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INTEGRATED
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DESIGN
ACTION

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TECHNISCHE
UNIVERSITÄT
WIEN

Vienna University of Technology



Energy efficiency and renewable energy in buildings in South-East Europe

Raphael Bointner

Vienna University of Technology

Energy Economics Group (EEG)

www.eeg.tuwien.ac.at

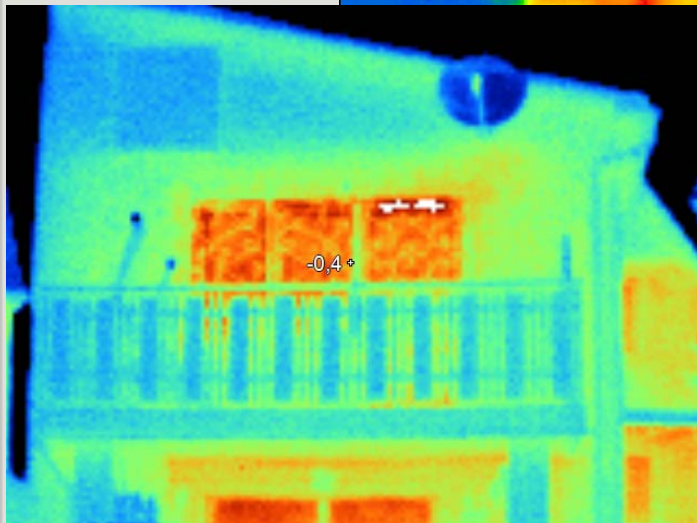
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Status Quo in Europe

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7. -Regionalbüro Emsland- Dipl.-Ing. J. Deeters, Meppen

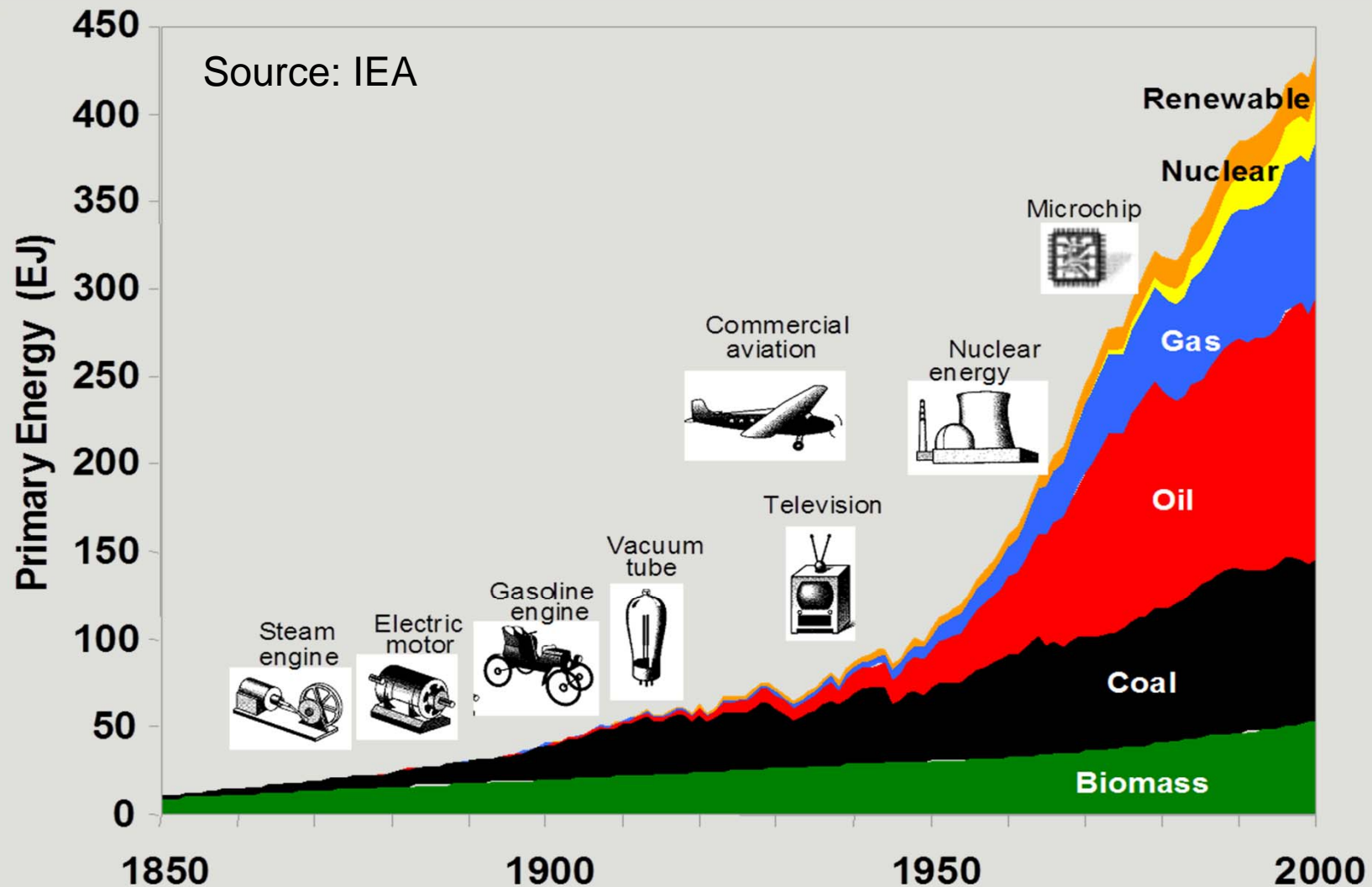


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Energy Efficiency – why?

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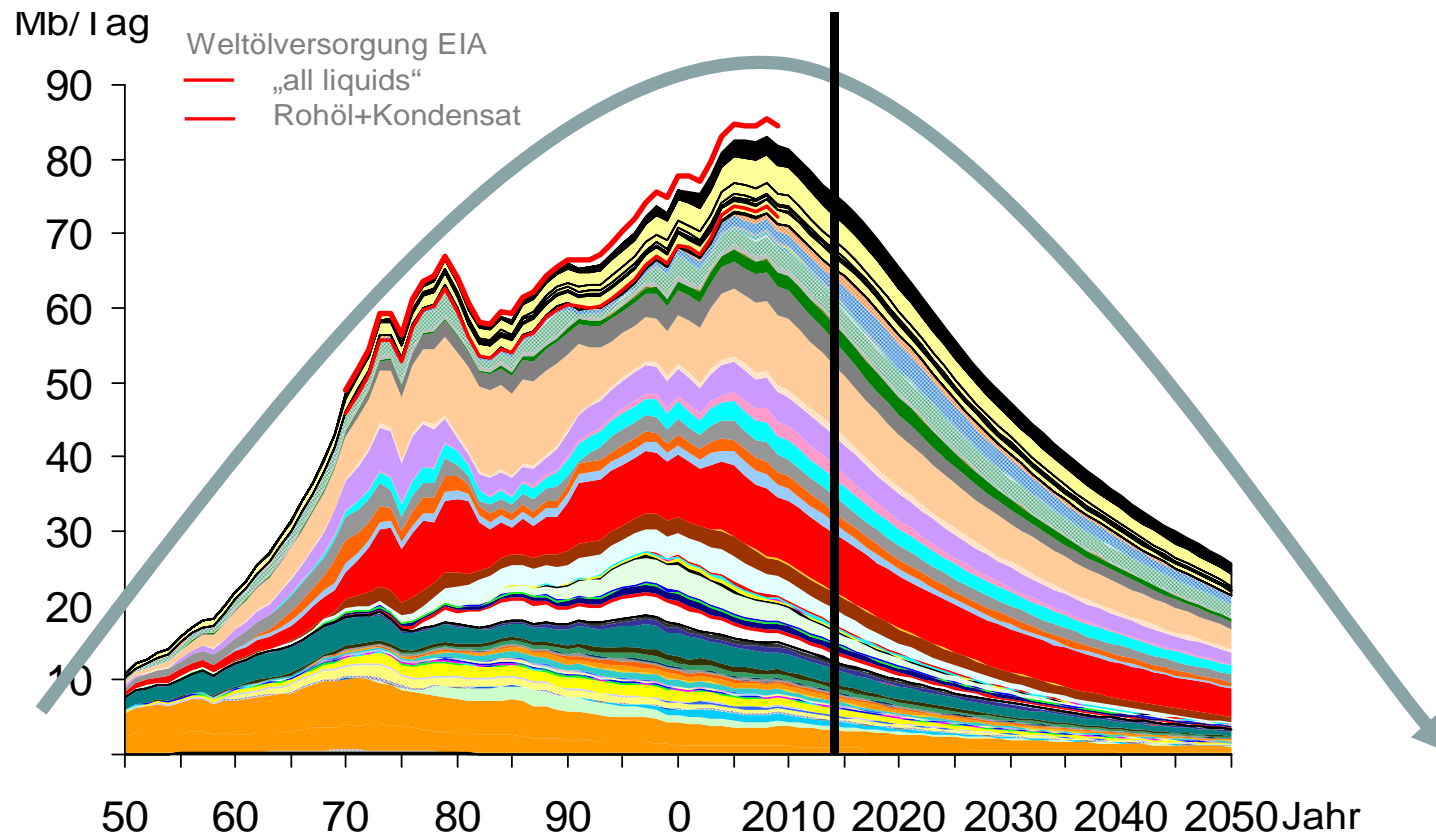




Energy Efficiency – why?

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World-wide Oil exploration 1950-2050 Peak oil?



Datenquelle:

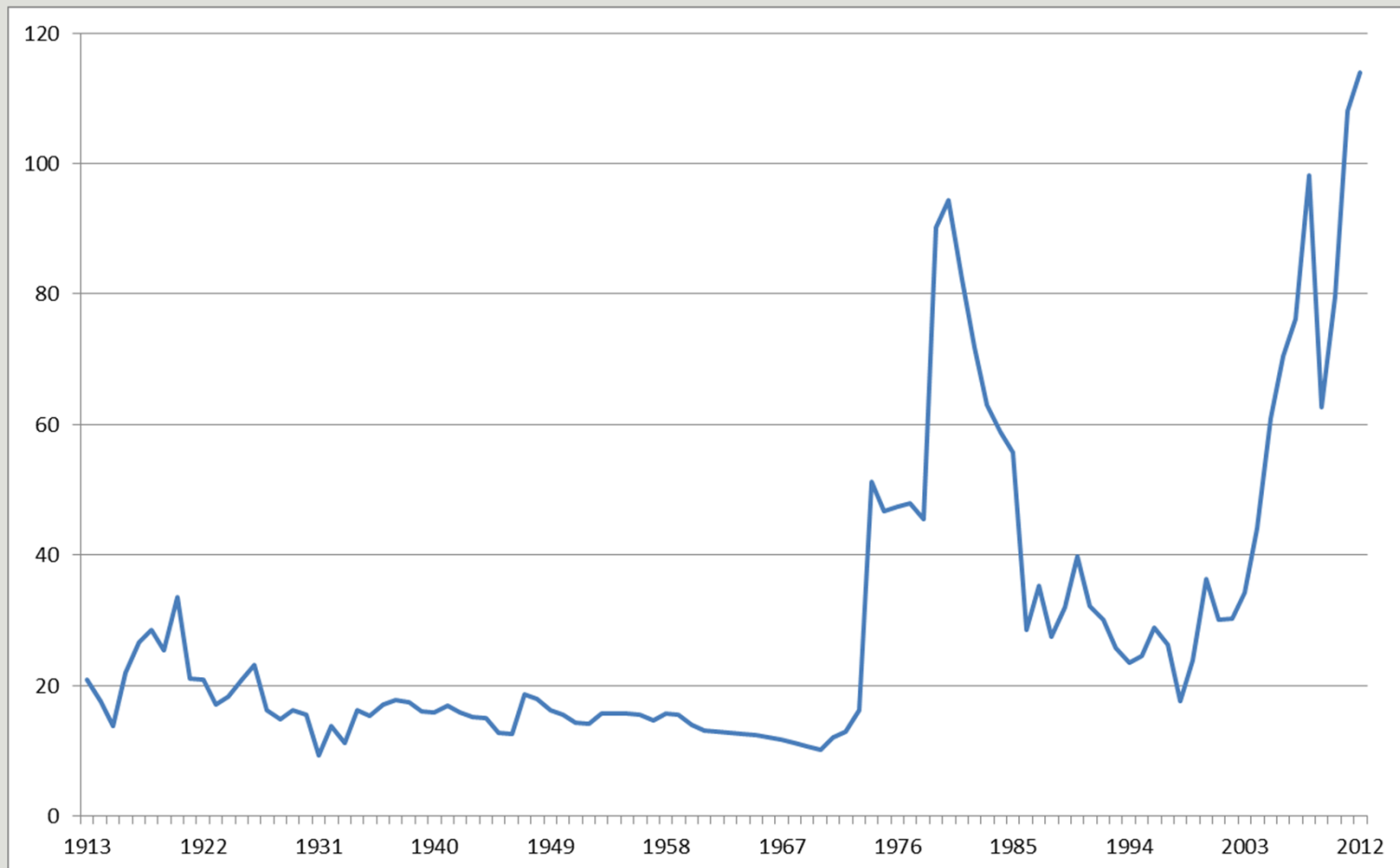
Österreich, Deutschland, USA, Kanada, Niederlande, UK, Norwegen, Dänemark, Saudi Arabien, Brasilien: Statistiken nationaler Behörden/Firmen;
Für andere Staaten US-EIA, soweit verfügbar. Für die verbleibenden Staaten BP Statistical Review und LBST-Schätzung
Historische Zahlen bis 1970 bzw. für manche Staaten bis 2005: IHS-Energy soweit nicht aus oben genannten Quellen ermittelt; Analyse LBST Feb 2010



Energy Efficiency – why?

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Crude Oil price in USD 1913-2012 (2012 price and exchange rates)





nZEBs: Challenges for the decade

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“Energy performance of buildings”-directive

2010/31/EU

- **nZEB-standard** for public buildings by 2019
- By 2021 for ALL renovations and new buildings
- Independent, skilled workers
- „*achieving cost-optimal levels...*“ 2010/31/EU, Art. 4.1
- Further Info on EPBD-implementation and support in policy making → www.entranze.eu





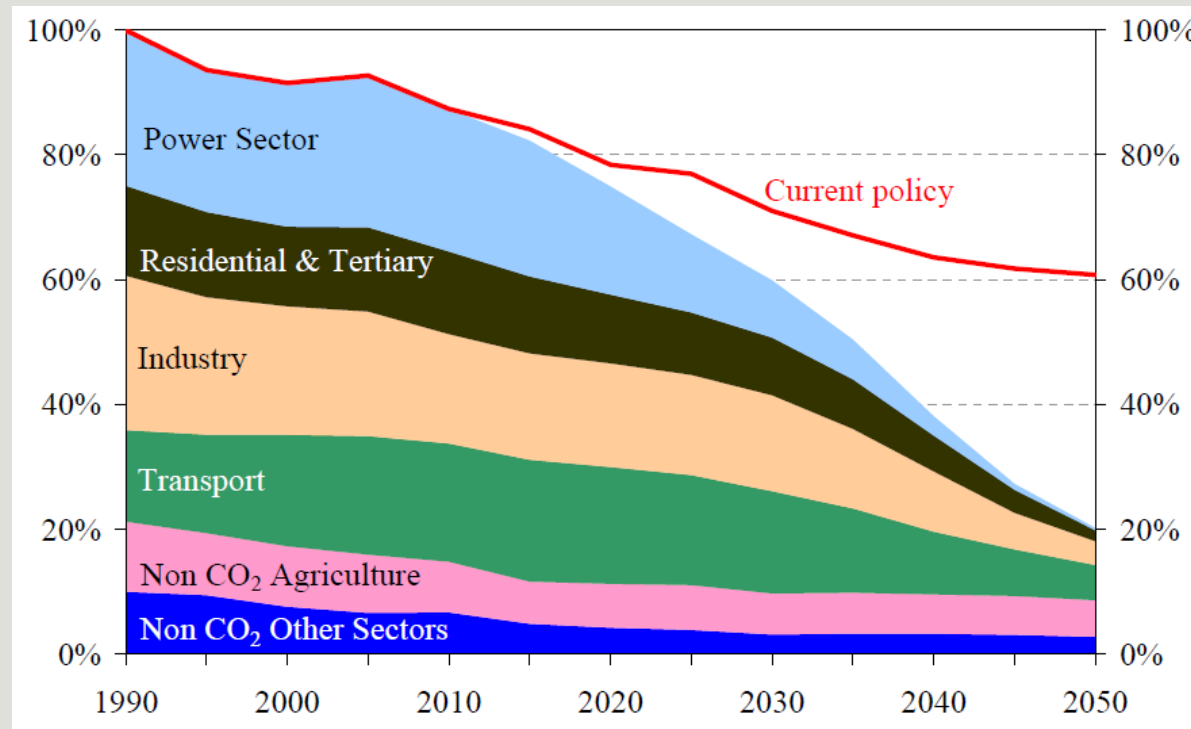
nZEBs:

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Challenges for the next decades

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„GHG emission reduction by 80 % to 95 % in the EU“



European target for CO₂-reduction according to the EU
Low-Carbon-Roadmap 2050, COM(2011) 112



Energy-efficient Buildings

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Conclusion:

1. nZEBs will become mainstream in Europe, if stakeholders and the public are well informed and both consider sustainable building as a matter of course.
2. The wide-spread use of sustainable building technologies can be accelerated by creating local seeds as starting points for technology diffusion all over Europe.

What can be done?



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Optimal solution?

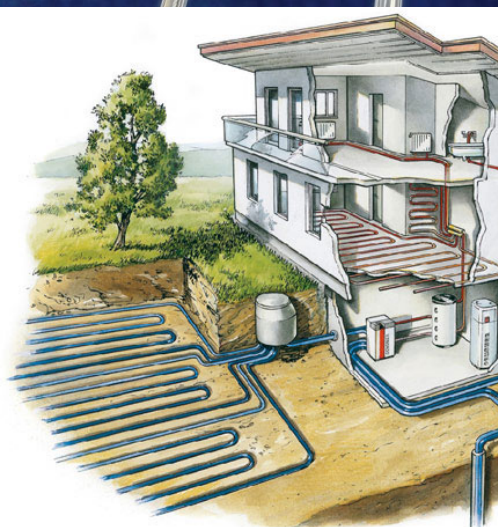
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Continental climate zone in
South-Eastern Europe –
Hot summer, cold winter





Optimal solution?





Many Questions...

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- What's the optimal mix of energy efficiency and renewable energy?
- How are the perspectives of space heating demand in the next decades?
- How is the interaction / trade-off between increasing energy efficiency and (renewable) space heating?



Even more Questions...

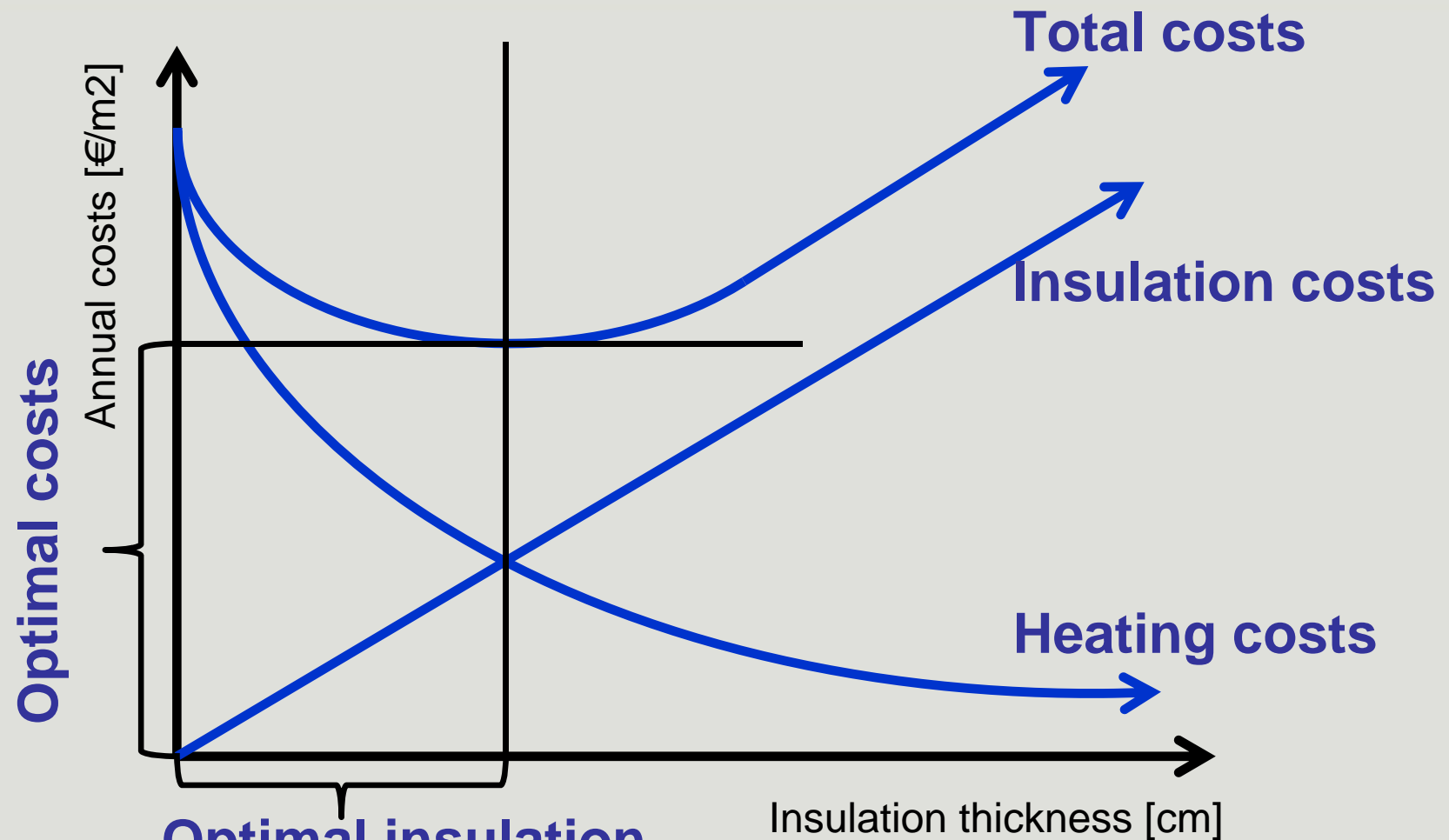
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- Under which conditions is it reasonable to use electricity for space heating and hot water supply?
- What is the future role of district heating?
- Energy storage?
- What about CO₂-Emissions?
- Which political decisions have to be taken today?



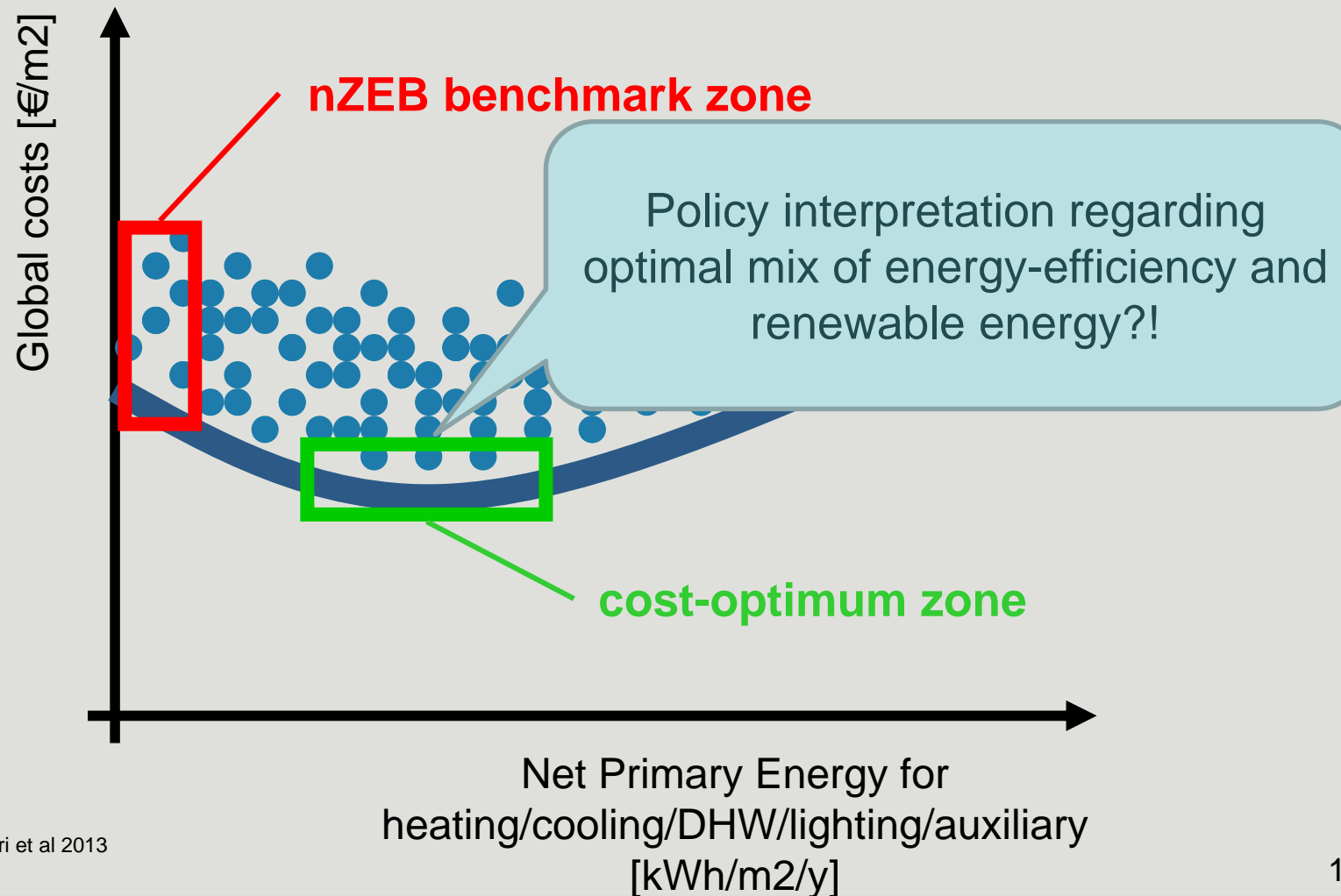
Insulation vs. heating demand

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**Optimal insulation
thickness ~ 15-25 cm for exterior walls**

Cost-optimality of whole buildings 2010/31/EU EPBD (recast)





Trade-off between energy efficiency and renewable energy

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- Increasing (fossil) fuel costs make energy efficiency measures more attractive → reduced health costs!
- Reduced flow temperature (nZEBs) makes heat pumps and solar thermal collectors more attractive
- High heat density (urban areas) makes district heating systems more attractive
- Biomass and geothermal energy is most effective by supplying several buildings at once → district heating
- PV roof-systems may increase security of power supply
- Large wind turbines prevail over micro-turbines → building-integrated wind turbines are ineffective



Examples of nearly Zero-Energy Buildings

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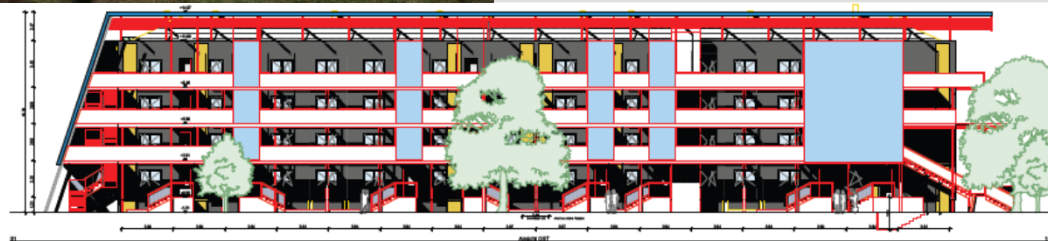
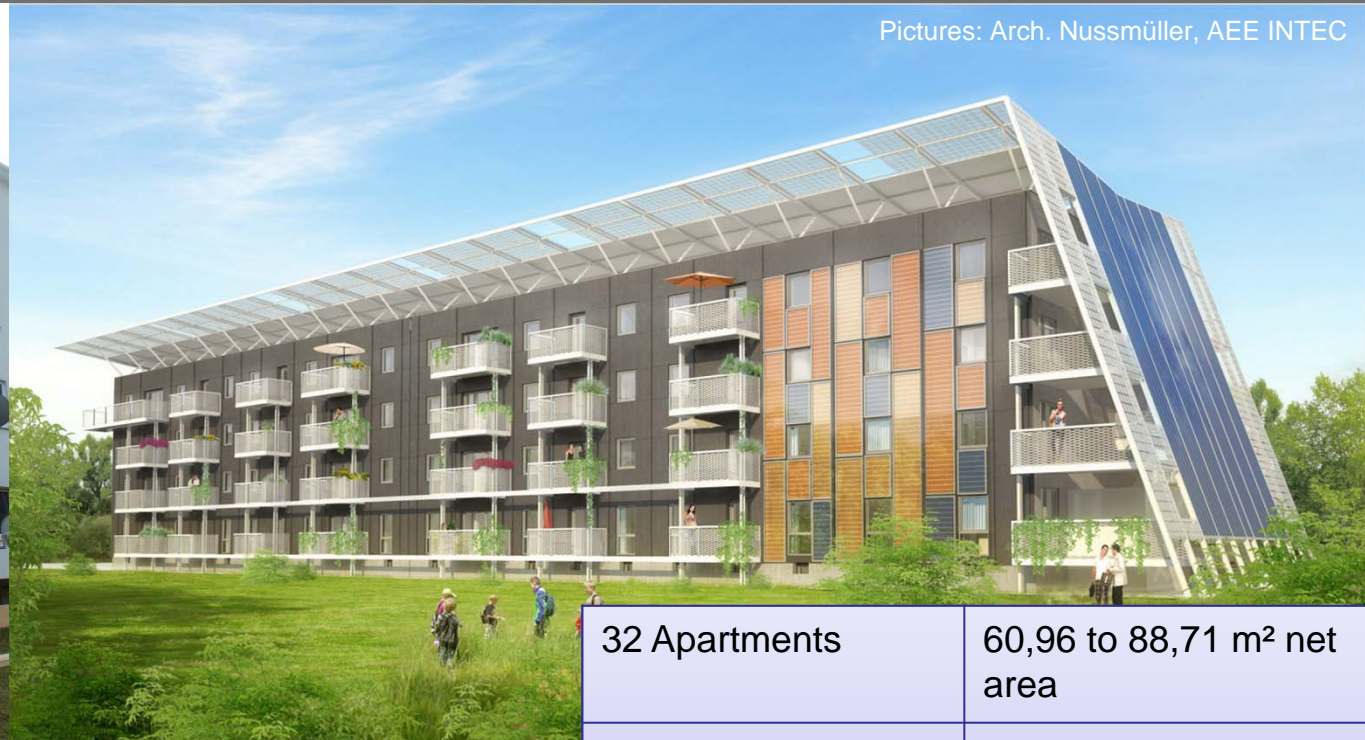
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Residential Building

Renovated to a Plus Energy Building in Kapfenberg / Austria (in 2012/13)

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Pictures: Arch. Nussmüller, AEE INTEC



32 Apartments	60,96 to 88,71 m ² net area
Energy demand for heating	11,6 kWh/m ² a
PV-system	400 m ² (50 kw _p) on the roof
Heating and domestic hot water system	200 m ² solar thermal collectors District heating



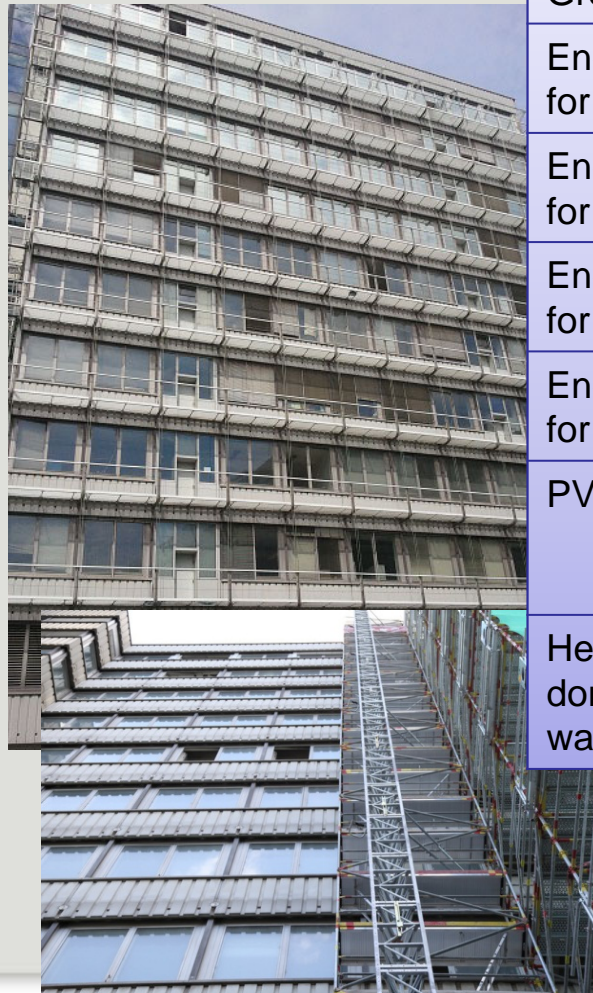
Plus-Energy-Office

Renovated to a Plus Energy Building in Vienna / Austria (2012/13)

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Office Tower of the Vienna University of Technology



Gross floor area	7.322 m ² (10 storeys)
Energy demand for heating	3,4 kWh/m ² a
Energy demand for cooling	2,5 kWh/m ² a
Energy demand for lighting	5,6 kWh/m ² a
Energy demand for ventilation	1,0 kWh/m ² a
PV-system	Austrias largest PV system on the roof and the facade
Heating and domestic hot water system	Heat pump & district heating



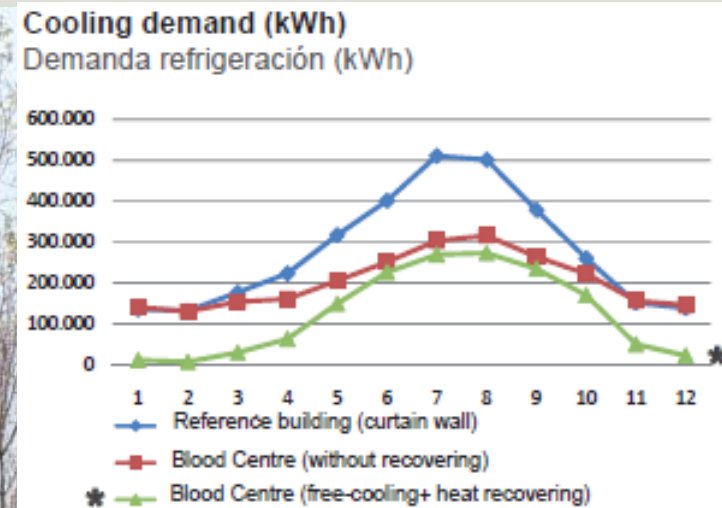


Blood bank of Catalonia

nZEB Office building

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- Office building (16.600m²)
- Exterior Wall $U=0.3$ W/m²K, G-Value glass front 0.27
- Heating demand 8 kWh/m²a
- Cooling demand 24 kWh/m²a
- Solar thermal and photovoltaic system on the roof



Vocational school

(school, office, workshop, dorm & canteen) nZEB in Amstetten, Austria

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Multifunctional building	
Energy demand for heating	20 kWh/m ² a
PV-system	5 kw _p tracking system
Heating and domestic hot water system	Biomass district heating system

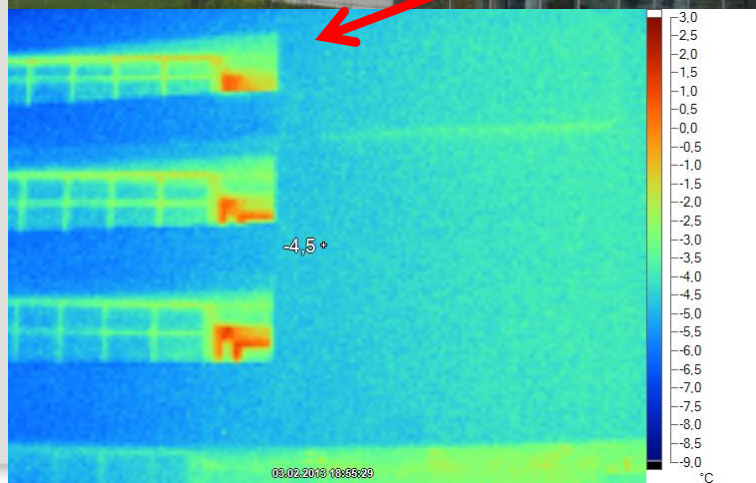


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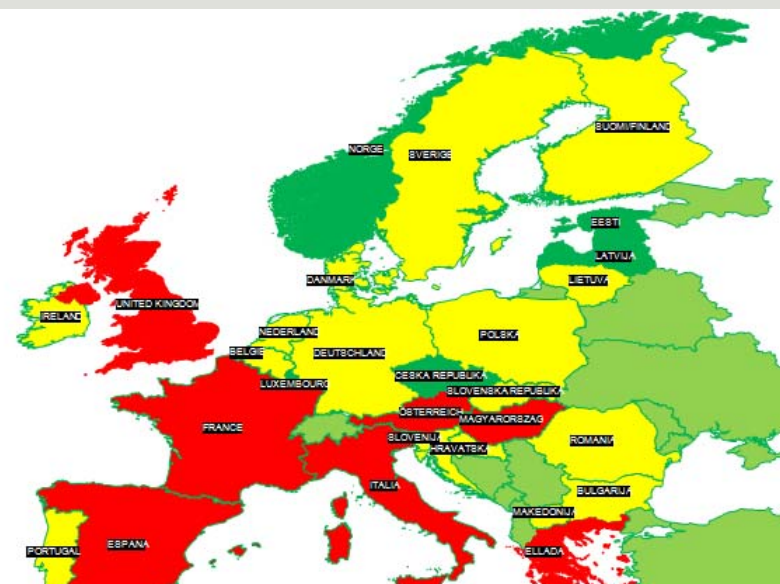


AIDA at a glance

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Affirmative Integrated Energy Design Action

- ✓ AIDA aims to accelerate the market entry of nearly zero-energy buildings (nZEB)
- ✓ AIDA supports municipalities and building professionals in the EU
- ✓ AIDA is financed by the European Commission (IEE)
- ✓ AIDA in many countries!
- ✓ April 2012 – March 2015



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AIDA for YOU!

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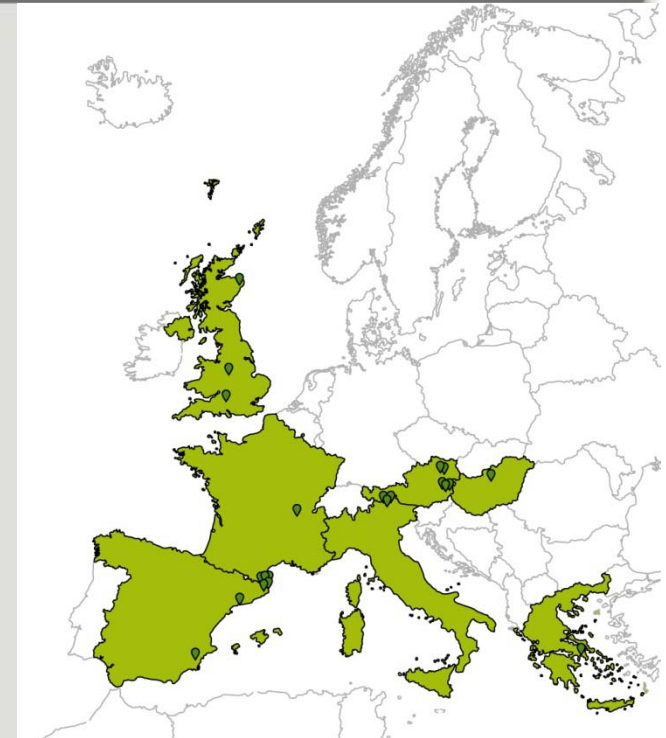
International study tours

- Vienna
- Lyon
- Athens
- Budapest
- Barcelona... & many more!

nZEB in municipal practice



- Best practice in new buildings & renovations
- Many reports available!



International network; contact: Peter Schilken/Energy Cities



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Assistance in the development of NZEB-roadmaps for members of the covenant of mayors www.eumayors.eu

Your nearly zero-energy building lowers operation cost and sets a positive example for the local community and neighbouring municipalities!

Assistance for municipalities in the planning process of a new building or a major renovation (e. g. kindergarten, city hall, residential housing)

FOR MAYORS, MUNICIPAL REPRESENTATIVES AND LOCAL AUTHORITIES

BUILDING PROFESSIONALS, ARCHITECTS AND MASTERS

Guidance in using nearly zero-energy design software

First-hand information on developments and trends

National and international study tours to innovative buildings

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AIDA project
90 likes · 1 talking about this

Non-Profit Organization
Supporting building professionals and local authorities all over Europe in designing nearly zero-energy buildings (NZEB).

About Photos Likes Events

Highlights

AIDA project shared a link.
Monday

"Inventing Nearly Zero Energy Buildings for tomorrow" - Meet AIDA in Energy Cities Annual Rendezvous, Växjö, Sweden, 24-26 April 2013 - in Växjö, Kronobergs Län.

Energy Cities
energy-cities.eu

Energy Cities, the European Association of local authorities inventing their energy future.

Recent Posts by Others on AIDA project

Magyar Passzívház Szövetség, Mapasz
Sajnos nem tudunk részt venni a mai rendezvényen, bár...
February 15 at 3:51am

Rita Balázs
A Virtuális Erőmű Program várja energiatudatos, és energi...
January 22 at 12:27am

More Posts



Conclusions (1)

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- Decarbonisation in the building sector can be achieved „easily“ and should therefore be realised.
- Inertance of the building sector → measures should be taken right now and show high effectiveness
- Policy measures for minimum standards
- Role models: Denmark, Baden-Württemberg



Conclusions (2)

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- Combined heat & power (CHP) district heating systems in urban areas
- System-wide picture → interlinkages between energy efficiency, heat- and electricity sector and energy storage
- High potential for solar- and ambient heat in nZEBs



Technical scheme for nearly zero-energy buildings

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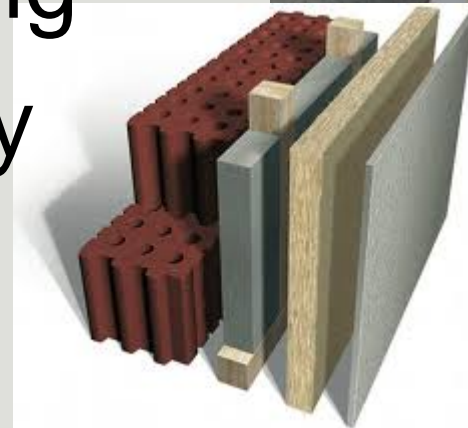
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1. Energy efficient envelope
2. Use of passive heat sources, passive cooling & ventilation (heat recovery)
3. Energy efficient appliances
4. Use of renewable energy sources on-site
5. Off-site supply of renewable energy



First solution

- Biomass space heating
- Solar hot water supply
- Insulation





Surrounding conditions for nZEBs

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- Policy framework
- Detailed analysis of the building site
- Economic conditions (i. a. product's life-span, interest rate)
- Training and education of building professionals
- **User behaviour is essential!**



Conclusions (3)

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- Do not create competition among energy efficiency and renewable energy sources, instead push an optimal use of synergies!
- The requirements of a sustainable energy supply are enormous and thus all available options are needed!
- It's a long way but be positive...

Yes we can!



Affirmative Integrated Energy Design Action - AIDA



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- Technische Universität Wien, Energy Economics Group, AT
 - AEE - Institute for Sustainable Technologies, AT
- CIMNE BEEGROUP, Building Energy and Environment, ES
 - Centre for Renewable Energy Sources and Saving, EL
 - EURAC research Institute for Renewable Energy, IT
 - Geonardo Environmental Technologies Ltd., HU
- HESPUL - énergies renouvelables & efficacité énergétique, FR
 - IREC - Catalonia Institute for Energy Research, ES
 - Greenspace Live Ltd., UK
 - Energy Cities, FR

Co-ordinator:
Raphael Bointner

Vienna University of Technology, Energy Economics Group (EEG)
Bointner@eeg.tuwien.ac.at, +43(0)1-58801-370372, www.eeg.tuwien.ac.at

