ENTRA NZE

ADVANCED BUILDINGS MODELLING AND DATA, EU

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IEA Webinar 23 June 2014

CONTENT

- The model Invert/EE-Lab

- Data collected in the project ENTRANZE

- Selected results for a few EU countries

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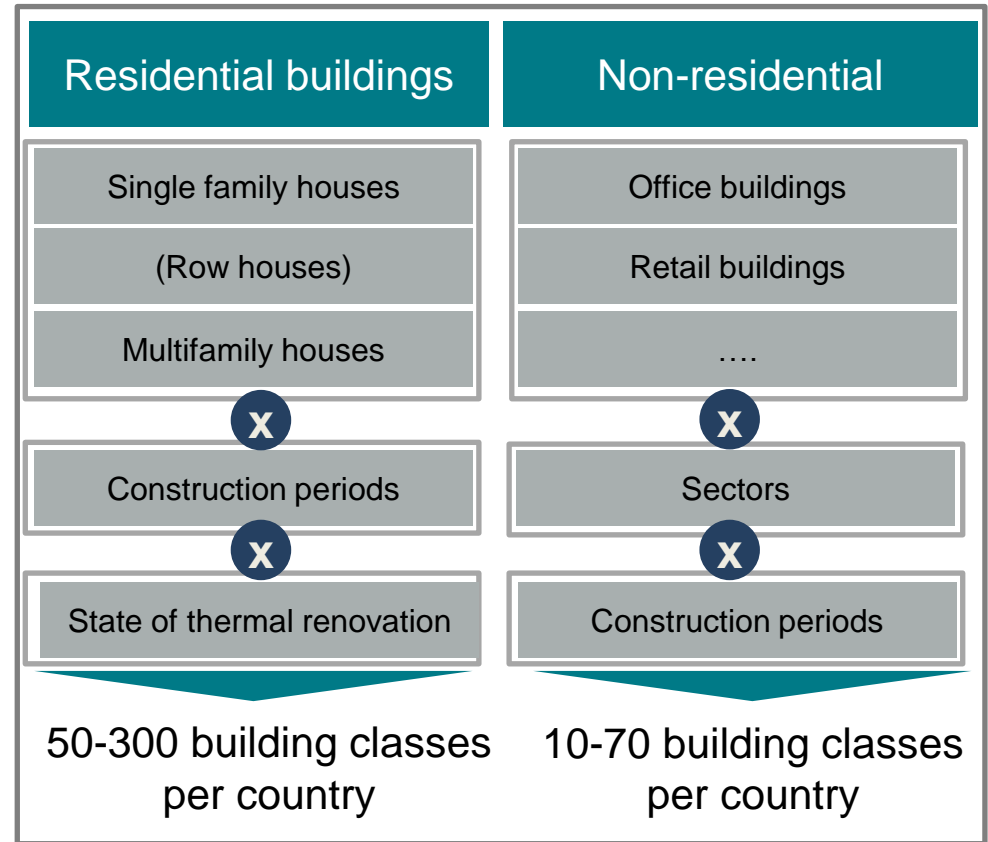
THE MODEL INVERT/EE-LAB

- Bottom-up modelling tool of building stock and related heating, cooling and hot water systems

- Simulates substitution and/or renovation of technologies and building components

- Takes into account user behaviour

- Endogenous modelling of decision making and resulting market share of technologies, renovation activities etc

- Delivers scenarios for energy demand, energy carrier mix, investment activities, …

- Development has started in 2002

- Has been used in more than 30 projects in more than 15 countries and has been extended to EU-28 (+Serbia) in the IEE project ENTRANZE (www.entranze.eu).

- www.invert.at

Co-funded by the Intelligent Energy Europe
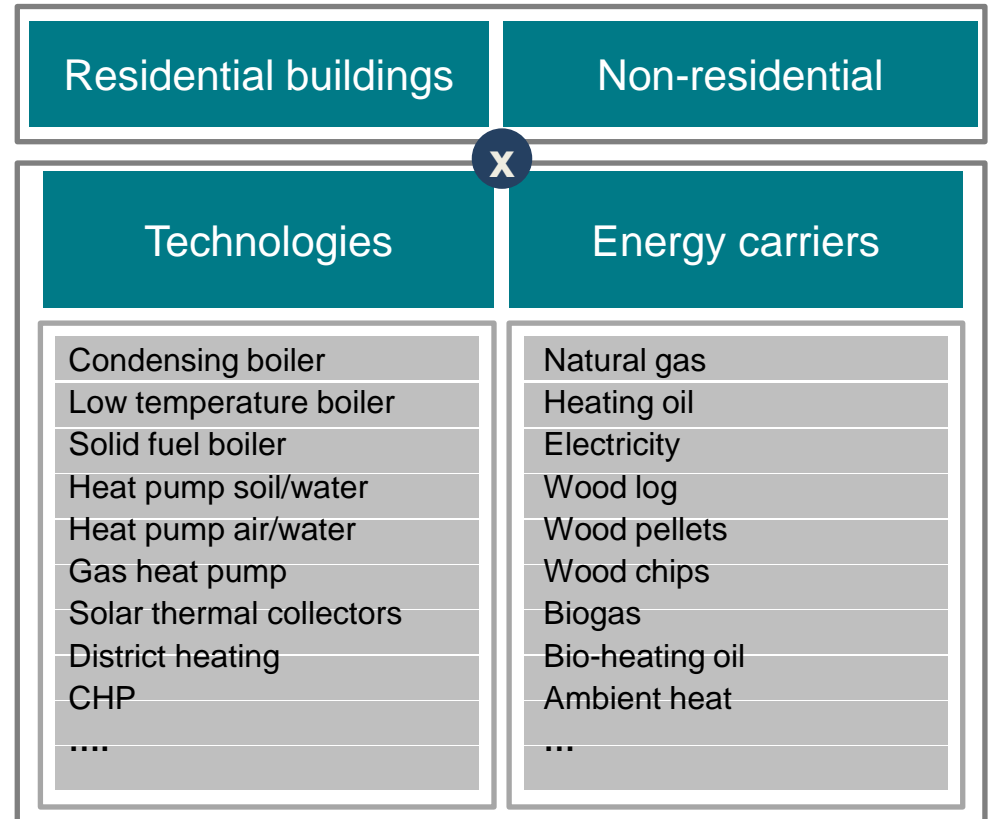Programme of the European Union

DISAGGREGATED MODELLING OF THE BUILDING STOCK

- Highly disaggregated representation of the building stock
- Demolition and construction of buildings

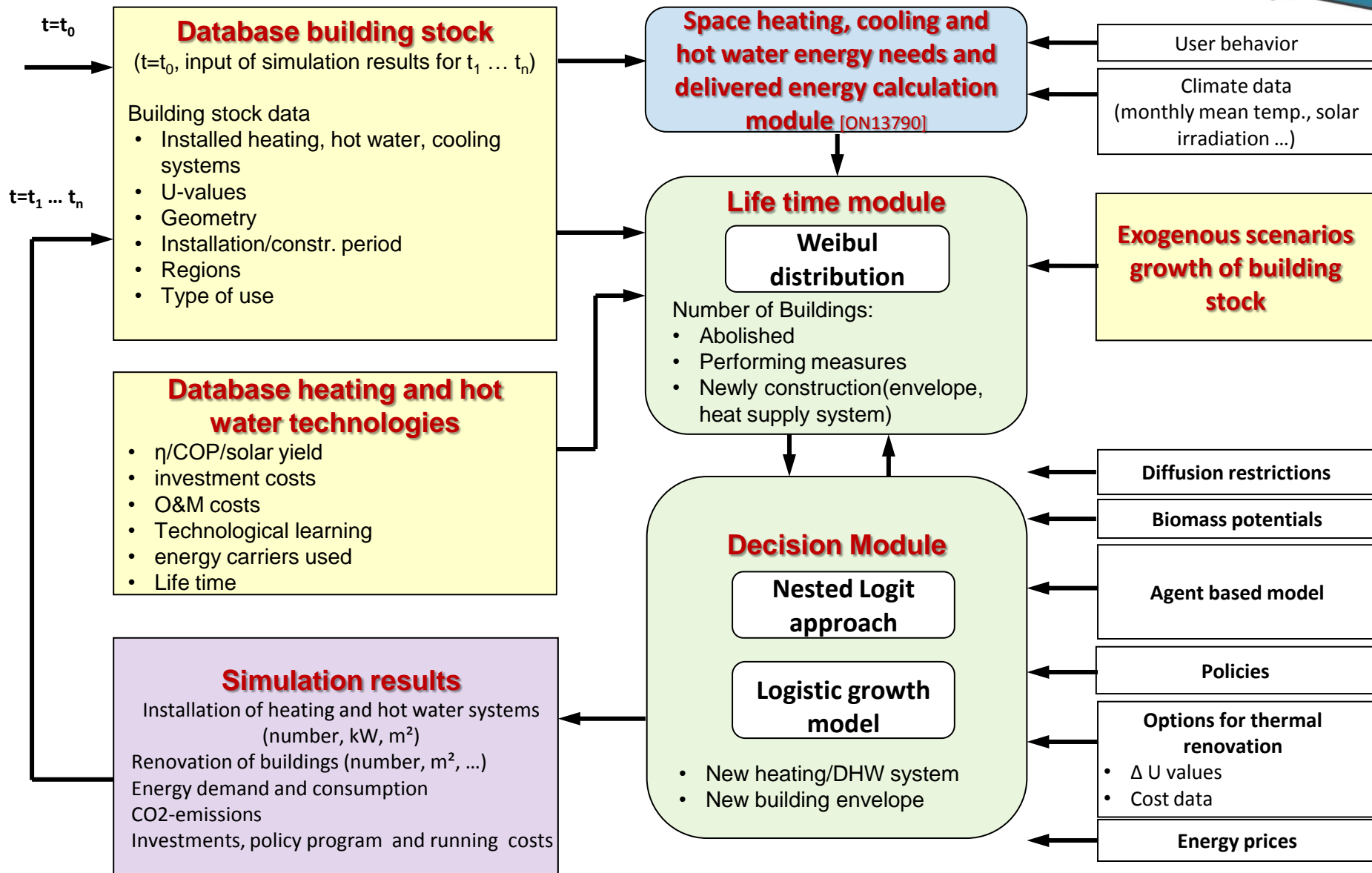| Residential buildings	Non-residential
Single family houses	Office buildings
(Row houses)	Retail buildings
Multifamily houses	….
X	**X**
Construction periods	Sectors
X	**X**
State of thermal renovation	Construction periods
50-300 building classes per country	10-70 building classes per country

DISAGGREGATED MODELLING OF THE BUILDING STOCK

- Highly disaggregated representation of the building stock
- Demolition and construction of buildings
- Various heating and hot water systems

Residential buildings	Non-residential

x

Technologies	Energy carriers
Condensing boiler	Natural gas
Low temperature boiler	Heating oil
Solid fuel boiler	Electricity
Heat pump soil/water	Wood log
Heat pump air/water	Wood pellets
Gas heat pump	Wood chips
Solar thermal collectors	Biogas
District heating	Bio-heating oil
CHP	Ambient heat
....	...

500 - 4500 reference building segments per country

STRUCTURE INVERT/EE-LAB

ENTRA
NZE

t=t₀

Database building stock

(t=t₀, input of simulation results for t₁ … tₙ)

Building stock data
- Installed heating, hot water, cooling systems
- U-values
- Geometry
- Installation/constr. period
- Regions
- Type of use

t=t₁ … tₙ

Database heating and hot water technologies
- η/COP/solar yield
- investment costs
- O&M costs
- Technological learning
- energy carriers used
- Life time

Simulation results

Installation of heating and hot water systems (number, kW, m²)
Renovation of buildings (number, m², …)
Energy demand and consumption
CO2-emissions
Investments, policy program and running costs

Space heating, cooling and hot water energy needs and delivered energy calculation module [ON13790]

User behavior

Climate data (monthly mean temp., solar irradiation …)

Life time module

Weibul distribution

Number of Buildings:
- Abolished
- Performing measures
- Newly construction(envelope, heat supply system)

Exogenous scenarios growth of building stock

Decision Module

Nested Logit approach

Logistic growth model

- New heating/DHW system
- New building envelope

Diffusion restrictions

Biomass potentials

Agent based model

Policies

Options for thermal renovation
- Δ U values
- Cost data

Energy prices

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- Selected results for a few EU countries

POLICIES TO ENFORCE THE TRANSITION TO NZEBS IN THE EU (ENTRANZE)

- IEE Project
- Support of policy makers in the implementation of effective and efficient policies for nZEBs
- Investigate the impact of policies in scenarios up to 2030 in target countries and EU-28 (+Serbia)
- Set up a comprehensive database of policies, costs, building stock, HVAC stock

Legend:
- Target countries
- Focus countries
- Remaining EU-27 countries
- Other countries

ENTRANZE DATABASE COVERS:

- Residential and non-residential buildings (industrial buildings excluded)
- EU-28 (+Serbia)
- Split into climatic regions for selected EU countries
- Building stock data
  - Installed heating, hot water and cooling systems
  - U-values
  - Geometry
  - Installation/constr. period
  - Regions
  - Type of use
  - (Previous renovation activities: year, type, depth => relevance)
- Techno-economic data of heating, hot water, cooling systems

DATA SOURCES

- ENTRANZE database (www.entranze.eu), building on:
  - BPIE data hub (www.buildingsdata.eu)
  - Odyssee - Mure
  - Eurostat
  - National building statistics
  - National statistics on various economic sectors for non-residential building data
  - Tabula and similar projects regarding building typologies

- The level of detail the number of construction periods etc. depends on the data availability and structure of national statistics.

ONLINE DATA TOOL

www.entranze.eu

ONLINE DATA TOOL
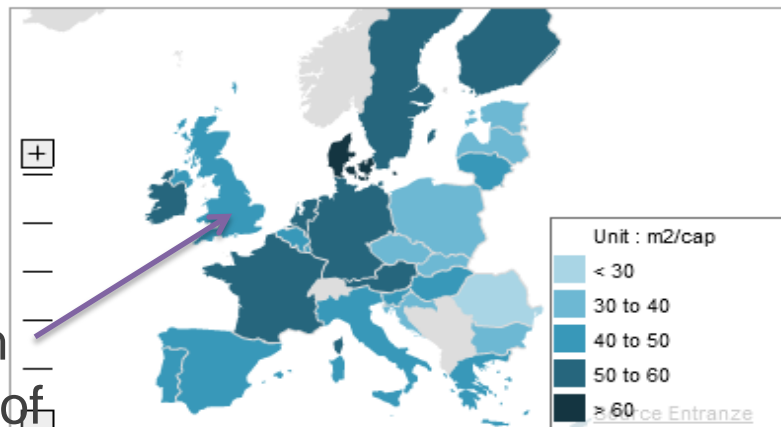
A **table** showing the country **ranking**

A **bar chart** providing additional detail for the indicator

A **map** with the values of indicators by country

www.entranze.eu

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- Exemplary, selected results for a few EU countries

ONLINE SCENARIO TOOL

User chooses country, scenarios and indicators

ENTRANZE

ENTRANZE scenario tool

| ANALYSIS | ALL-BUILDINGS | RESIDENTIAL | NON-RESIDENTIAL | | INFORMATION |
METHODOLOGY, OBJECTIVES

Enerdata

Contact | Entranze Website

Countries | Scenarios | Items

Search...

Items: 3 ✕

✕ 🔍 Gas market share in space and water heating building demand
✕ 🔍 Electricity market share in space and water heating building demand
✕ 🔍 Oil market share in space and water heating building demand

Countries: 1 ✕

✕ 🔍 France

Scenarios: 3 ✕

✕ 🌐 BAU
✕ 🌐 CO2 tax
✕ 🌐 Proactive

High prices 🌐

Countries

- Austria
- Bulgaria
- Czech Rep.
- Finland
- France
- Germany
- Italy
- Romania
- Spain

- Belgium
- Croatia
- Cyprus
- Denmark
- Estonia
- Greece
- Hungary
- Ireland
- Latvia
- Lithuania
- Luxembourg
- Malta
- Netherlands
- Poland
- Portugal
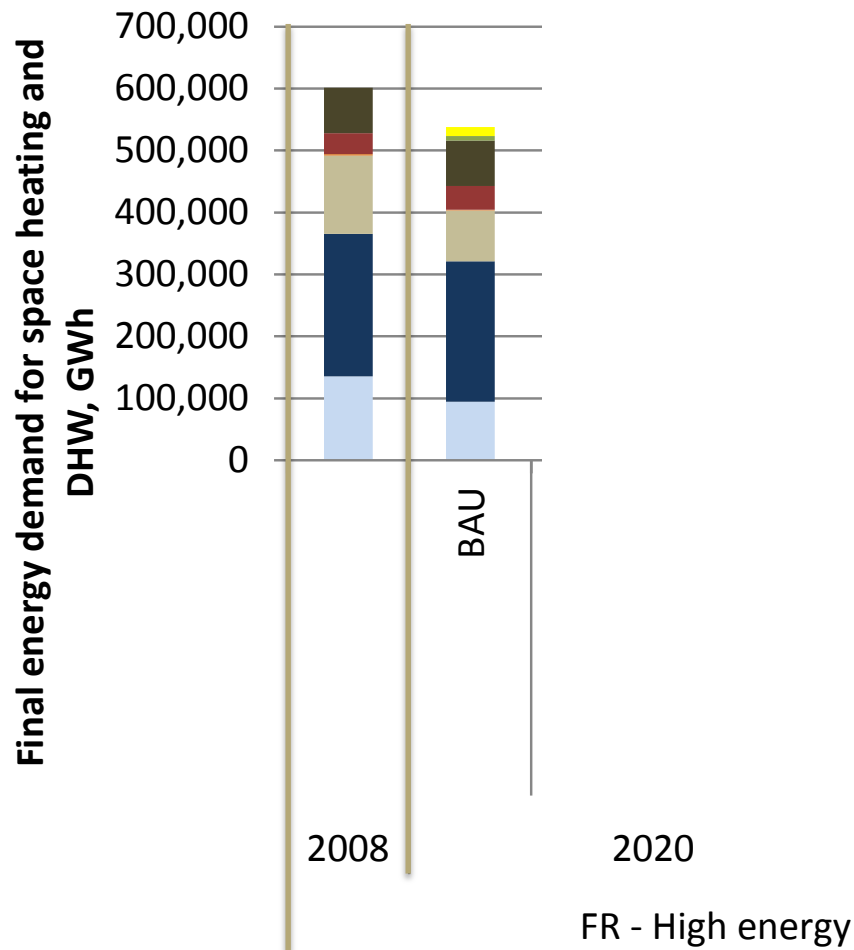- Slovakia
- Slovenia

France - High prices

	Scenario	Price	Unit	2008	2015
Gas market share in space and water heating	BAU	H	%		
Gas market share in space and water heating	CO2 t...				
Gas market share in space and water...					
Electricity market share in spa...					
Electricity market share in spa...					
Electricity market share in spa...					
Oil market share in space and...					
Oil market share in space and w...					10.4
Oil market share in space and w... building demand				16.9 13.7	10.6

Still under construction, will be completed until September 2014

Price sensitivity

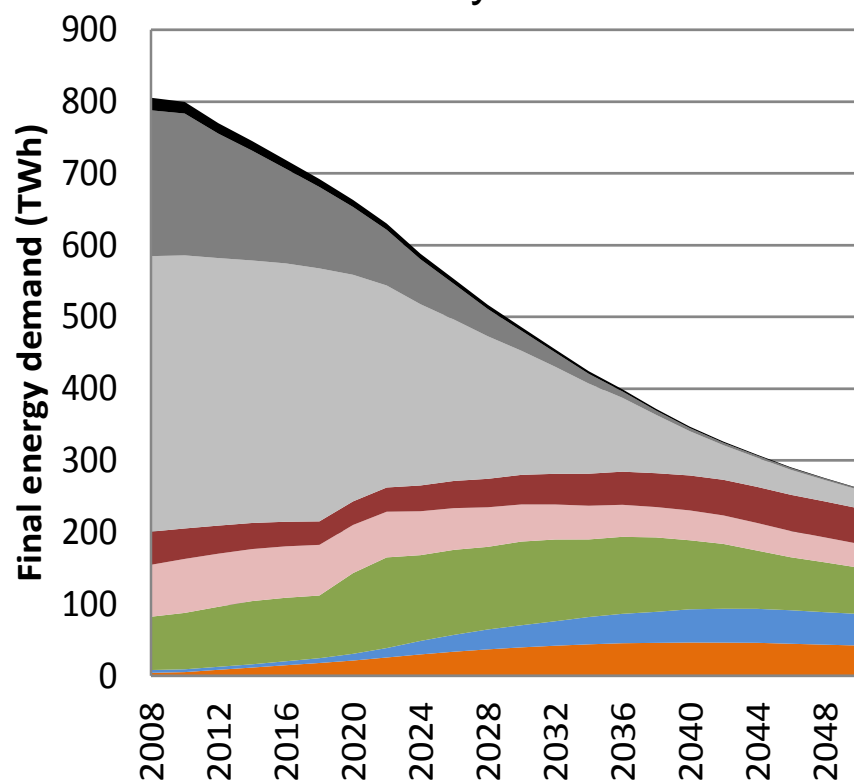Results can be uploaded in excel, and displayed in several formats (table or graphs)

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www.entranze.eu

E.G. FRANCE: CO2/ENERGY-TAX VS. PROACTIVE, TARGET GROUP ORIENTED POLICY SETS
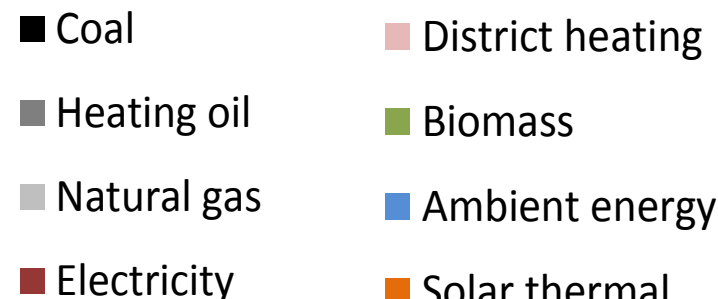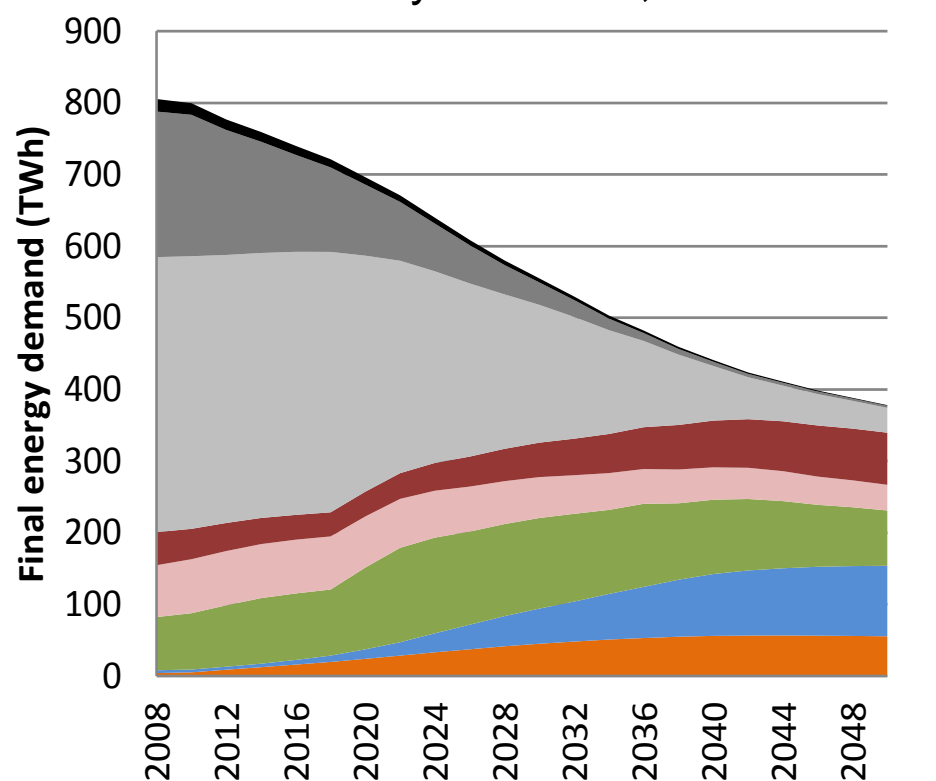
FR - High energy
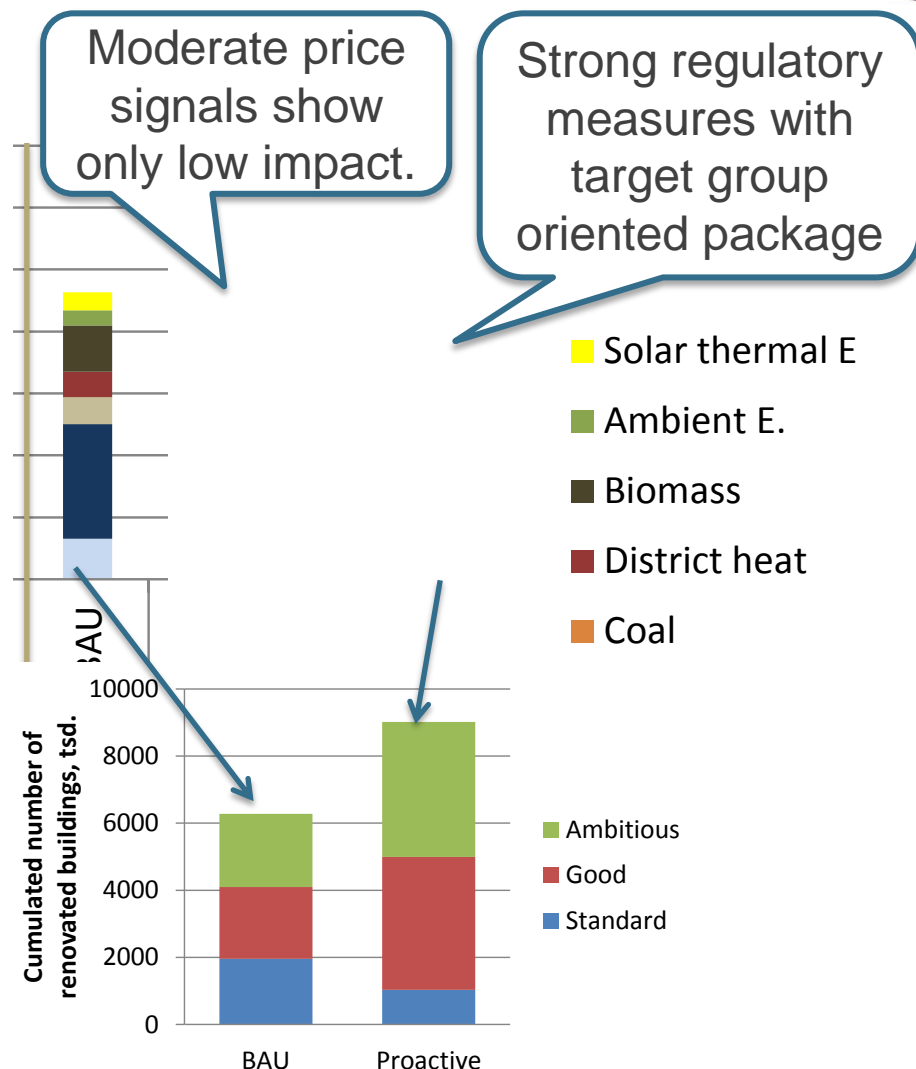
E.G. GERMANY: LONG-TERM SCENARIOS

Focus efficiency

Focus electricity and RES, moderate eff.

Legend: Coal, Heating oil, Natural gas, Electricity, District heating, Biomass, Ambient energy, Solar thermal

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E.G. AUSTRIA: CLIMATE SENSITIVE SCENARIOS
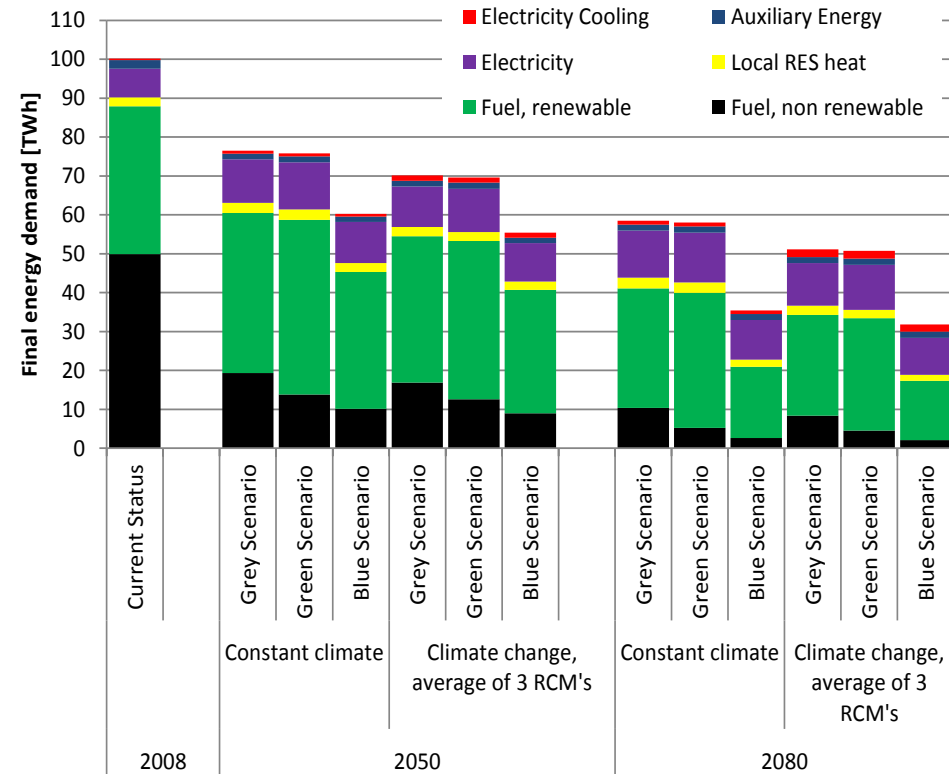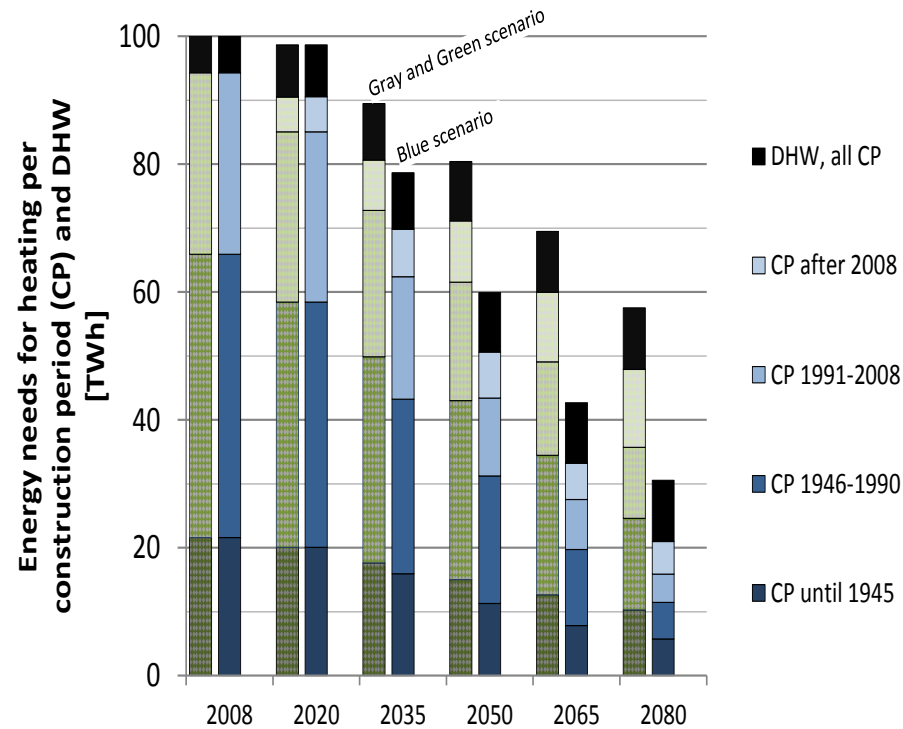
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Further information: www.entranze.eu
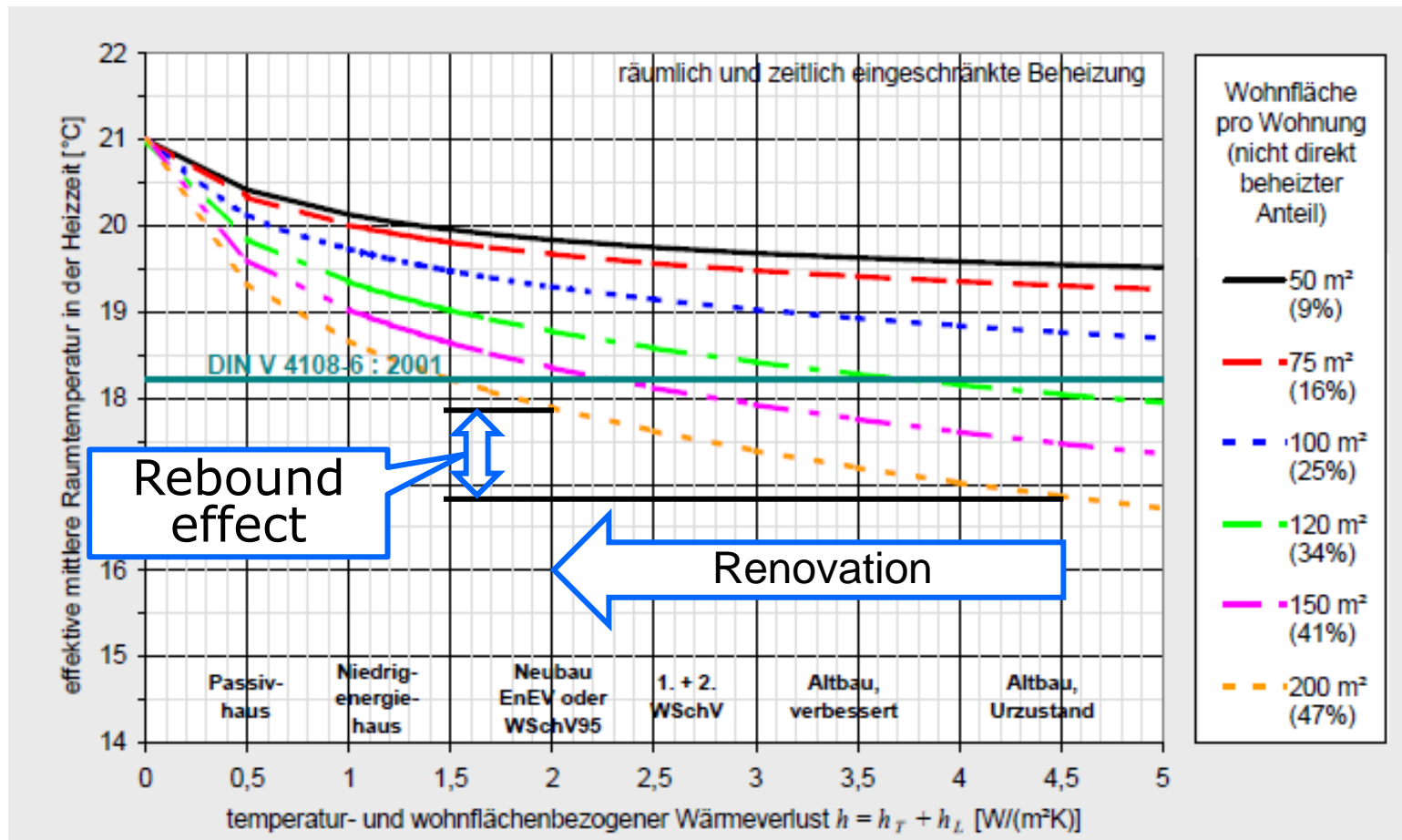
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SERVICE FACTOR AND REBOUND EFFECT

Impact of dwelling size and building quality on average indoor temperature

Source: IWU, 2004

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