Overview +

### Select a retrofit measure

**1** internal insulation with 6 cm polystyrene, vapour barrier and gypsum board (mind thermal bridges, follow-up costs and sp

improved U-Value:  Investment costs:  €/m²

Maintenance costs:  €/m²a

Select this measure as chosen retrofit measure for this element

**2** external insulation with 12 cm mineral wool and plaster

improved U-Value:  Investment costs:  €/m²

Maintenance costs:  €/m²a

Select this measure as chosen retrofit measure for this element

**3** external insulation with 20 cm mineral wool and plaster

improved U-Value:  Investment costs:  €/m²

Maintenance costs:  €/m²a

### Overview

Retrofit Measures:	Heat Energy demand:	Capital Expenditure:	Cost Benefit Value:
Existing Building	1160,0 kWh/m²a		
<b>1</b> internal insulation with 6 cm polystyrene, vapour barrier and	1060,0 kWh/m²a	197000 €	0,30 €/(kWh/m²a)
<b>2</b> external insulation with 12 cm mineral wool and plaster	1040,0 kWh/m²a	316000 €	0,40 €/(kWh/m²a)
<b>3</b> external insulation with 20 cm mineral wool and plaster	1030,0 kWh/m²a	395000 €	0,50 €/(kWh/m²a)
<b>4</b> external insulation with 12 cm polystyrene foam and plaster (mind	1040,0 kWh/m²a	276000 €	0,30 €/(kWh/m²a)
<b>5</b> external insulation with 20 cm polystyrene foam and plaster (mind	1030,0 kWh/m²a	336000 €	0,40 €/(kWh/m²a)

## Create and compare energy saving concept



### How to use this part

This part is for the creation and comparison of different concepts for an energy efficient retrofitting. There are five different concepts possible. After selecting elements for a concept, that should be retrofitted, the different concepts can be compared in the lower part.

#### Select elements for the different concepts

Choose here, which elements shall be retrofitted within a concept

#### Overview:

Look at the results of the different concepts. Various energy and economy relevant values can be displayed.

### Select elements for the different concepts

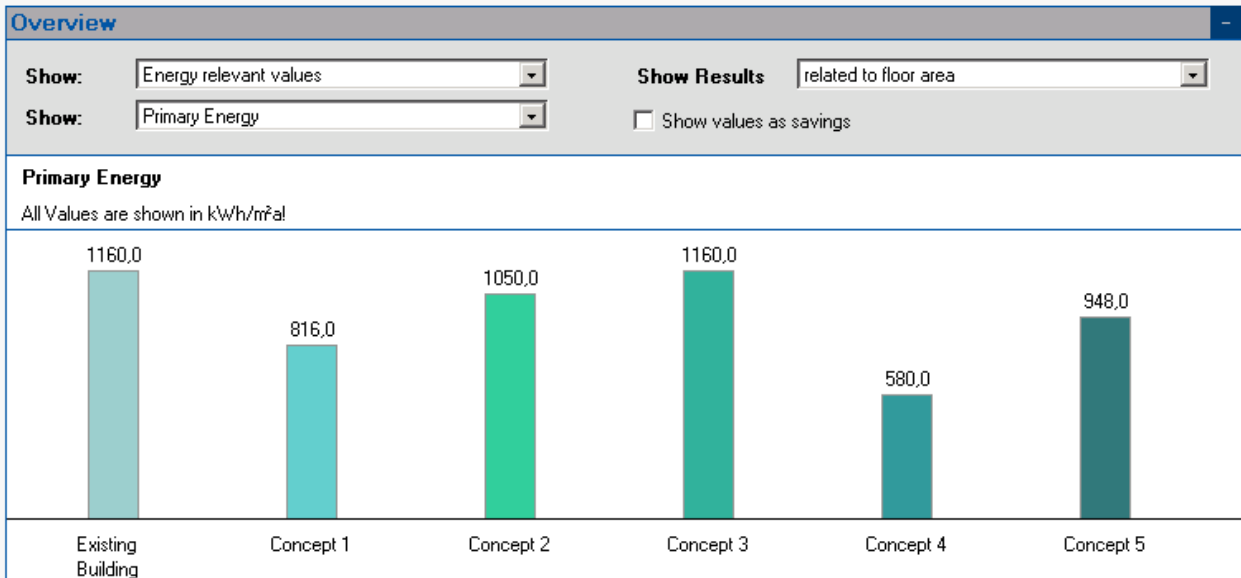


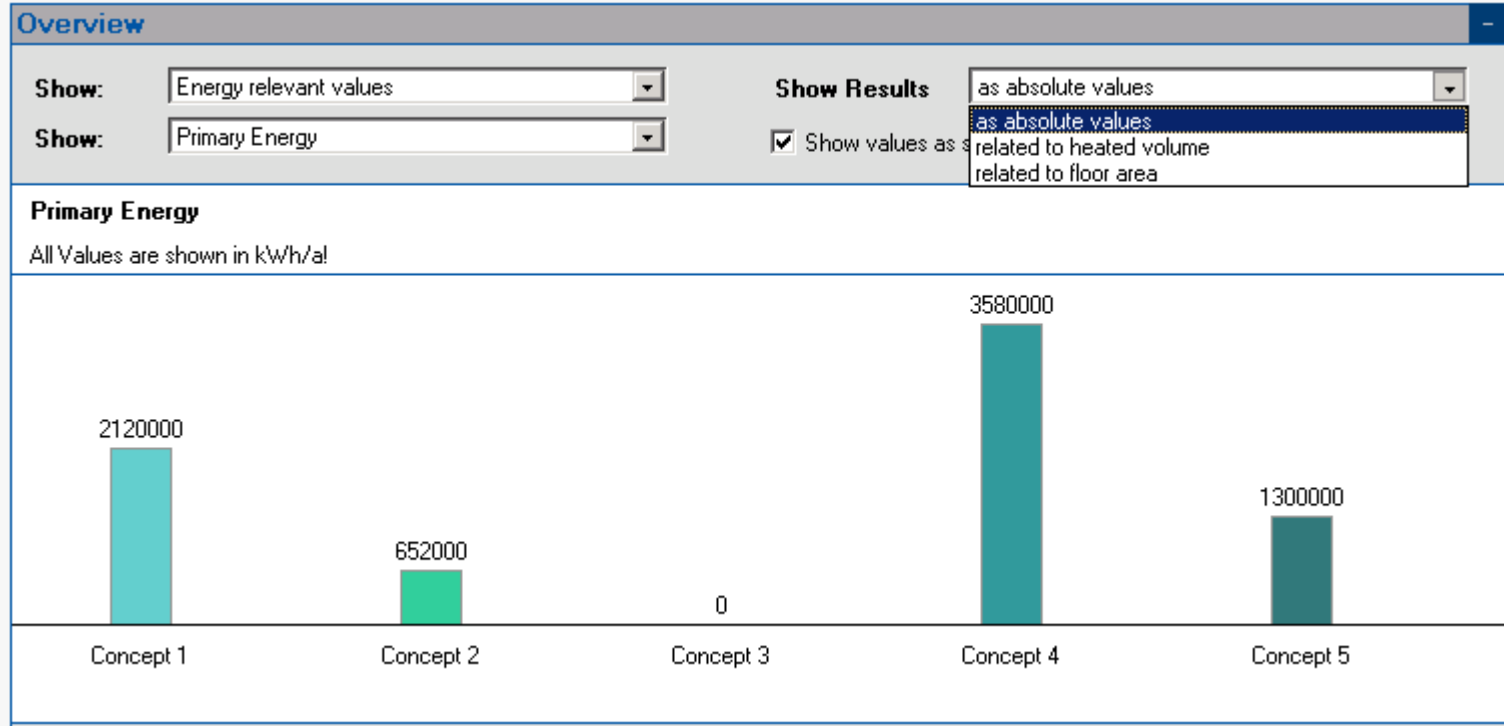
### Overview

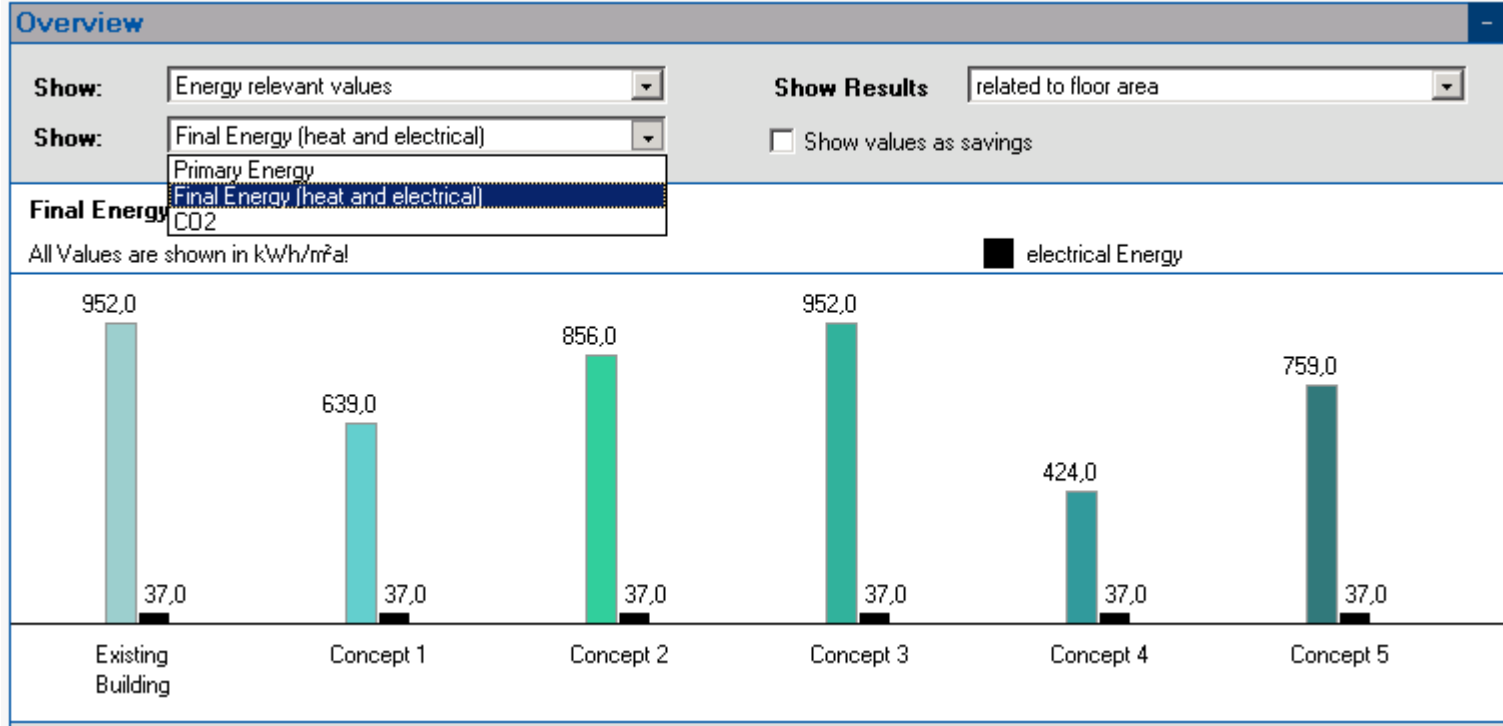


Select elements for the different concepts

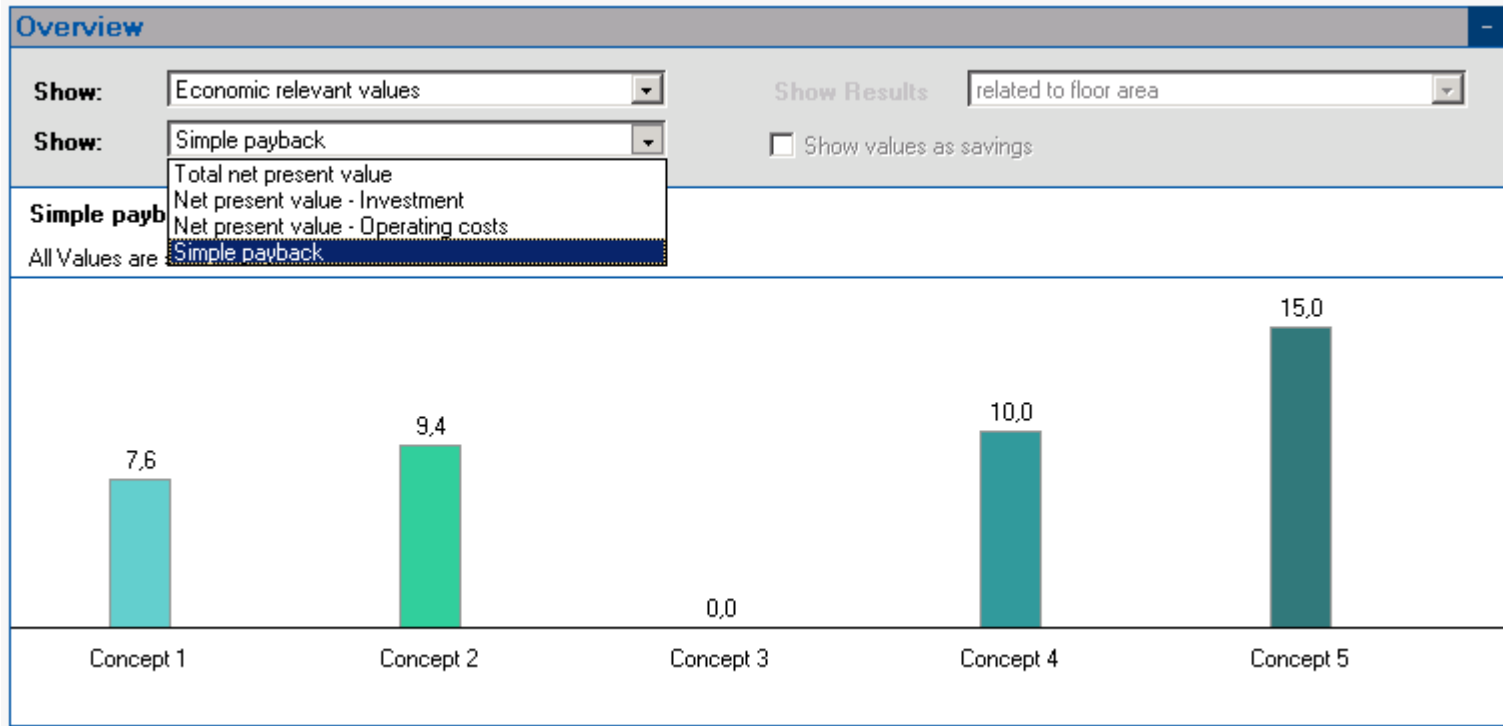
Element: Chosen retrofit measure:	Concept				
	1	2	3	4	5
<b>pitched roof</b> 14 cm mineral wool insulation between the rafters, vapour barrier, water barrier, lattice	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>ground plate</b> 4 cm mineral wool, screedfloor (extra costs for shortening of the doors)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>steam heating</b> Low Temperature Boiler 70/55	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>external wall</b> internal insulation with 6 cm polystyrene, vapour barrier and gypsum board (mind ther	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<b>lighting source</b> Compact Fluorescent	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>window north</b> The measures are sorted by benefit-cost-value					











## Summary and Report



### How to use this part

An output can be created in this part.

**Summary** This is a short summary of the input values and the selected retrofit measures. It is shown in a popup window.

**Report** The report is a comprehensive list of the whole concept including input values and results. It is also possible to include the diagrams into the report. The report can include all concepts or just one selected. It is delivered by email as a pdf document.

### Options

Summary

Select a concept:

Concept 1

Show Summary

Report

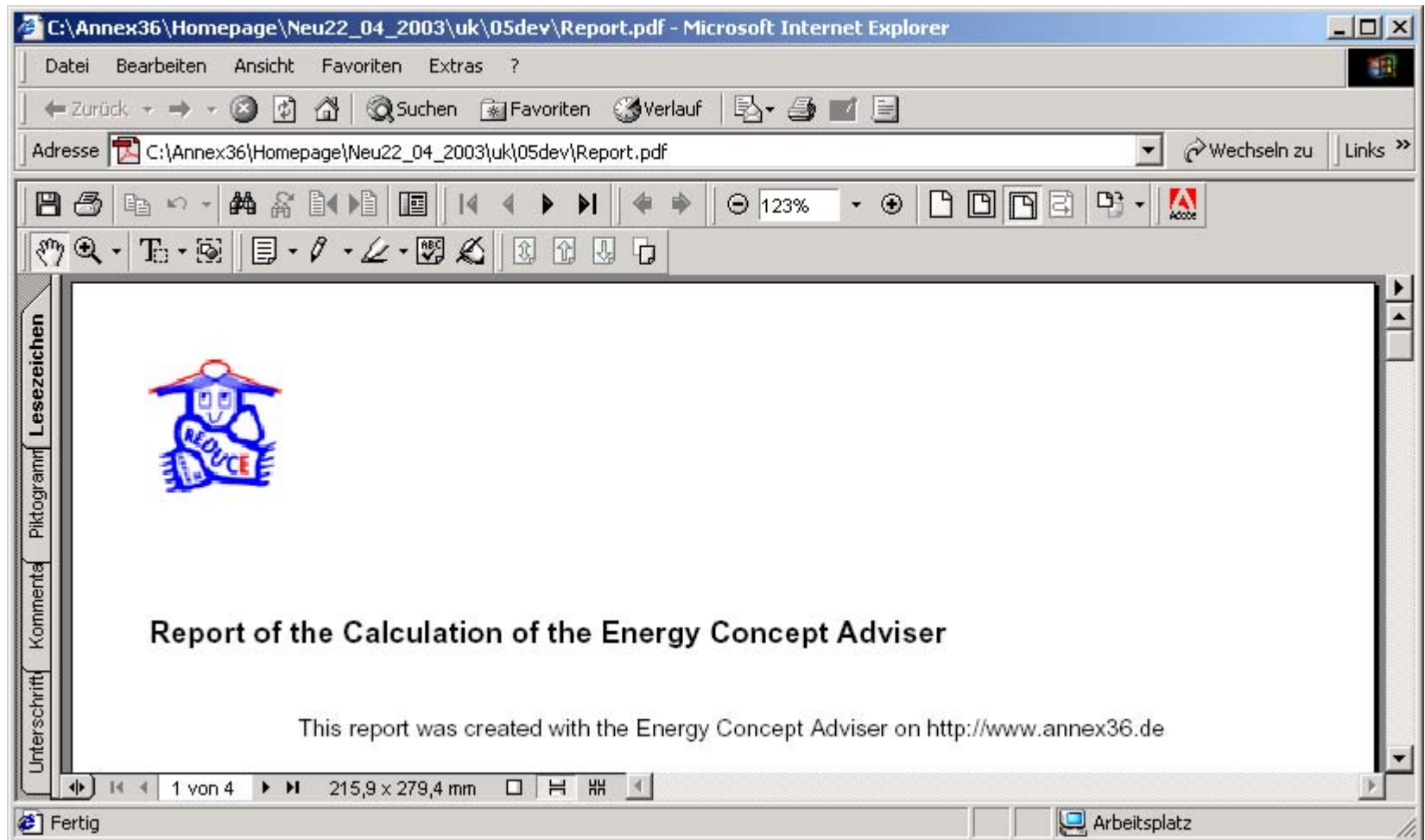
Show:

All concepts

show Diagramms

Enter your Email-address:

Show Report





## Utilities

### KULU IEA ECBCS Annex 36



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# Information

<http://www.annex36.com/>