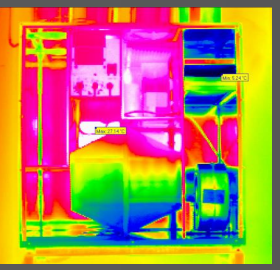
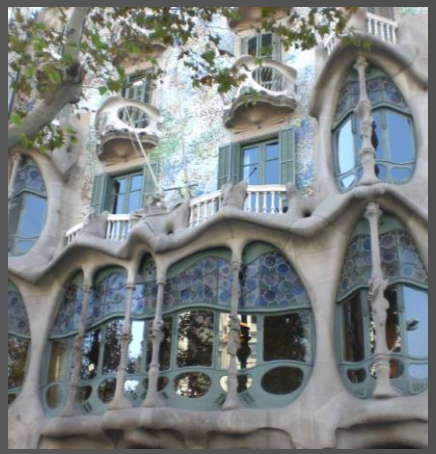
TRAINING SEMINAR ON HIGH-PERFORMANCE ENERGY EFFICIENCY STANDARDS IN BUILDINGS IN THE UNECE REGION

St. Petersburg, 5-7 September 2018





Practical examples of highly efficient buildings

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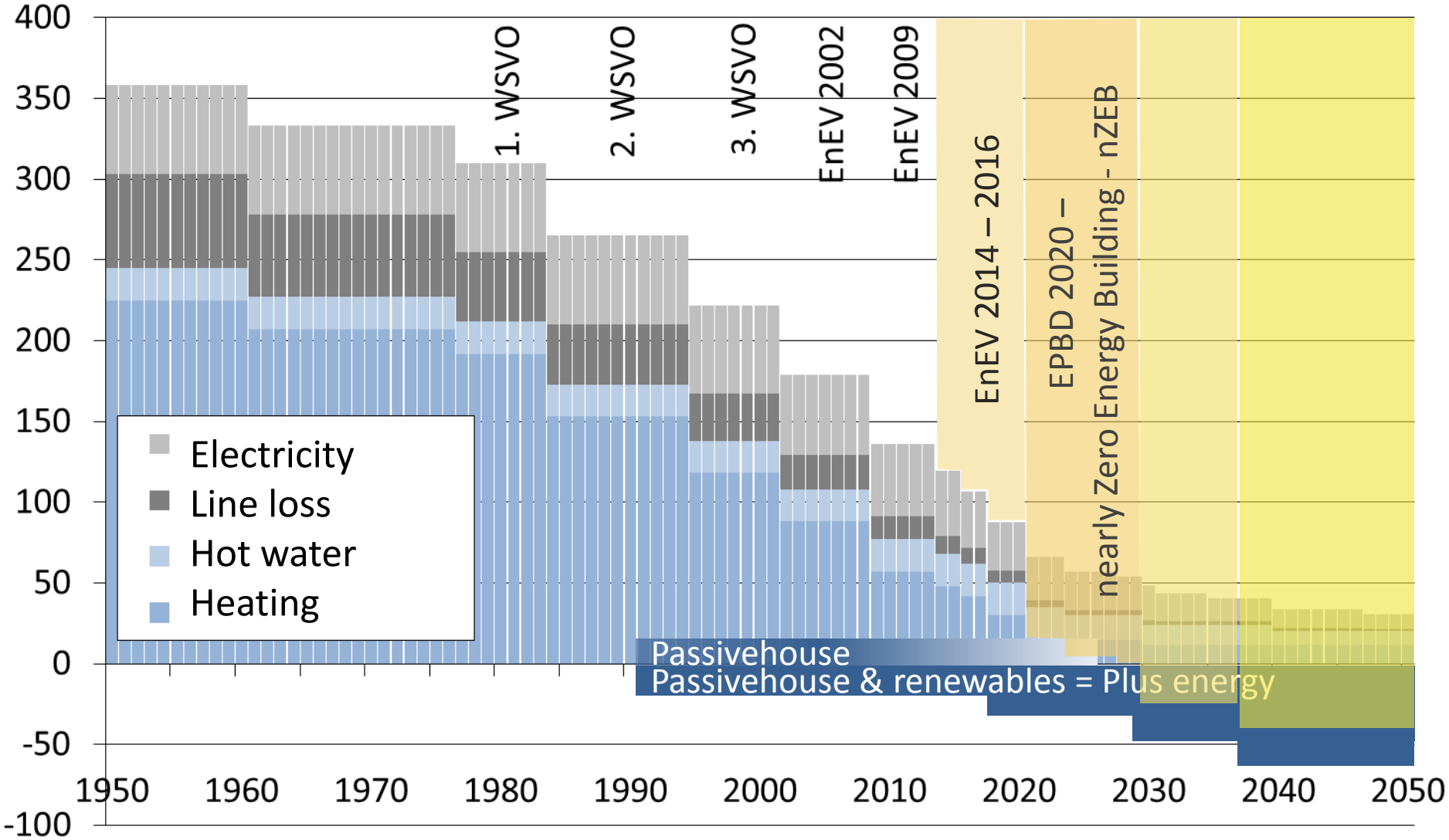
Ideas for further steps of the training programme

Dr. Burkhard Schulze Darup, Architect
Co-chair of the Joint Task Force, Germany

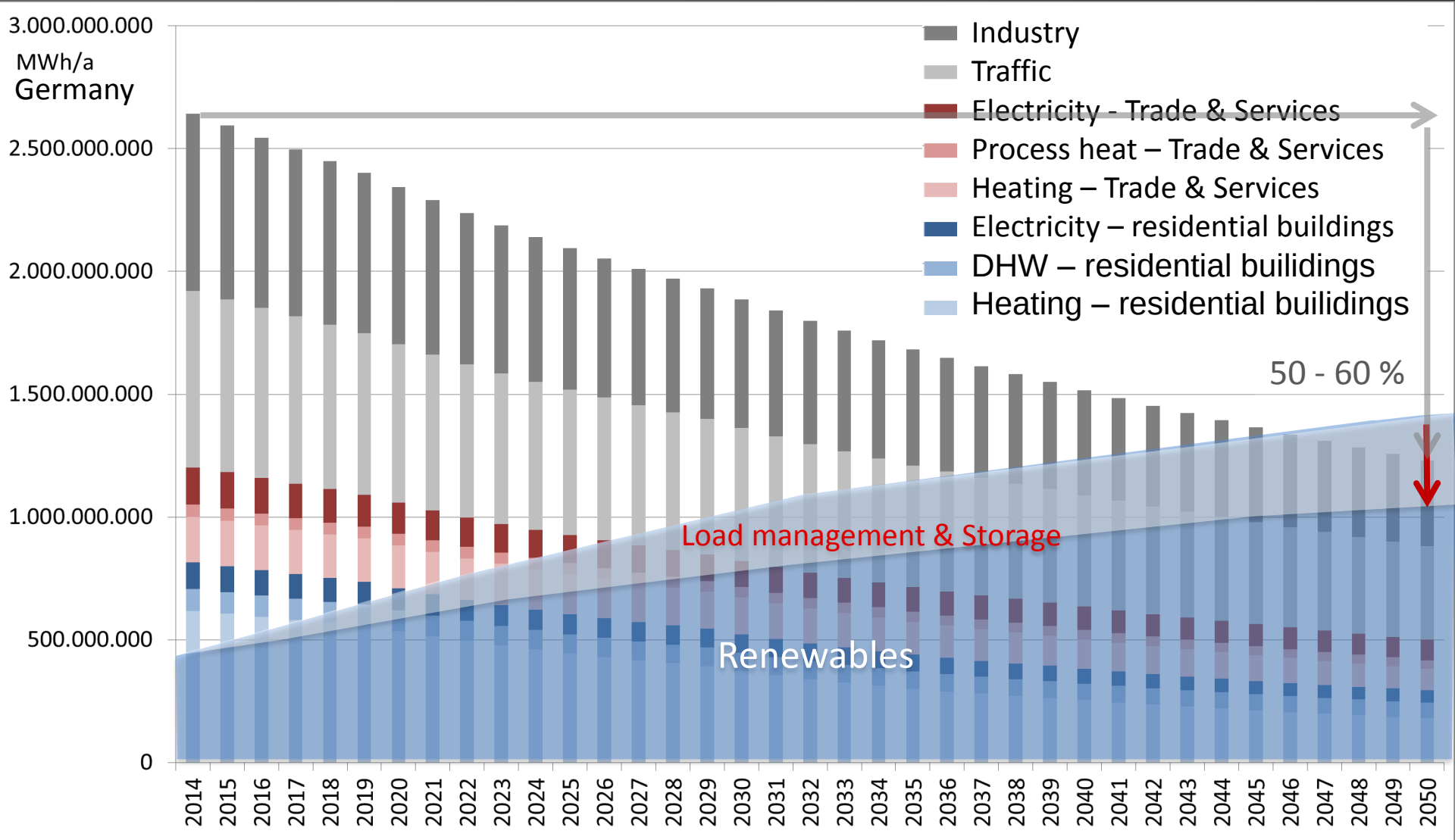
Introduction: Development of the Building Code in Germany & Europe



Source: Dr. Burkhard Schulze Darup, Architekt

Target: 95-percent reduction of greenhouse gas emissions until 2050

Balance between energy efficiency and renewables

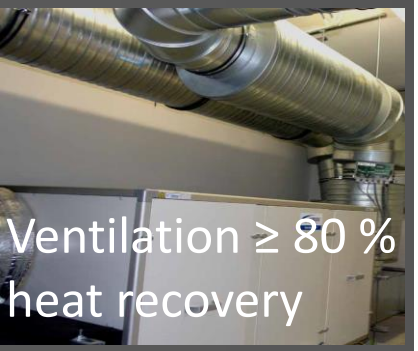


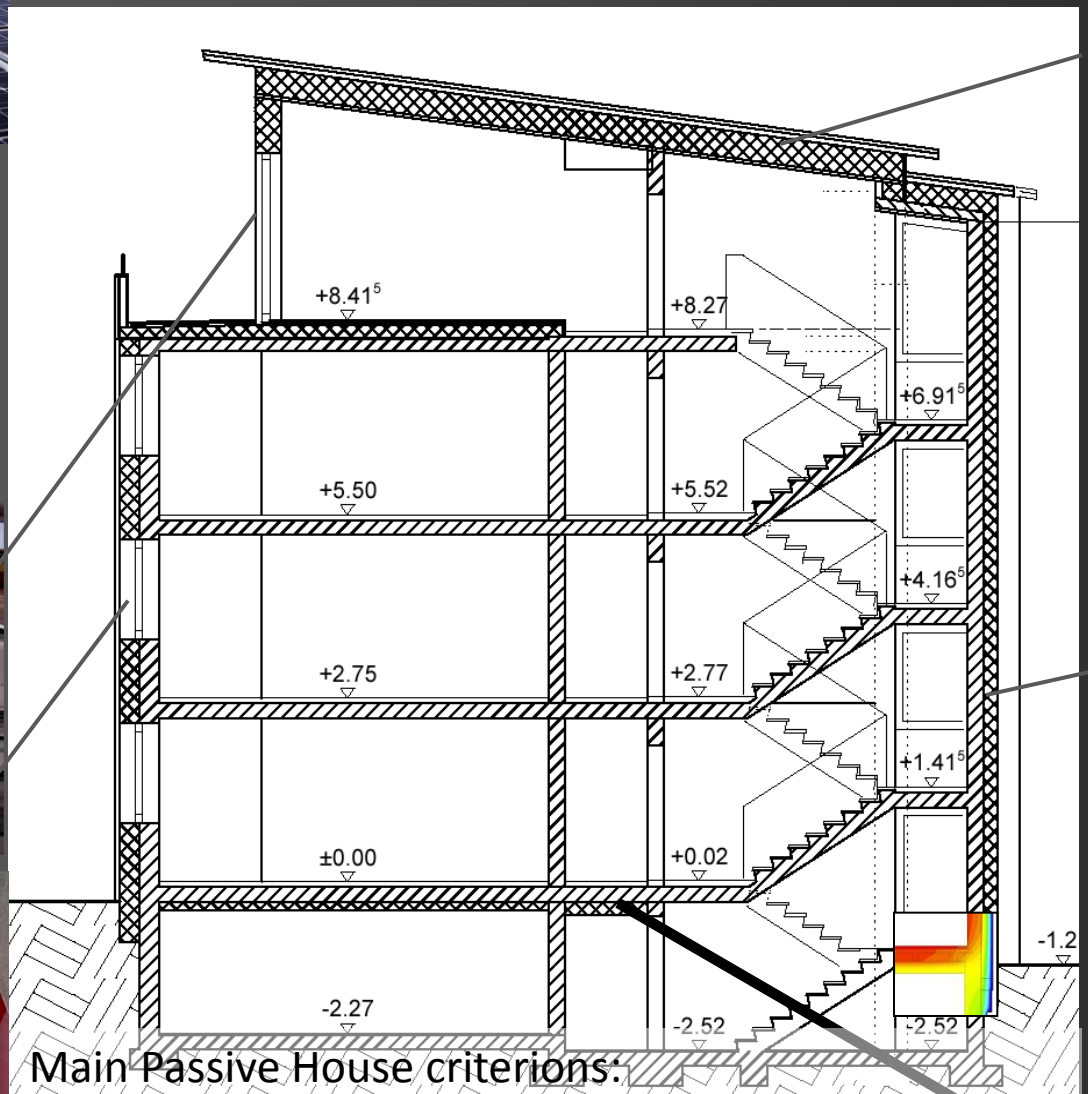
Quelle: DGS / Schulze Darup: Gebäudetypologie und Energieeffizienzstrategie BRD, Berlin 2015

UNECE Framework Guidelines for Energy Efficiency Standards in Buildings, Geneve 2017

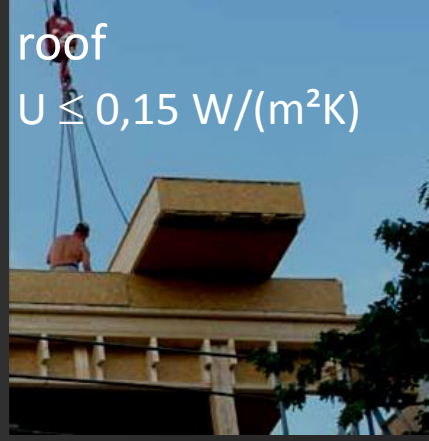
	Heating/ Cooling	Hot Water	Ventilation Heat recovery	Electric Power Requirement
Energy demand	25 kWh/(m²a)			
Primary energy demand	45 kWh/(m²a)			
Primary energy demand	90 kWh/(m²a)			

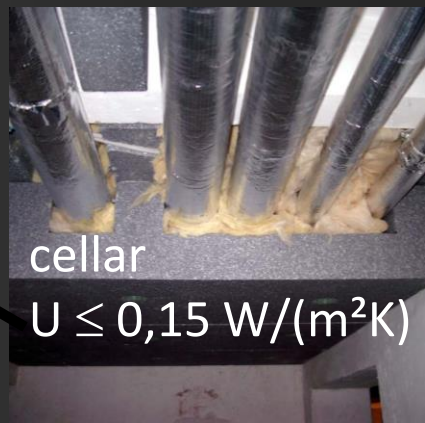
Efficiency components



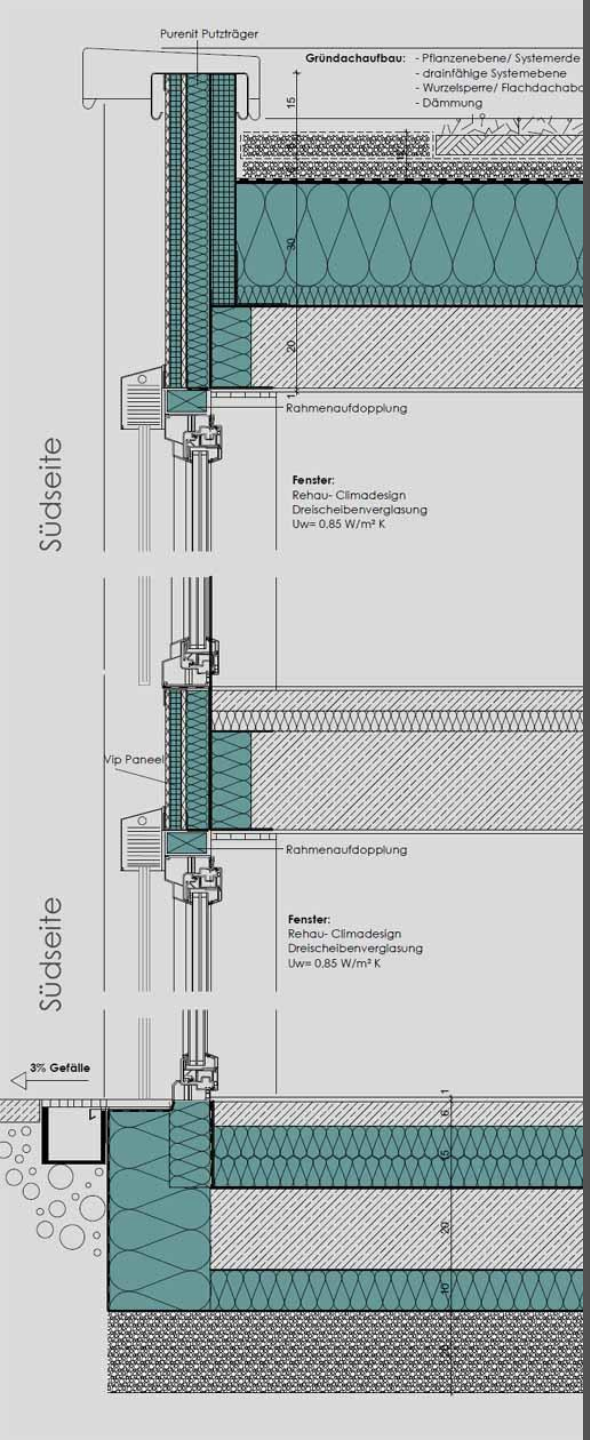


Main Passive House criterions:
energy requirement for heating ≤ 15 kWh/(m²y)
combined primary energy consumption
heating, warm water, electricity ≤ 120 kWh/(m²y)





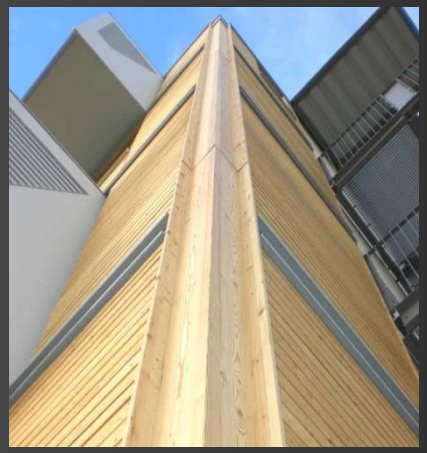
Building envelope

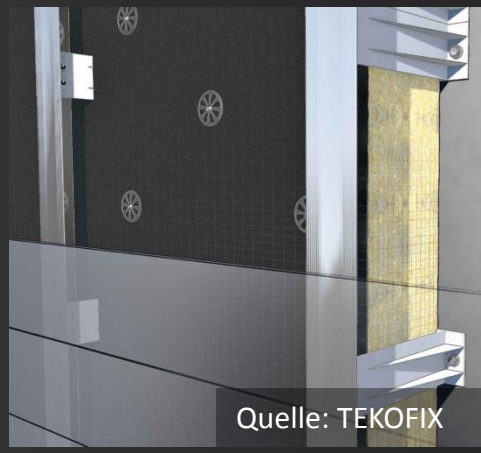


Development of standards since 1980

U-Value (W/m²K)	1980	1995	2010	2016	2021	Passive House
Wall	0,40	0,30	0,24	0,20	0,18	0,15
Roof	0,30	0,24	0,18	0,16	0,14	0,15
Ground	0,50	0,35	0,28	0,24	0,20	0,15

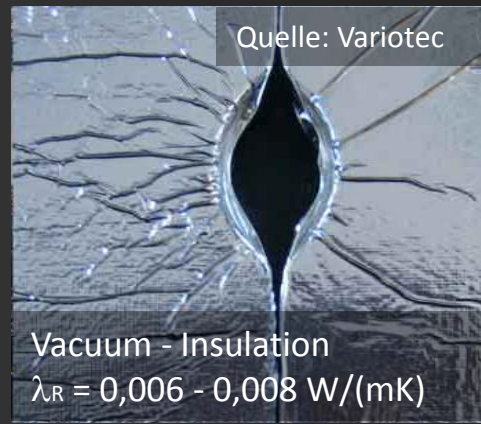

Quelle: KS-Piano




Quelle: TEKOFIX


Quelle: Wienerberger Ziegelindustrie GmbH

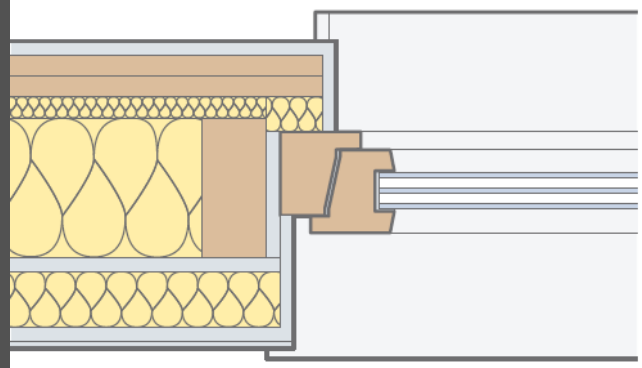

Aerogel - Insulation
λ_R = 0,014-0,019 W/(mK)

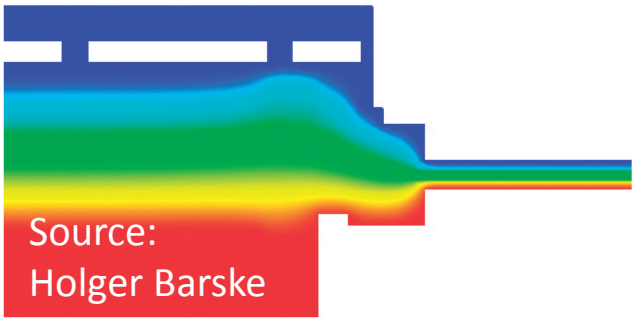

Quelle: Variotec
Vacuum - Insulation
λ_R = 0,006 - 0,008 W/(mK)

Development of Window-Standards

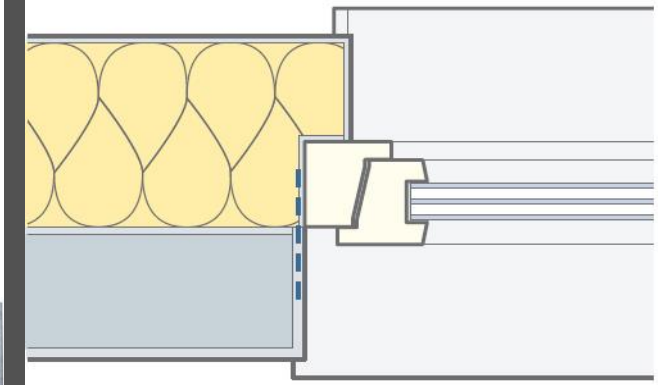
Best practice – development 1980 - 2050

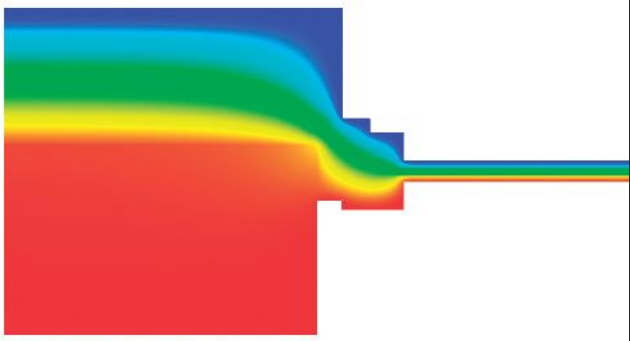
Windows	1980	1995	2010	2020	2030	2050
U_g [W/(m²K)]	1,8	0,7	0,6	0,5	0,45	0,4
U_f [W/(m²K)]	1,8	0,8	0,7	0,6	0,55	0,5
g-value	60%	50%	52%	55%	55%	58%





Source:
Holger Barske





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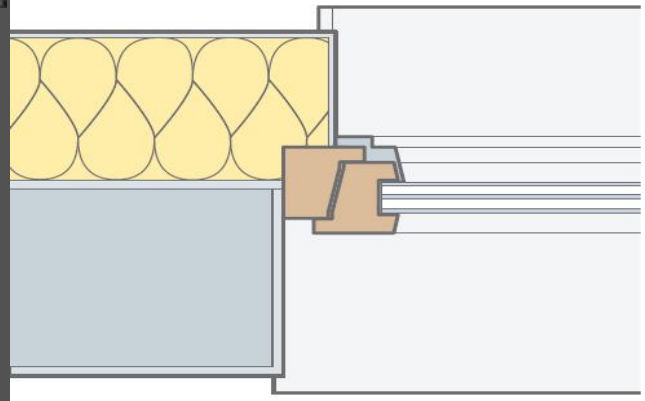
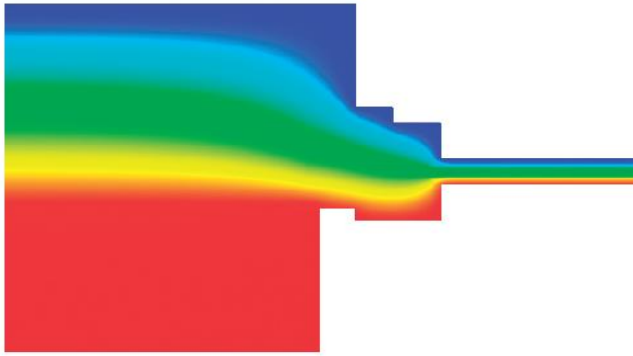
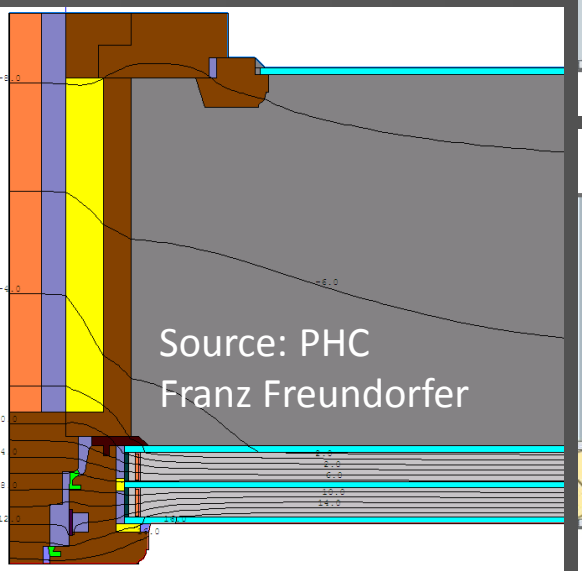
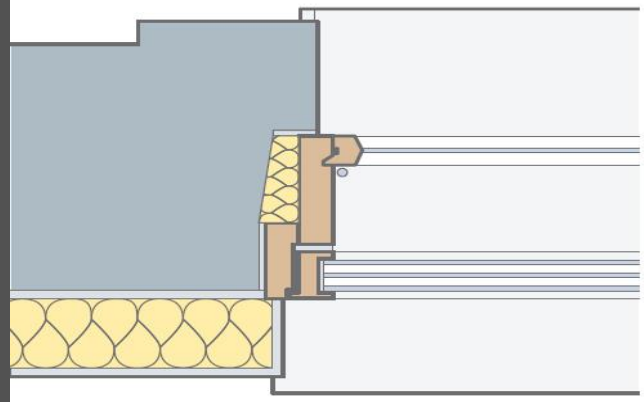
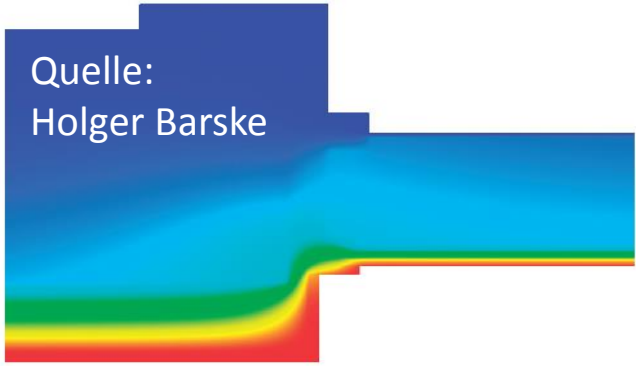






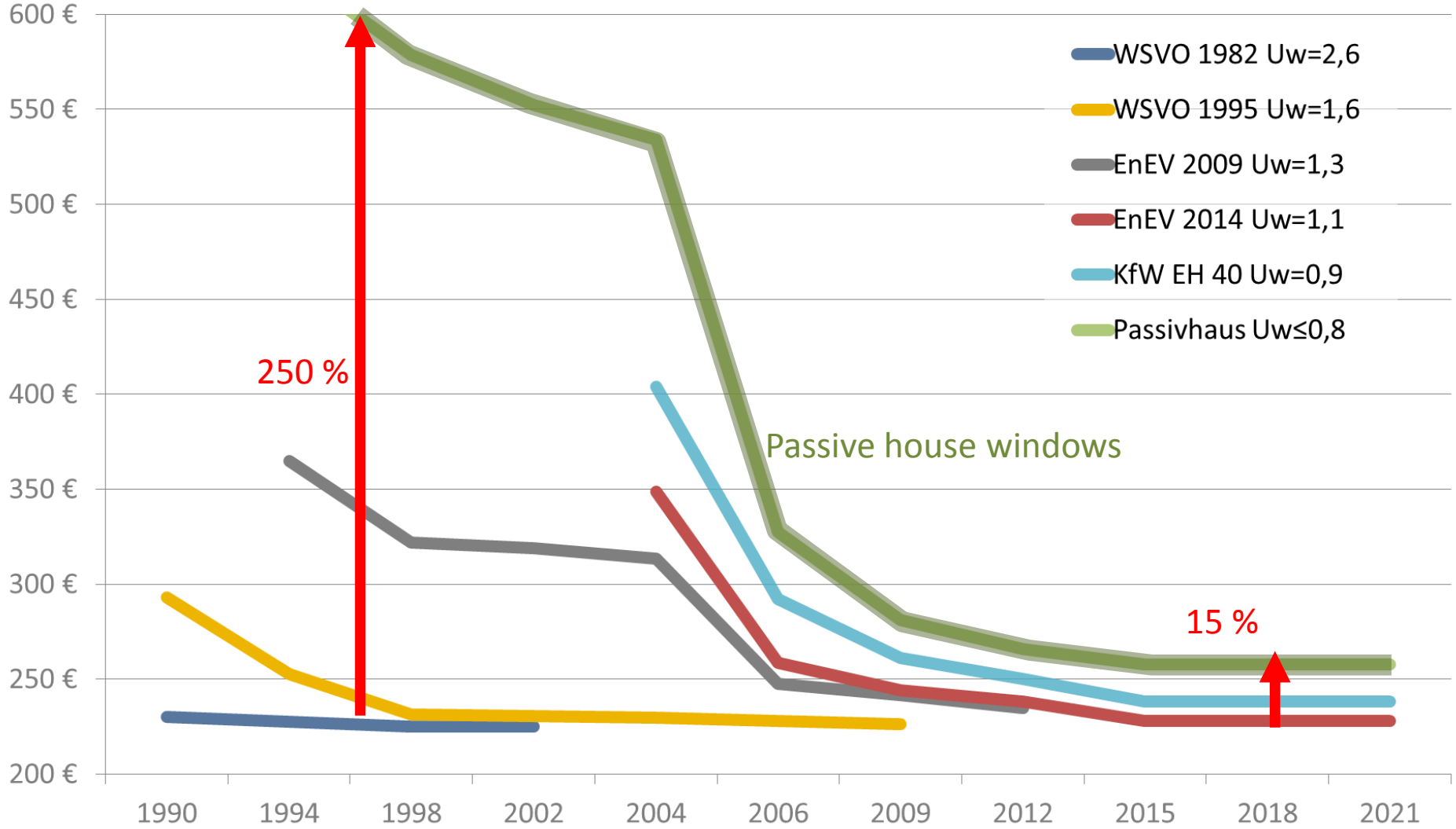
Source: PHC
Franz Freundorfer





Quelle:
Holger Barske

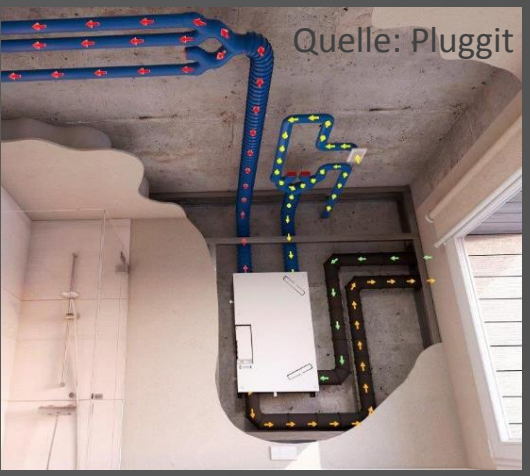
Investment costs for windows (€) per m² window area

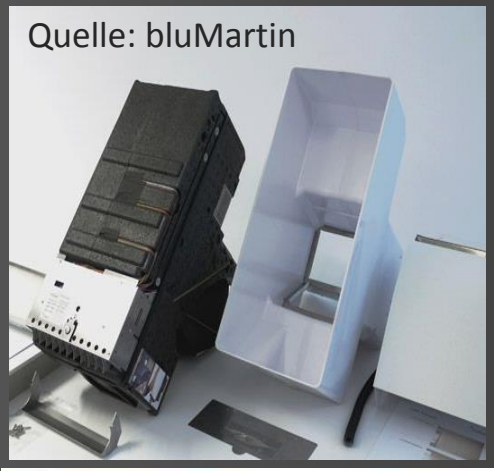


Source: Ecofys, Schulze Darup: Preisentwicklung Gebäudeenergieeffizienz. – Im Auftrag der DENEFF Berlin 2014

Ventilation with heat recovery

	1980	1995	2010	2020	2030	2050
Heat recovery	65%	80%	85%	90%	92%	94%
Electric-Efficincy [W/m³]	0,8	0,45	0,4	0,35	0,3	0,27


Quelle: Pluggit

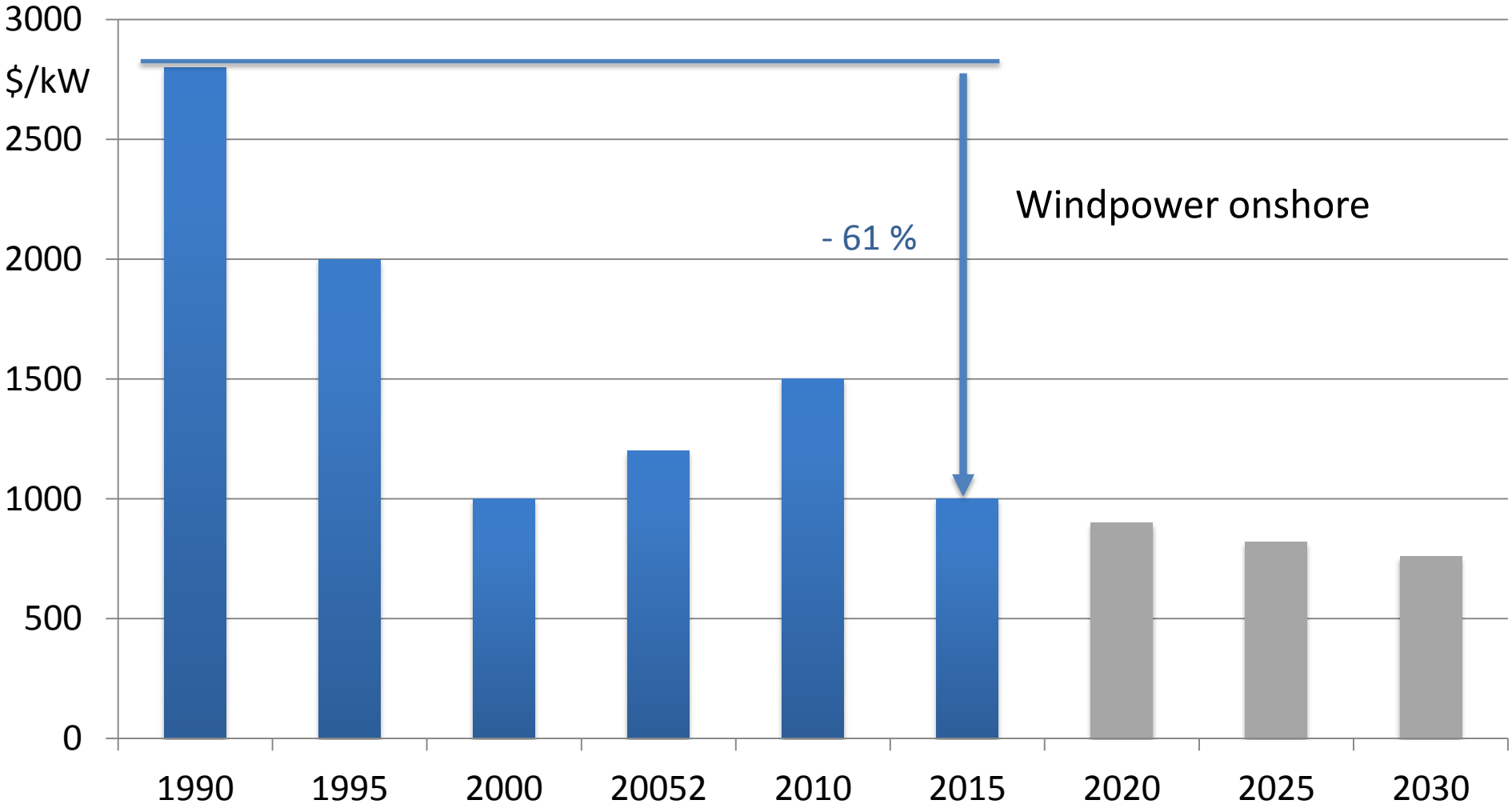

Quelle: bluMartin


Quelle: Pluggit


Quelle: Zehnder

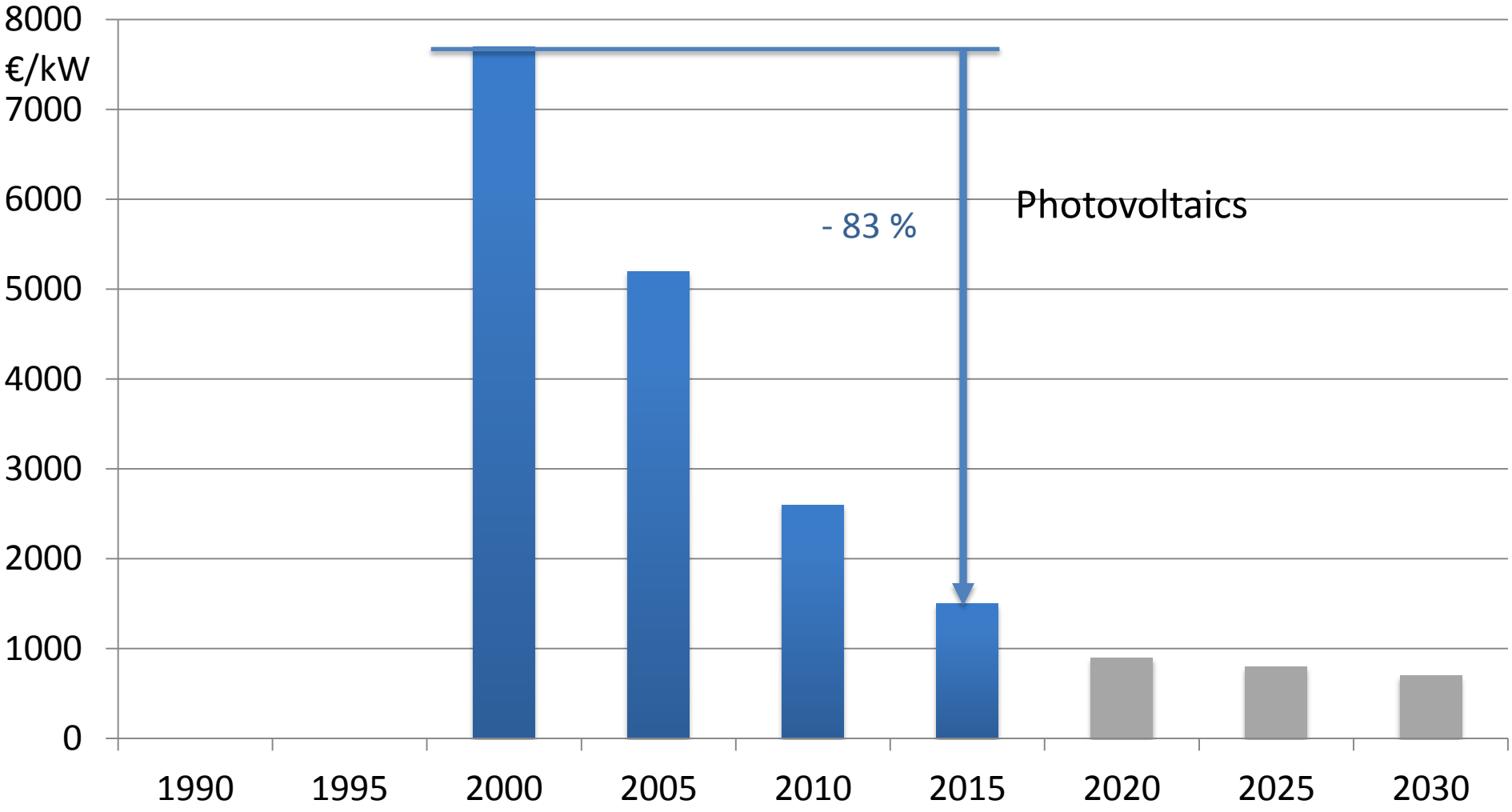

Quelle: Zehnder

Costreduction of decentral Renewables – Windpower onshore



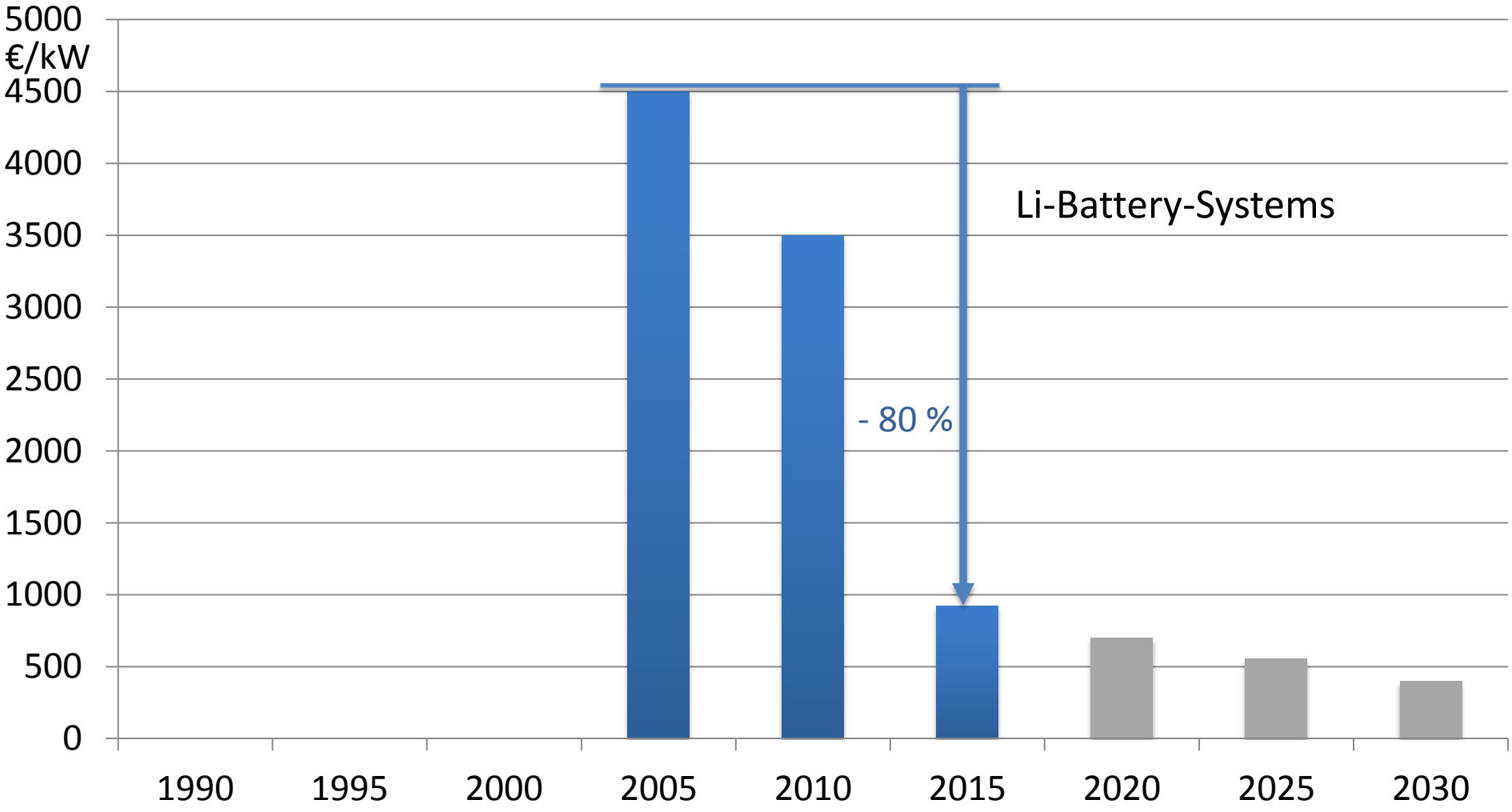
Source: Dr. Rainer Saliger, Siemens AG, CoC Dezentrale Energiesysteme; LBNL, Wind technologies market report 2014, Fraunhofer ISE PV report 2014, IHS Technology Battery report 2015, BNEF 2015

Costreduction of decentral Renewables – Photovoltaics



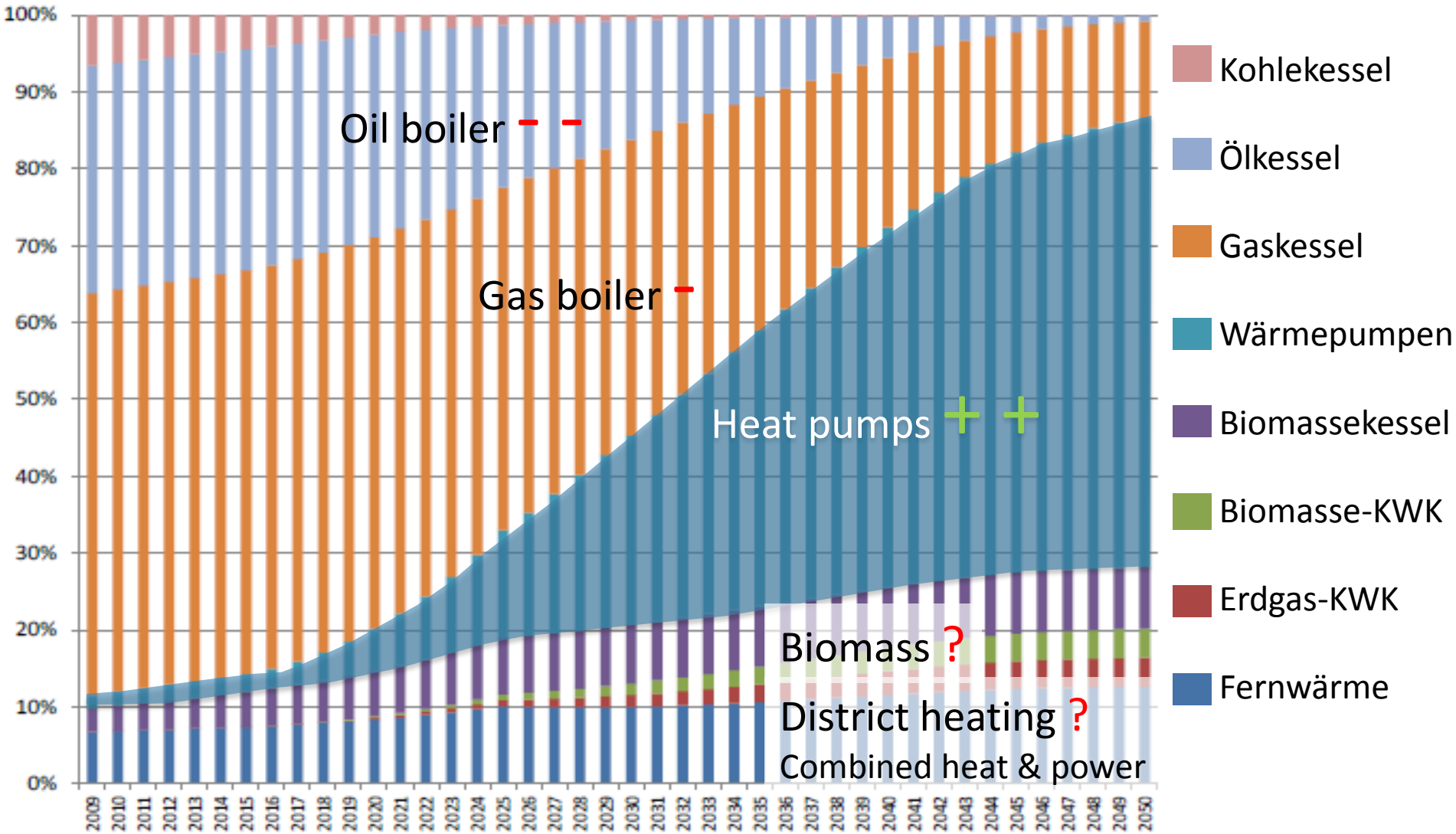
Source: Dr. Rainer Saliger, Siemens AG, CoC Dezentrale Energiesysteme; LBNL, Wind technologies market report 2014, Fraunhofer ISE PV report 2014, IHS Technology Battery report 2015, BNEF 2015

Costreduction of decentral Renewables – Li-Battery-Systems



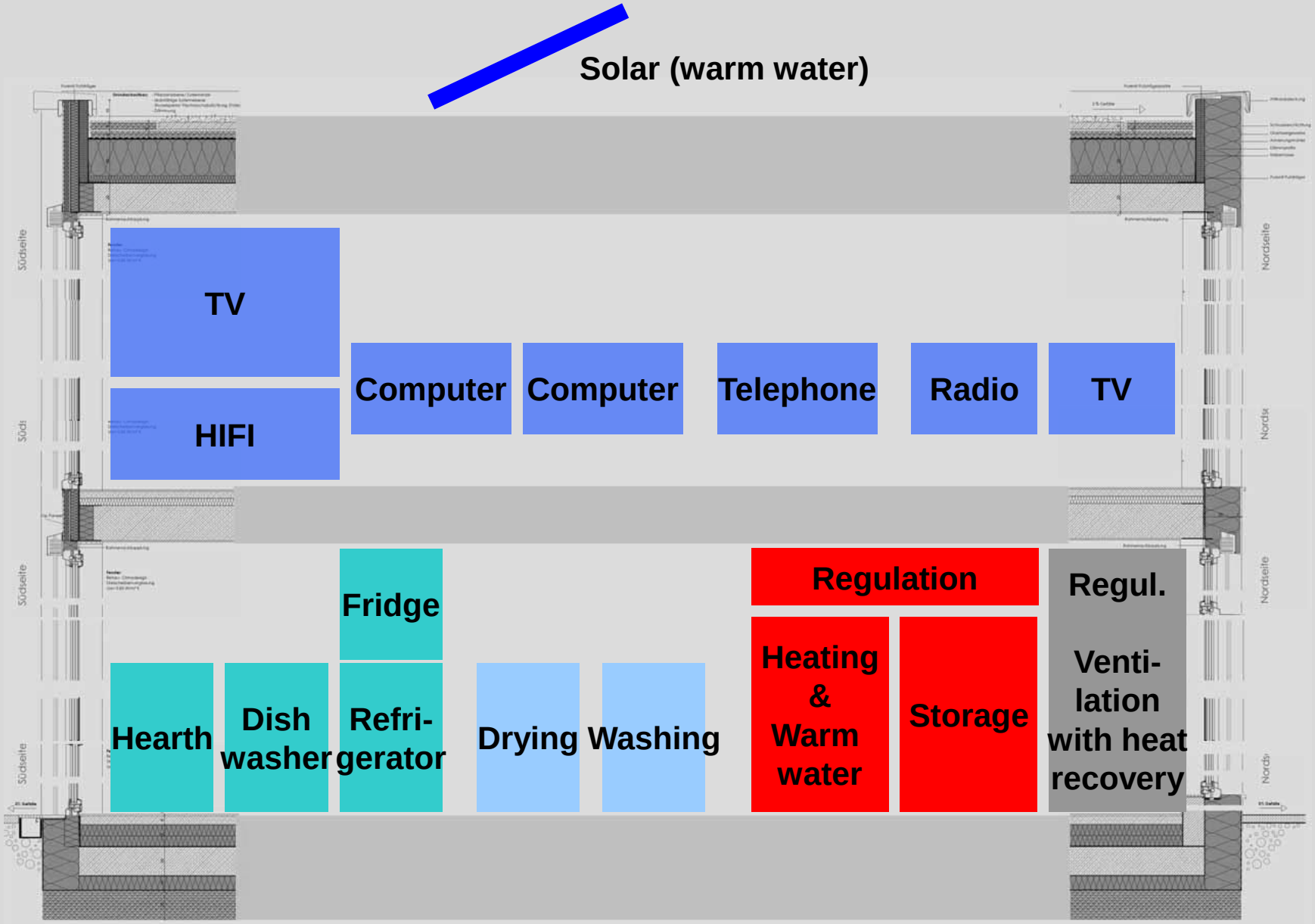
Source: Dr. Rainer Saliger, Siemens AG, CoC Dezentrale Energiesysteme; LBNL, Wind technologies market report 2014, Fraunhofer ISE PV report 2014, IHS Technology Battery report 2015, BNEF 2015

Development of heating systems in the building sector until 2050

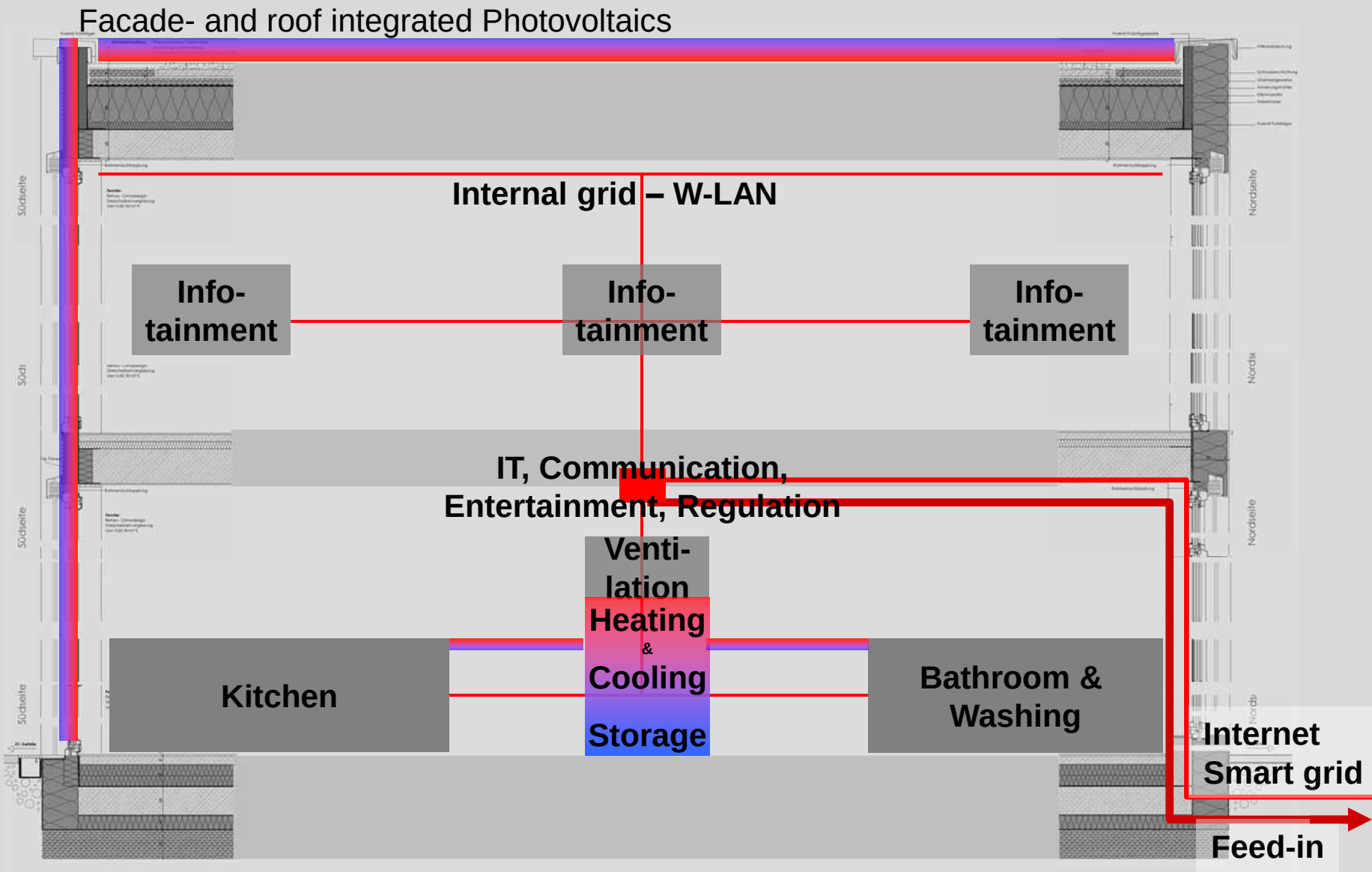


Quelle/Source: IWU / Prof. Dr.-Ing. Dieter Wolff - Ostfalia Hochschule Wolfenbüttel

Building services engineering until now



Building services engineering in future

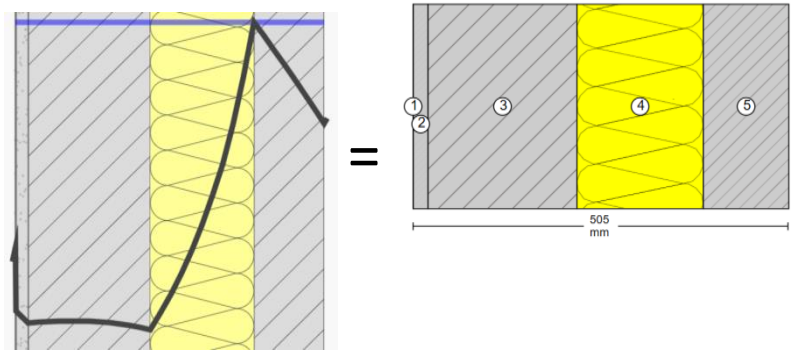


Life Cycle Analysis & Embodied energy: eLCA & Energetic calculation

Bauteil / Component

PHPP
EnEV

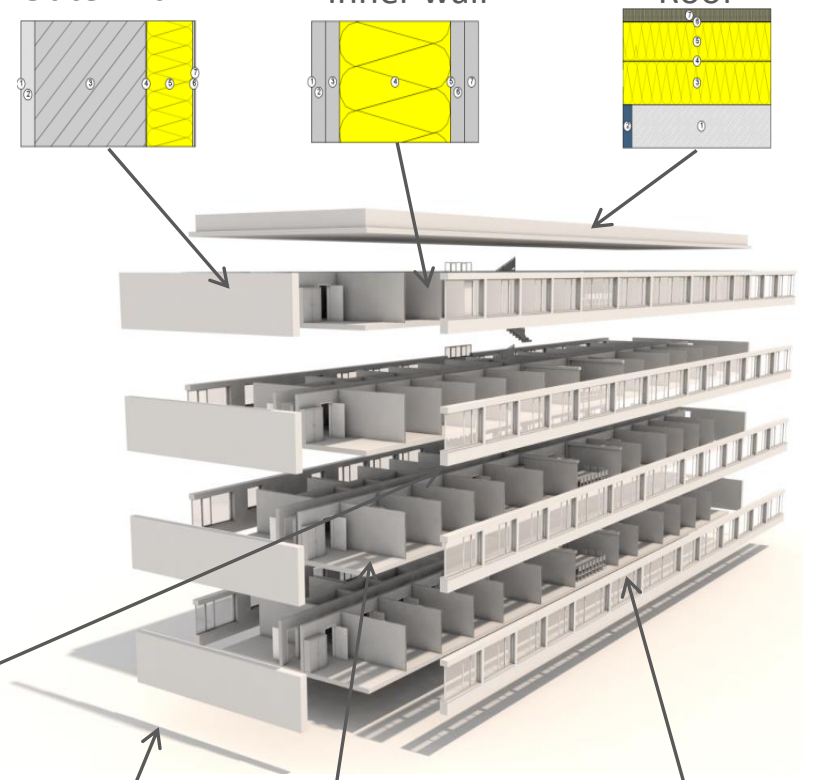
eLCA



Aussenwand
Outer wall

Innenwand
Inner wall

Dach
Roof



Gebäudetechnik
Building technology

Bodenplatte
Floor slab

Decken
Pavements

Fenster
Windows

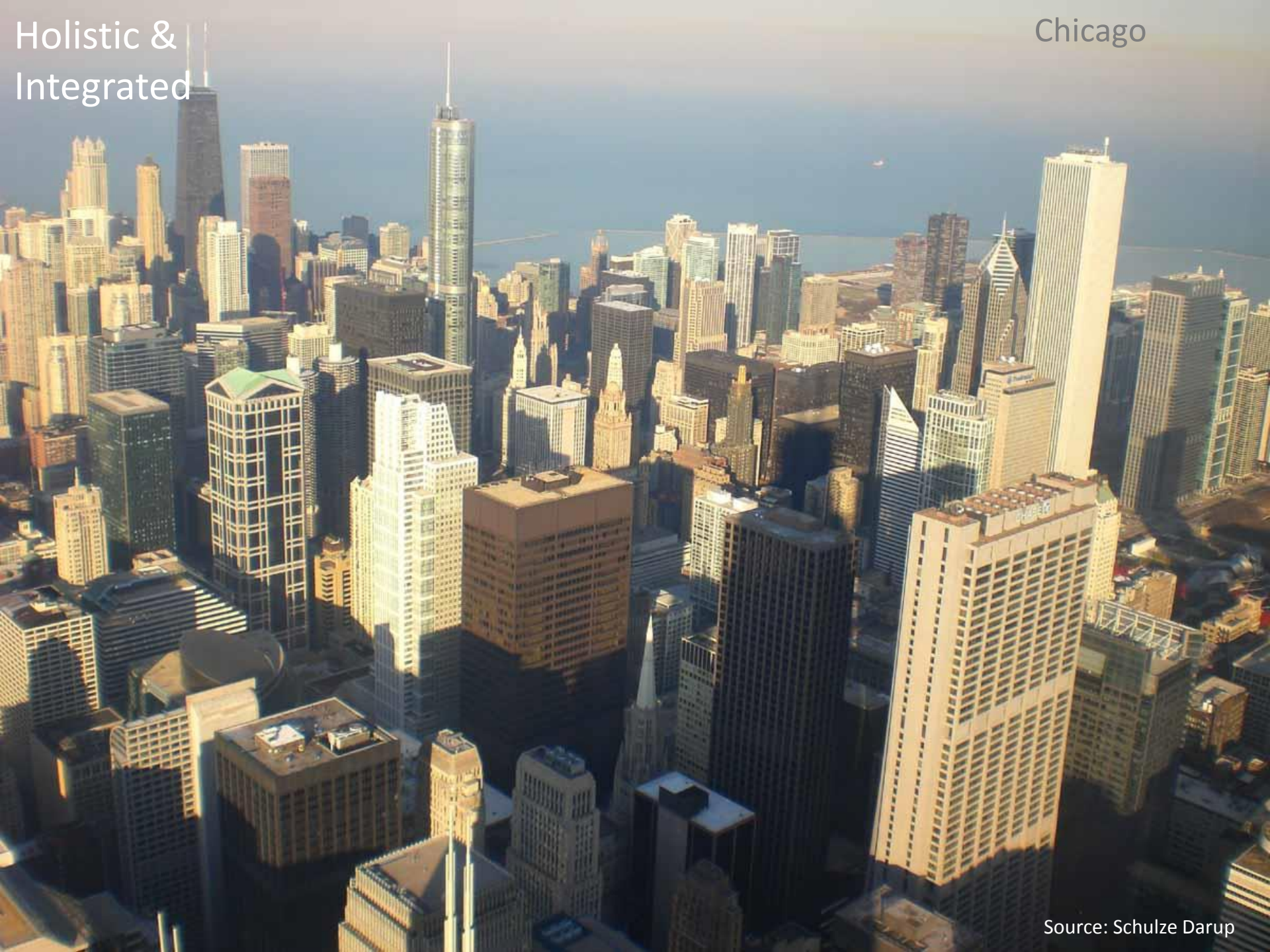
Quelle/Source: BBSR Germany, Electronic Lifecycle Analysis - eLCA: https://www.bauteileditor.de/

Urban & Regional identity

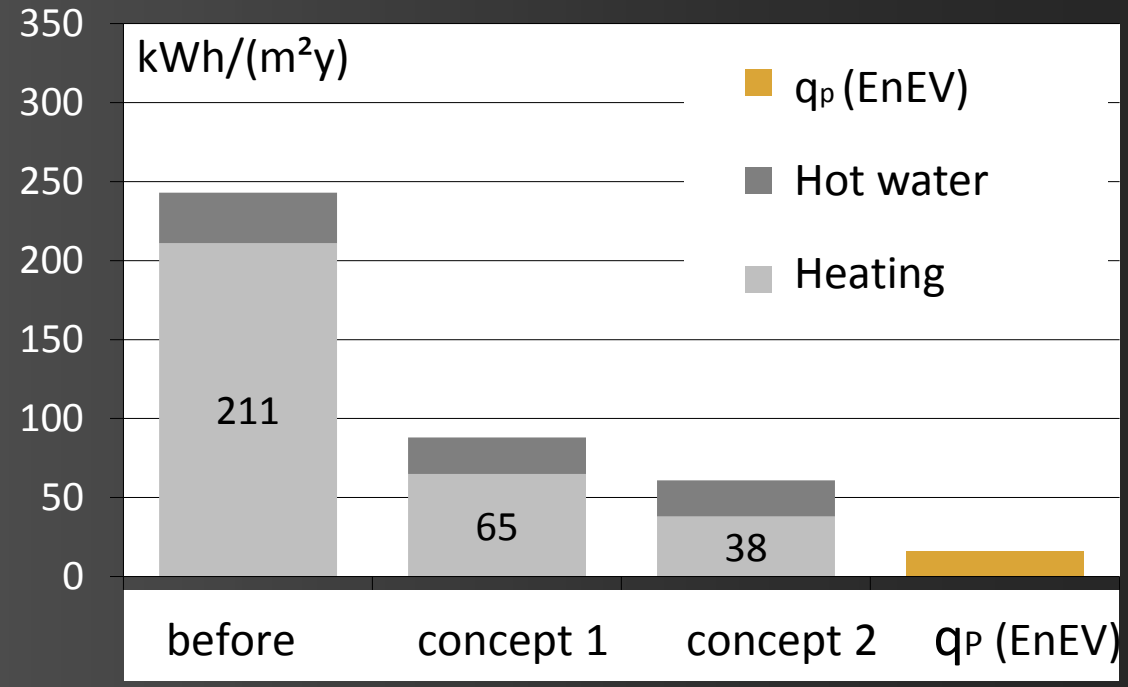
Source: Schulze Darup

Holistic & Integrated

Chicago



Source: Schulze Darup

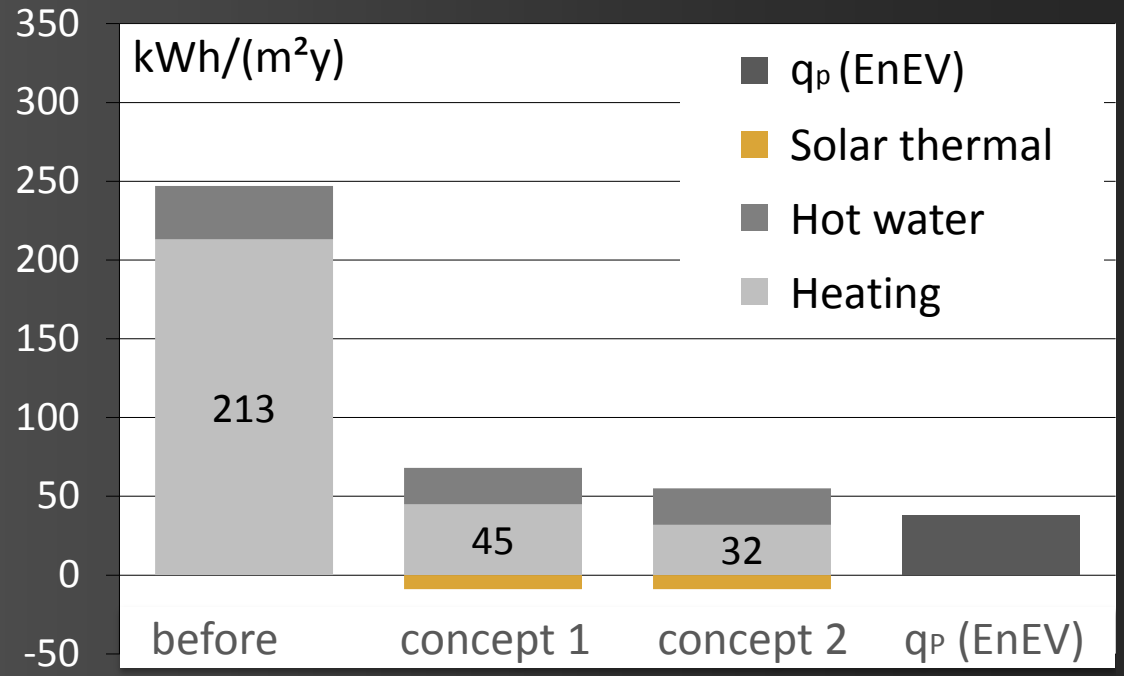


Multy family building (1520 / 2010)

Pfeifergasse 9, Nürnberg

Source: Alexandra Fritsch, Fritsch & Knodt + Klug, Nuremberg

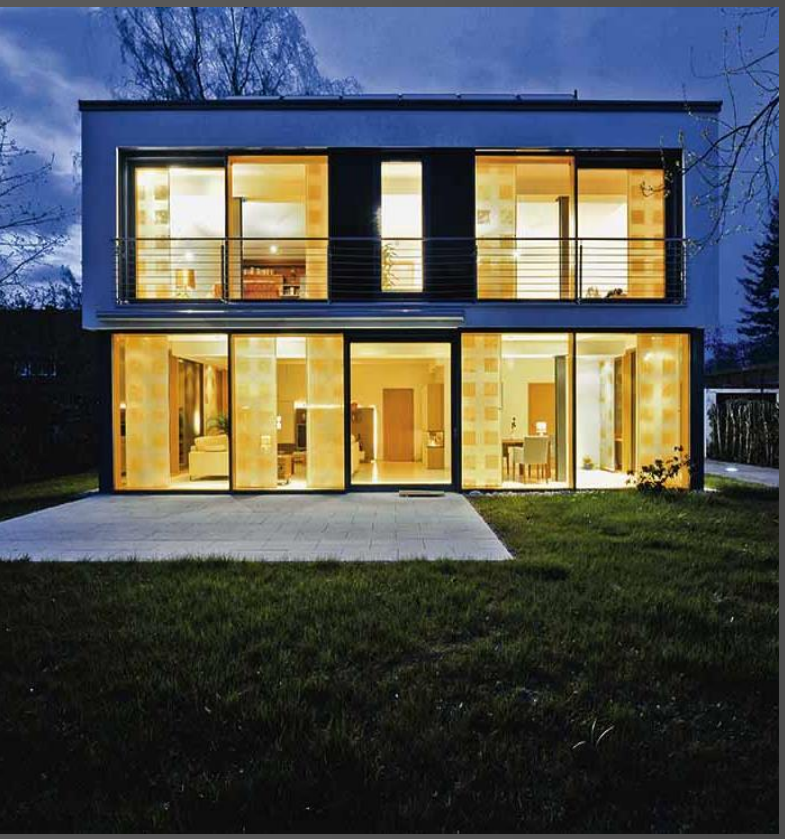
Urban planning & Monument conservation

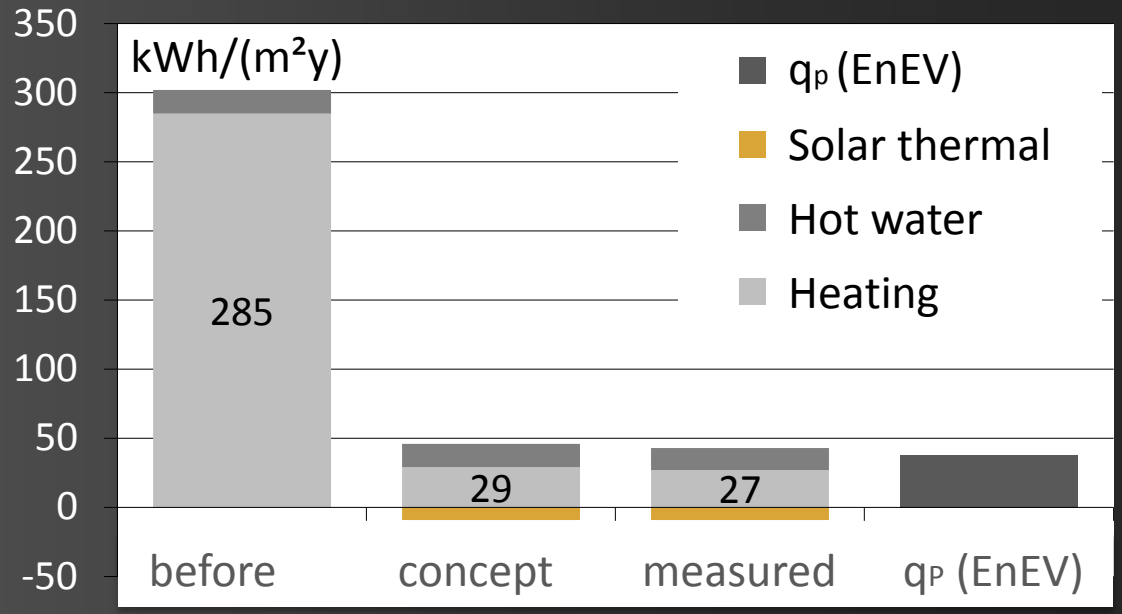


Multy family building (1876 / 2000)

Mathildenstraße, Fürth

Source: Schulze Darup





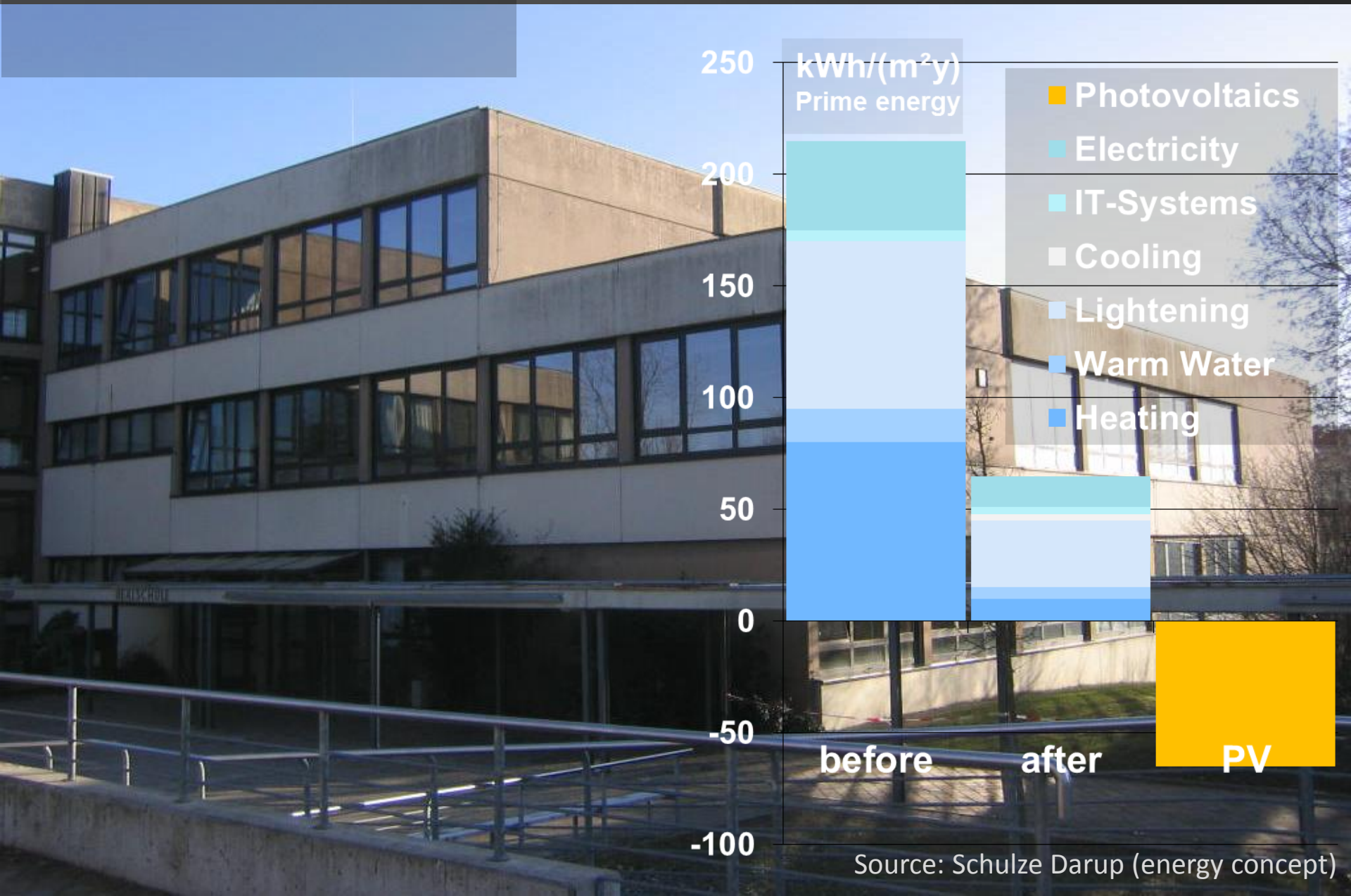
One family building (1958 / 2011)

Nuremberg

Source: Wimmer - Schulze Darup & Partners

Energy efficiency & Plus energy balance

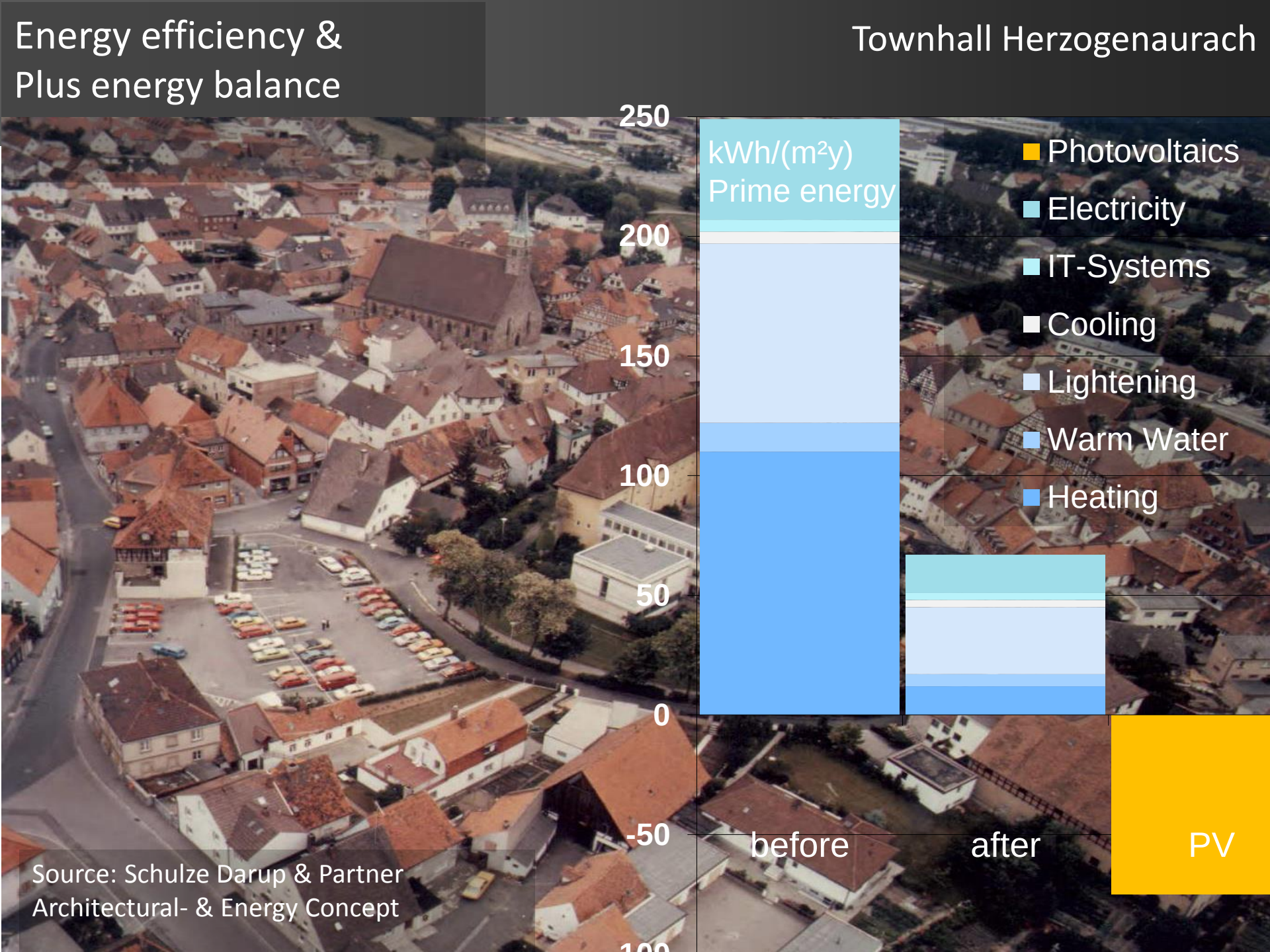
Junior high school Feuchtwangen



Source: Schulze Darup (energy concept)

Energy efficiency & Plus energy balance

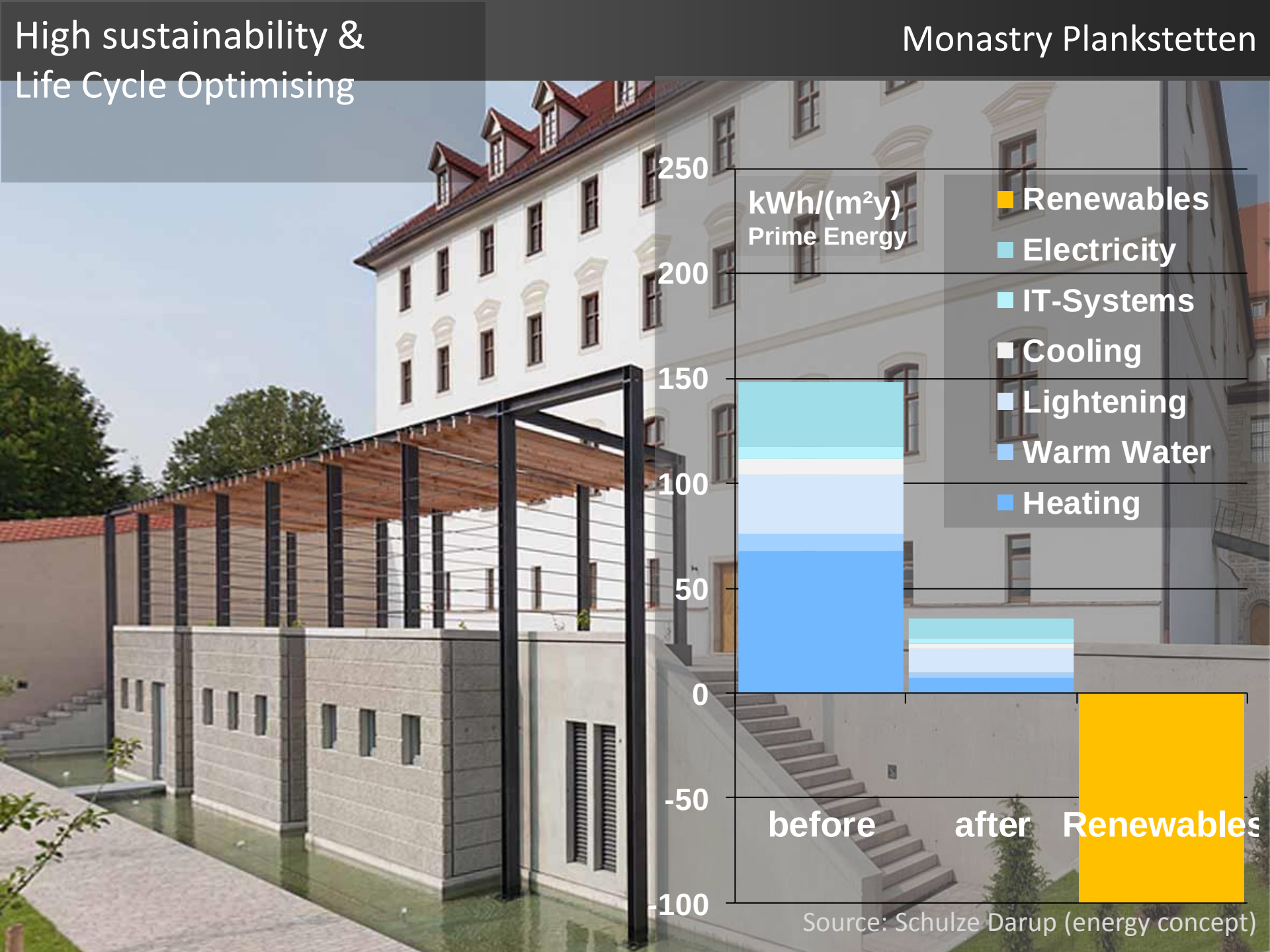
Townhall Herzogenaurach



Source: Schulze Darup & Partner Architectural- & Energy Concept

High sustainability & Life Cycle Optimising

Monastry Plankstetten



Source: Schulze Darup (energy concept)

Research-Project with Building Companies
KfW Effizienzhaus 40 Plus, Berlin, Sewanstraße

Quelle/Source: Planung THOMA Architekten / Bauherr: HOWOGE Berlin /Forschungsvorhaben mit 5 Wohnungsunternehmen; Schulze Darup: Kostengünstiger und zukunftsfähiger Geschosswohnungsbau im Quartier. – DBU-gefördert AZ 33119/01-25

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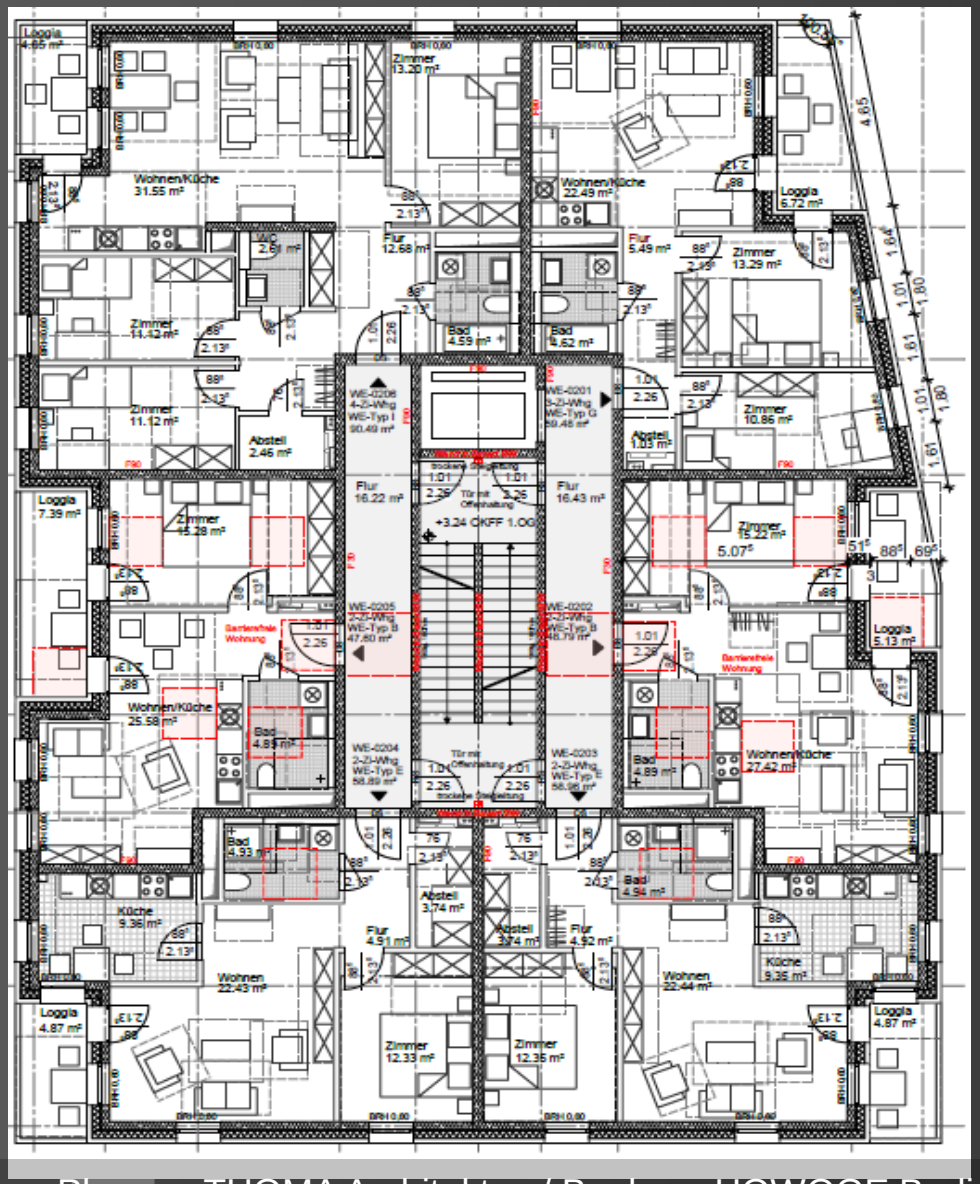
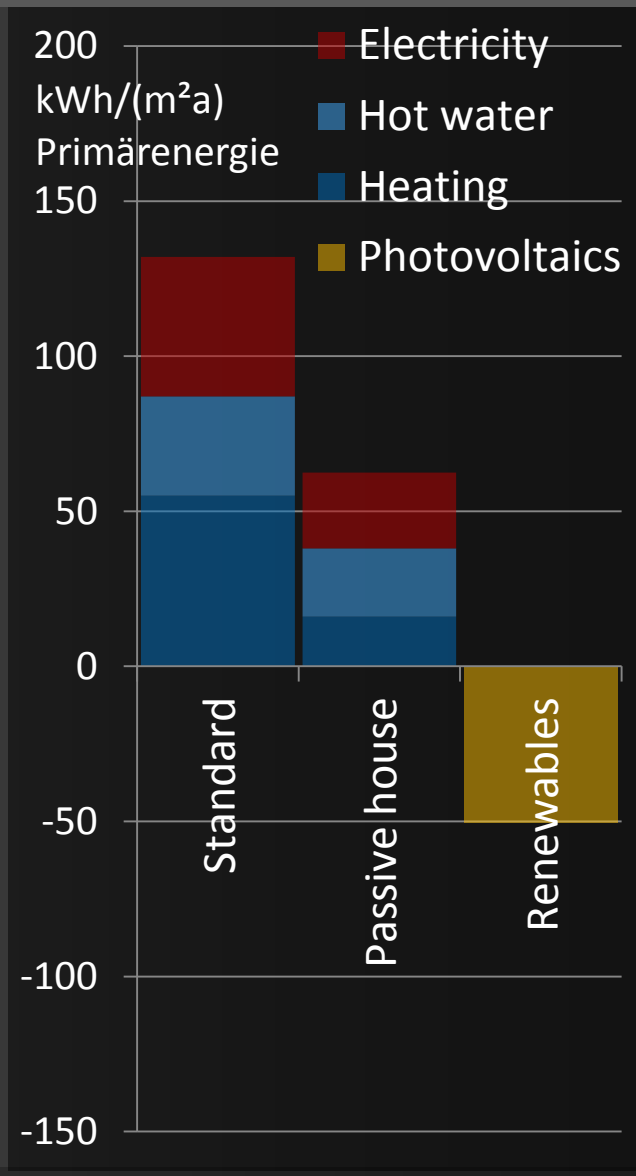
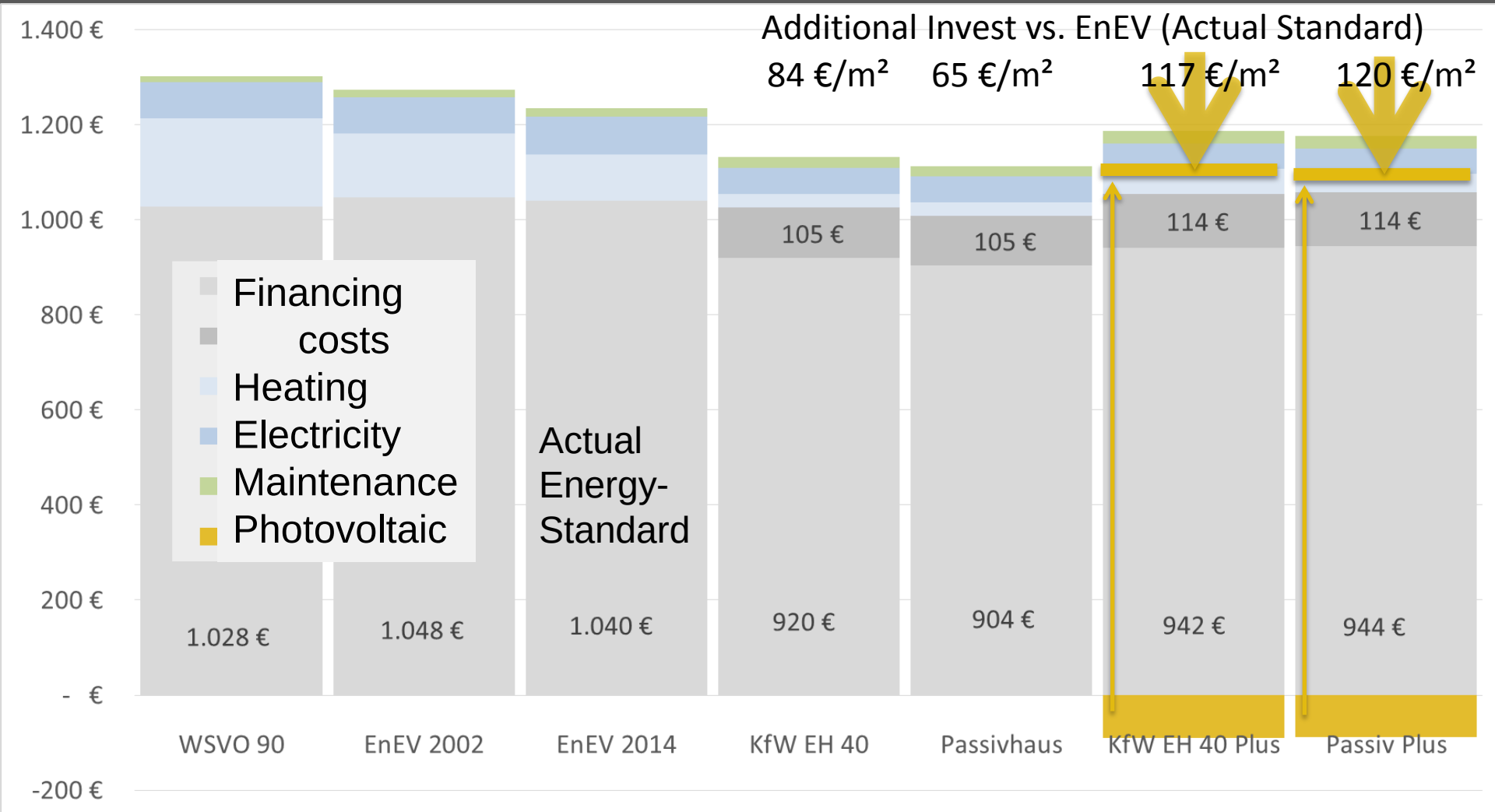




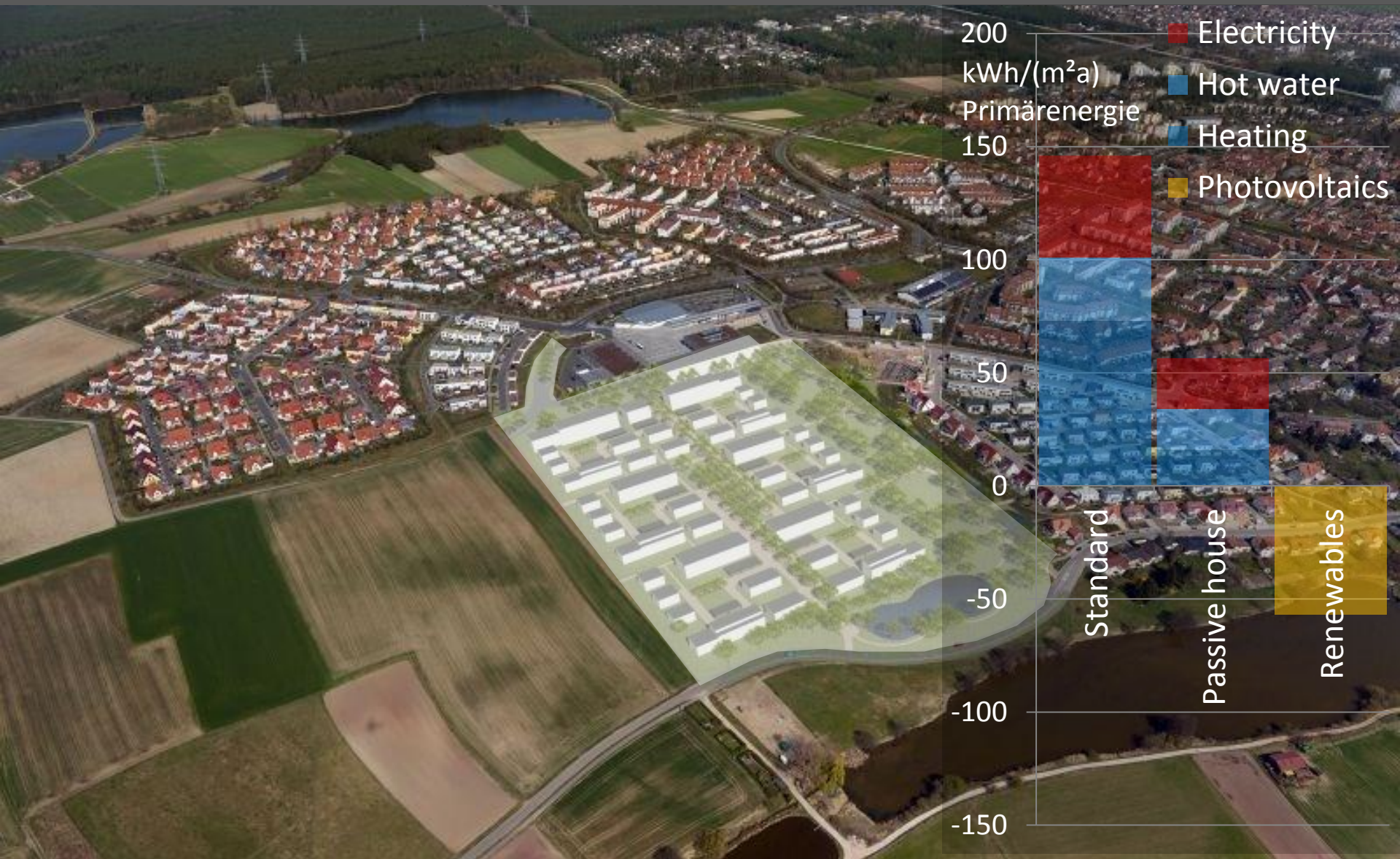
Quelle/Source: Planung THOMA Architekten / Bauherr: HOWOGE Berlin /Forschungsvorhaben mit 5 Wohnungsunternehmen

Monthly costs – Appartement 100 m² (€) (including promotion programs)



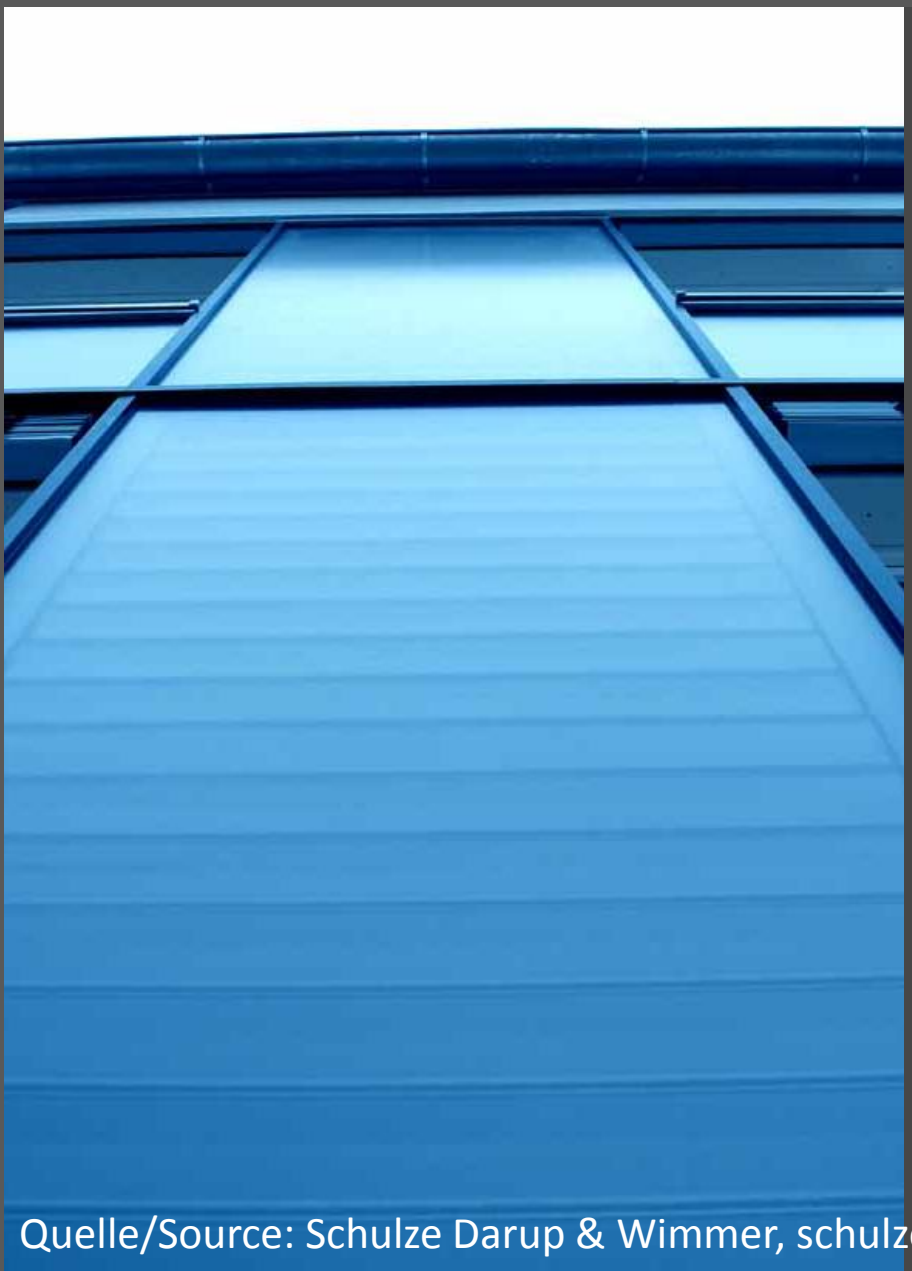
Quelle/Source: Ecofys / Schulze Darup: Preisentwicklung Gebäudeenergieeffizienz. – Im Auftrag der DENEFF, Berlin 11-2014

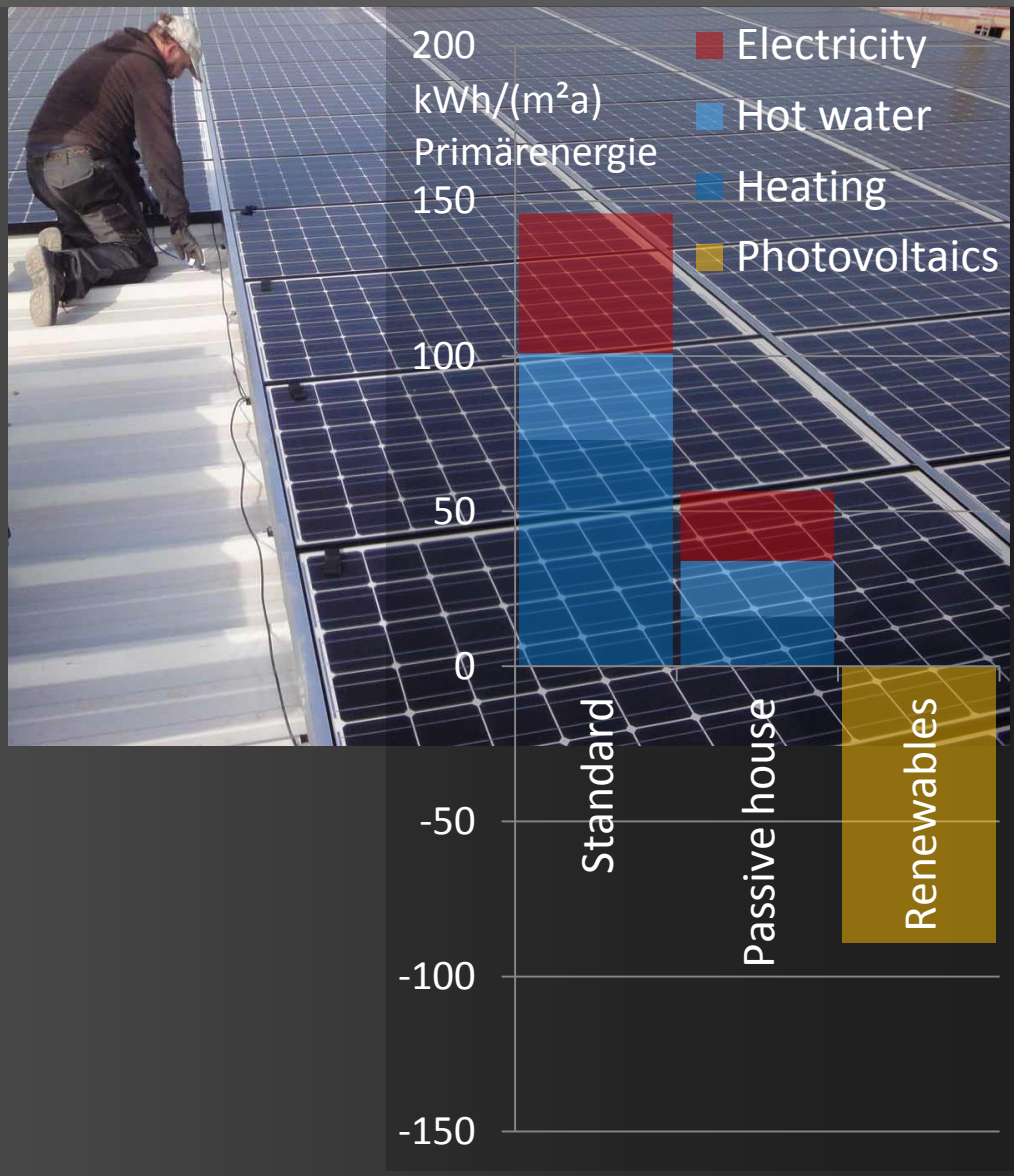
Plusenergy area Erlangen-Büchenbach



Quelle/Source: Energy-concept: Burkhard Schulze Darup / Picture: Stadt Erlangen

Plusenergy building Erlangen-Büchenbach

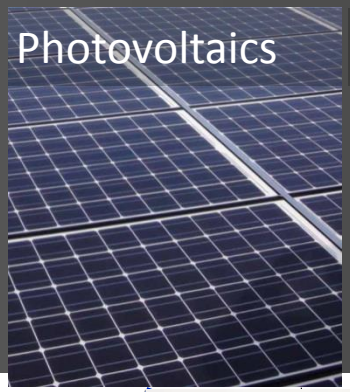


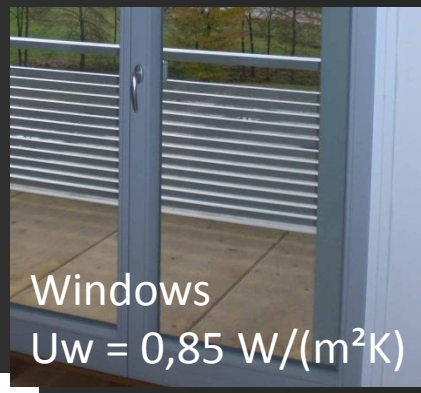


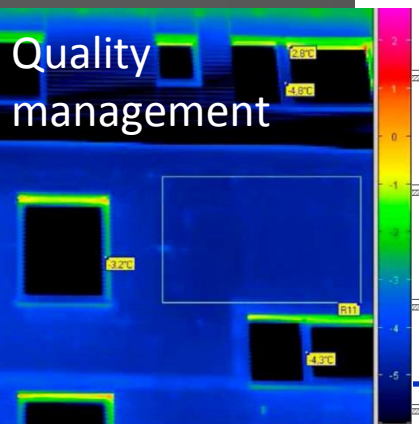
Quelle/Source: Schulze Darup & Wimmer, schulze darup & partner Berlin-Nürnberg

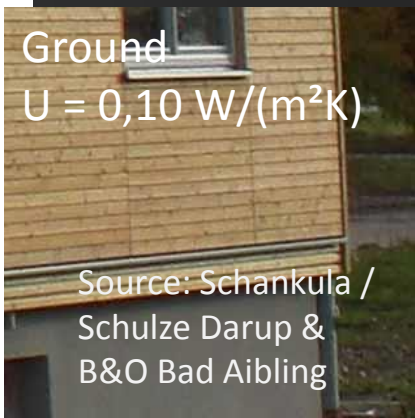
Top runner Efficiency & Highly renewable

Multy family building „WOOD5“ (B & O)







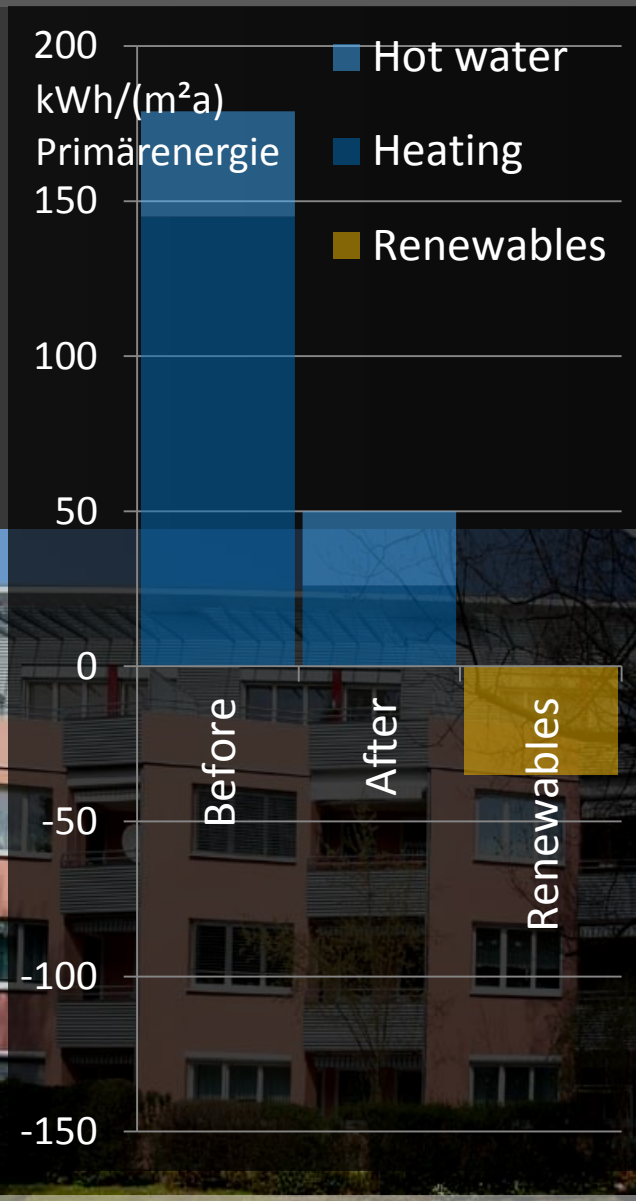


Source: Schankula / Schulze Darup & B&O Bad Aibling

Accomodation Nuremberg-West (1961-1964), 1030 Apartments

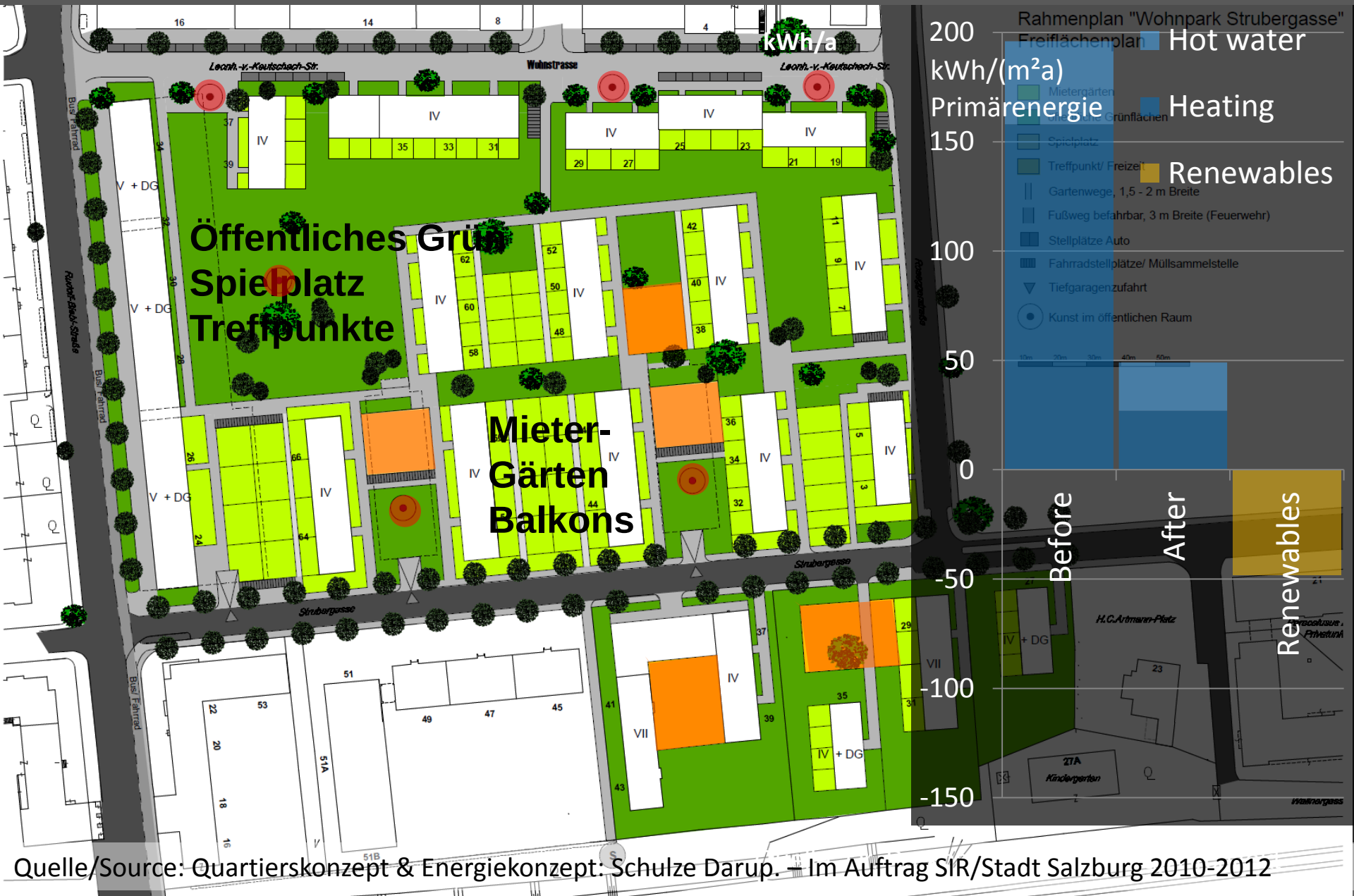
Quelle/Source: Rahmenplanung: Schulze Darup & fkk – Im Auftrag WBG Nürnberg 2008-2010

Accomodation Nuremberg-West (1961-1964), Bernadottestr. 42-48



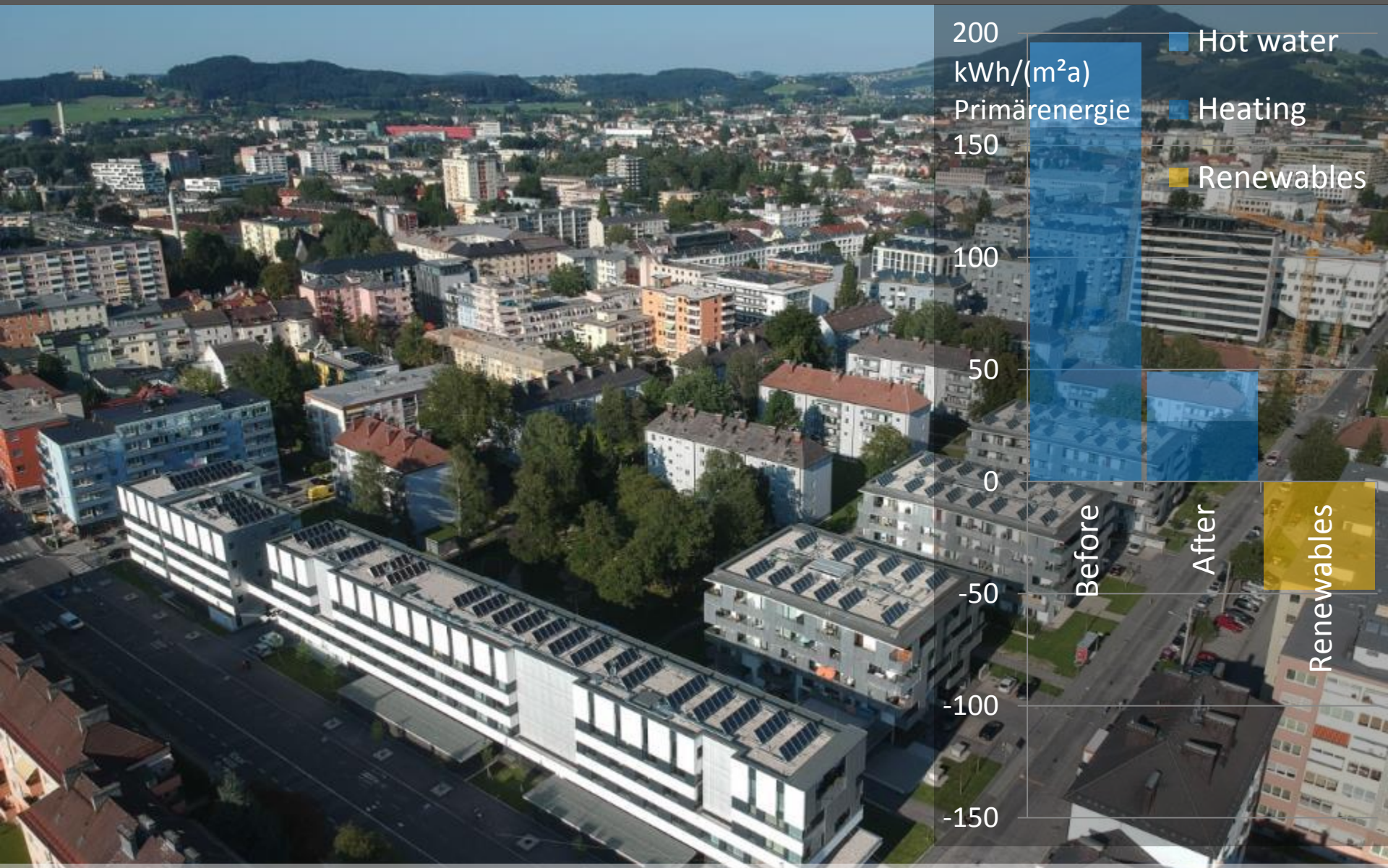
Quelle/Source: Architekt Schulze Darup – Im Auftrag WBG Nürnberg 2006

Accomodation Strubergasse, Salzburg (1949-1958 / Mod.: 2013-2017)



Quelle/Source: Quartierskonzept & Energiekonzept: Schulze Darup. – Im Auftrag SIR/Stadt Salzburg 2010-2012

Accomodation Strubergasse, Salzburg (1949-1958 / Mod.: 2013-2017)



Quelle/Source: Quartierskonzept & Energiekonzept: Schulze Darup. – Im Auftrag SIR/Stadt Salzburg 2010-2012

New old urban heart

DomRömer Frankfurt - Reconstruction of the old historic core

Quelle: DomRömer GmbH

New old urban heart
DomRömer Frankfurt - Reconstruction of the old historic core

Quelle/Source: Schulze Darup

National promotion program for UNECE Energy Efficiency Standards in Buildings

		First year	Second year	Third year	Fourth year
1	UNECE-Invitation for Participation				
2	Participating Nations: Letter of confirmation				
3	Preliminary Meeting (round table)				
4	Kick-off conference with:				
4.1	Roadmap "efficiency standards"				
4.2	Nomination of pilot projects				
4.3	Plan for the Training Program				
4.4	Establishing of Expert Group				
4.5	Start National Network & Energy Agencies				
4.6	Yearly National Efficiency Conferences				
5	Training Program				
5.1	Train the Trainers (by UNECE Experts)				
5.2	Adaptation to the national requirements				
5.3	Train the Trainers - national				
5.4	Multiplying National Training Program (energy agencies, universities, chambers, institutes ...)				
6	Implementation of the UNECE Framework Guidelines to the building code of the country				
6.1	Political Process				
6.2	Round Table of politics, experts & co				
6.3	Workshops of Experts				
6.4	Scientific groundwork				
6.5	Research Projects for the implementation				
6.6	Political Process - Resolution / Act				

National promotion program for UNECE Energy Efficiency Standards in Buildings

		First year	Second year	Third year	Fourth year
7	Financiation & Promotion Program				
7.1	Political Process - Form of Promotion				
7.2	Scientific groundwork & economic aspects				
7.3	Decision for a promotion program				
7.4	Programs of financing institutes for efficiency				
7.5	Training Progr. Financing Instit./Decision Makers				
8	Pilot Projects				
8.1	Planning Phase for 5-12 projects				
8.2	Realising Phase / Monitoring				
8.4	Second Phase for 50 - 100 projects				
8.5	Third Phase for 500 - 1000 projects				another year
8.6	Broad multiplying with UNECE Efficiency Standard				ongoing
9	Information & Marketing				
9.1	Marketing for efficiency				
9.2	Information for landlords & consumers				
9.3	Multiplying by media				
9.4	Multiplying by Culture - making Efficiency sexy