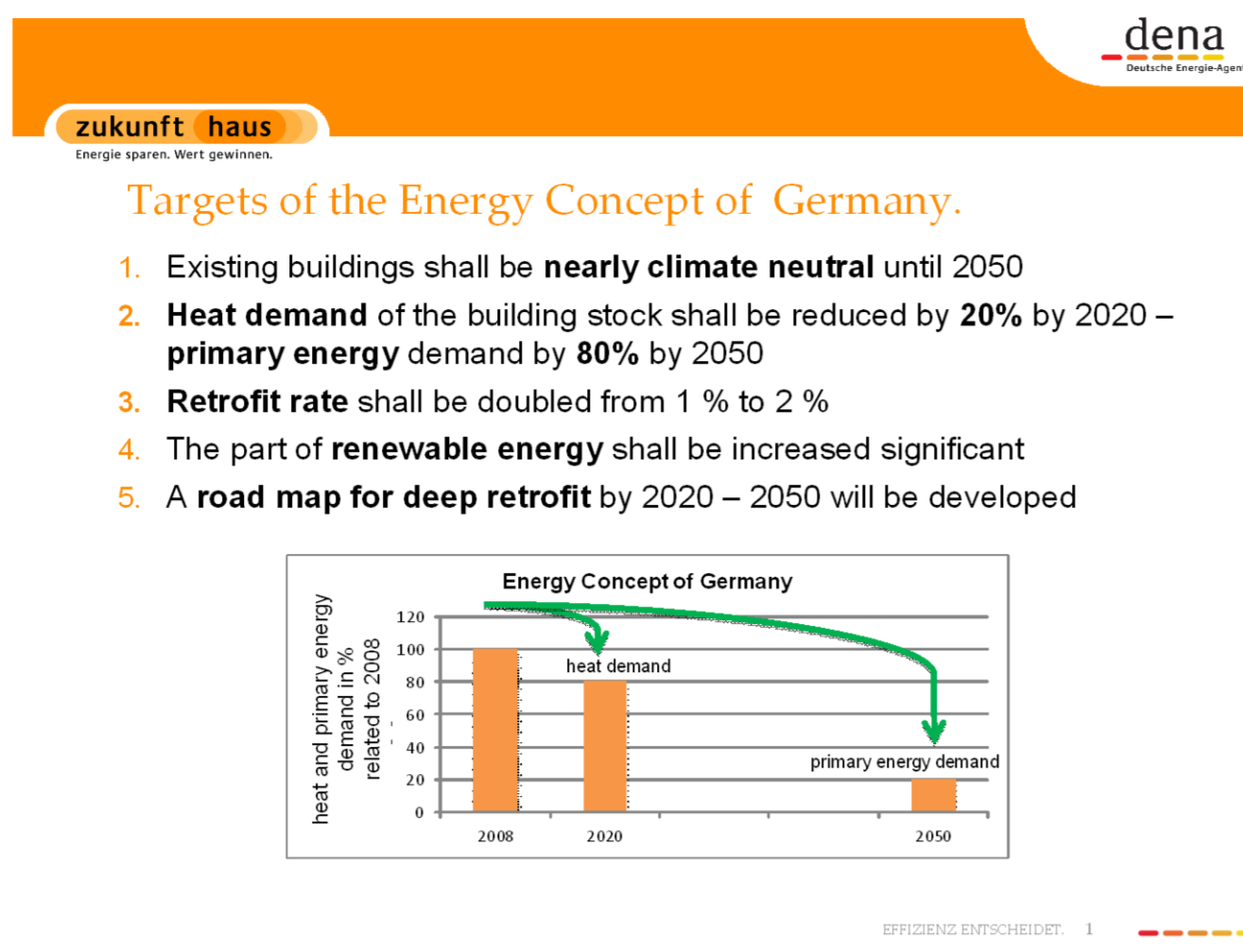
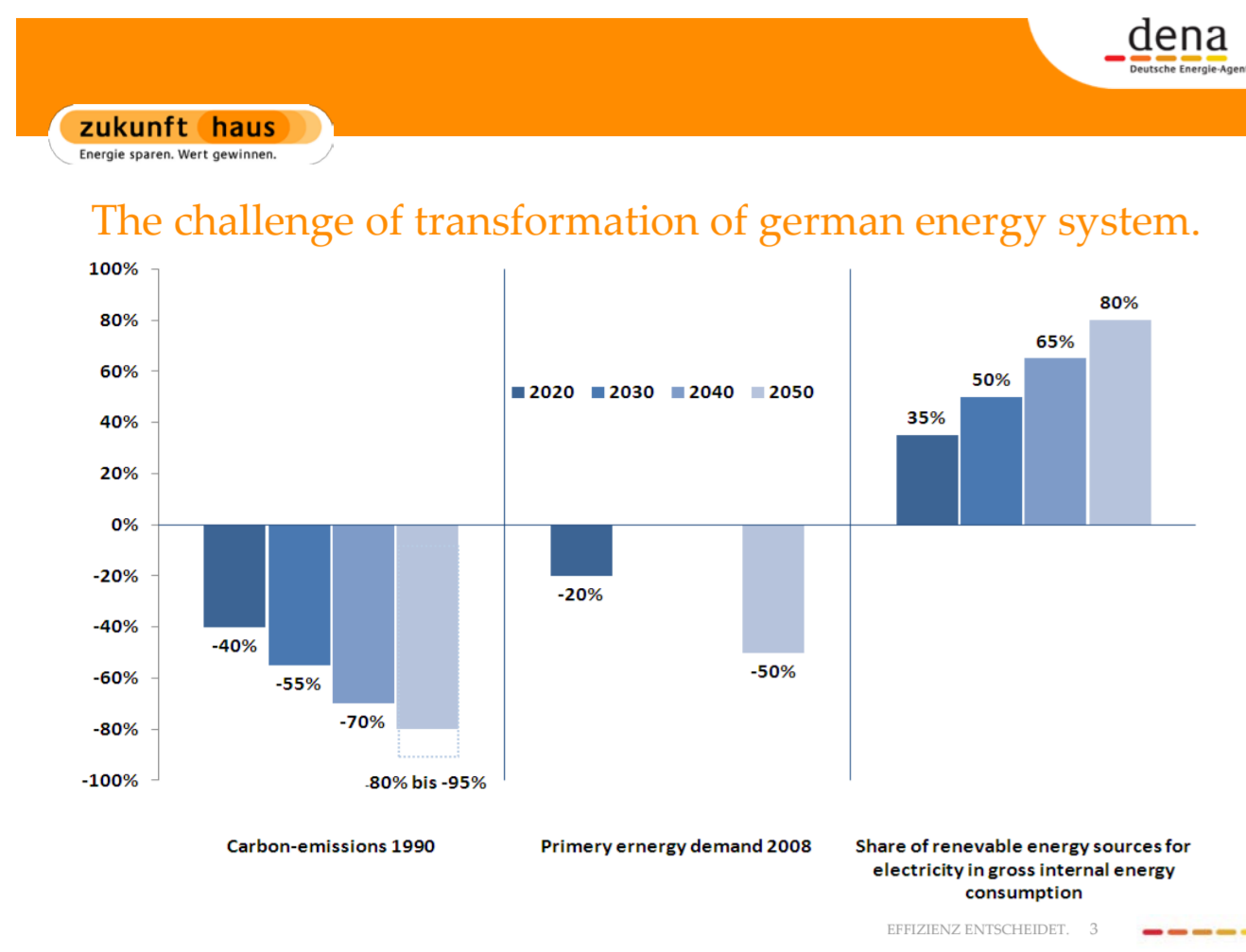


## Objectives in the Energy Sector

### Measures initiated in Germany:

- Germany strengthened its efforts
- Building sector: legislation, financial incentives, information
- Energy concept 2010, energy transition (Energiewende) 2011
  - Gradual phasing out of nuclear power until 2022 and
  - Accelerated shift to renewables and more energy efficiency



## Analysis of the German vocational education and training system for construction workers

### Basics of the German training system

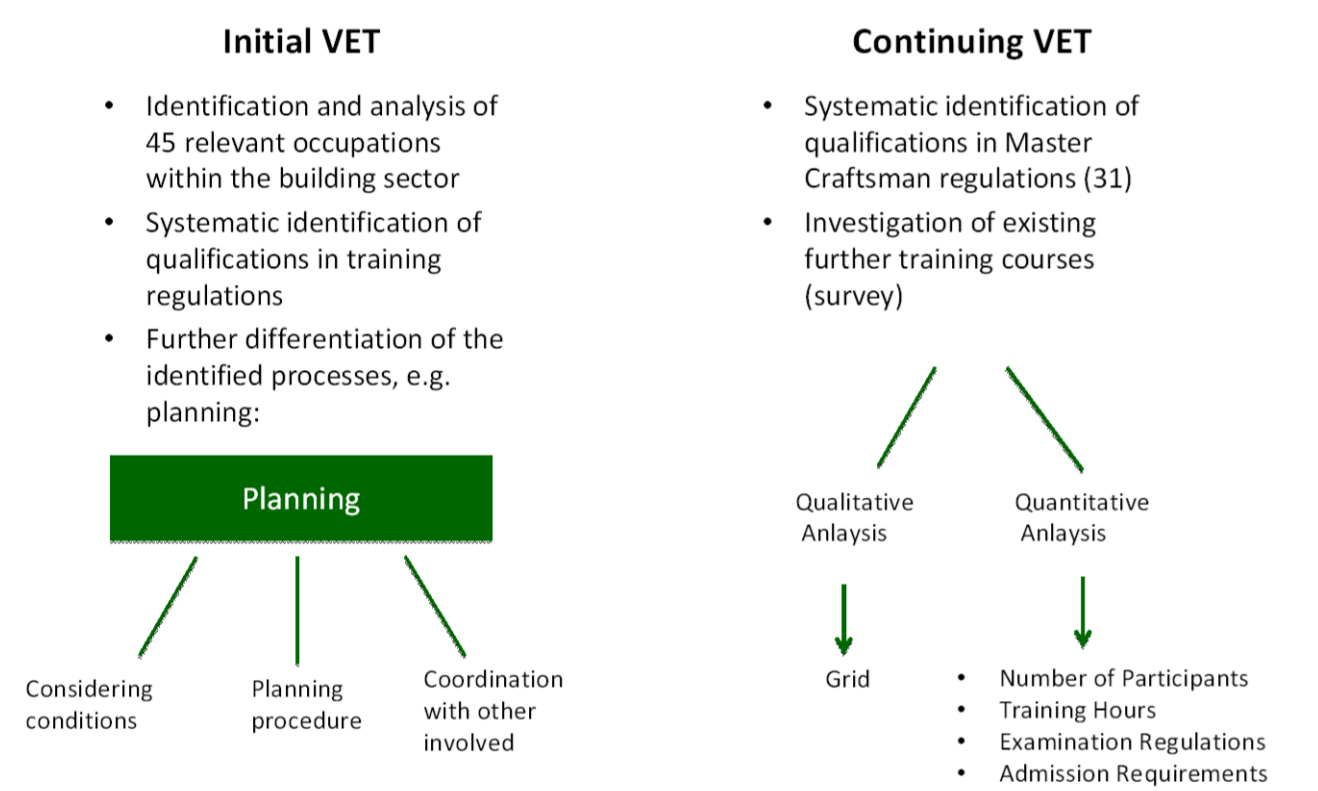
- 3 to 3.5 years in the dual training system
- 45 relevant building and construction occupations (30 alone in the craft sector)
- Crafts: Advanced training to a "master of crafts" with over 1800 hours
- nationally regulated training regulations and master's certificate regulations

Starting point: Development of a grid for the qualitative analysis

Point of Reference: Buildings	Processes (construction and reconstruction of buildings)					
	Advisory Services	Planning	Realization	Approval	Maintenance and Repair	Disposal
Building shell						
Roof						
Facades						
Windows and doors						
Interior fitting						
Electrotechnology						
Heat technology						
Ventilation and air conditioning						
Geothermal energy						
Biomass						
Solar heat						
Photovoltaics						
Block heat and power plant						
Wind engine						

Further differentiation of the grid

Relevant technological factors	Processes						
	Advisory Services	Planning	Realization	Approval	Maintenance and Repair	Disposal	
Reception of customer wishes							
Customer information							
Considering conditions							
Planning procedure							
Coordination with other involved							
Preparation of the site / choice of material							
Preparatory work at the building							
Preparation of the material							
Processing of material							
Assembly of parts							
Connection of systems							
Protection and insulation of parts and systems							
Commissioning of systems							
Documentation and inspection of completed							
Cleaning of the site							
Approval							
Assessment of maintenance needs							
Execution of maintenance activities							
Documentation of maintenance activities							
Disposal							



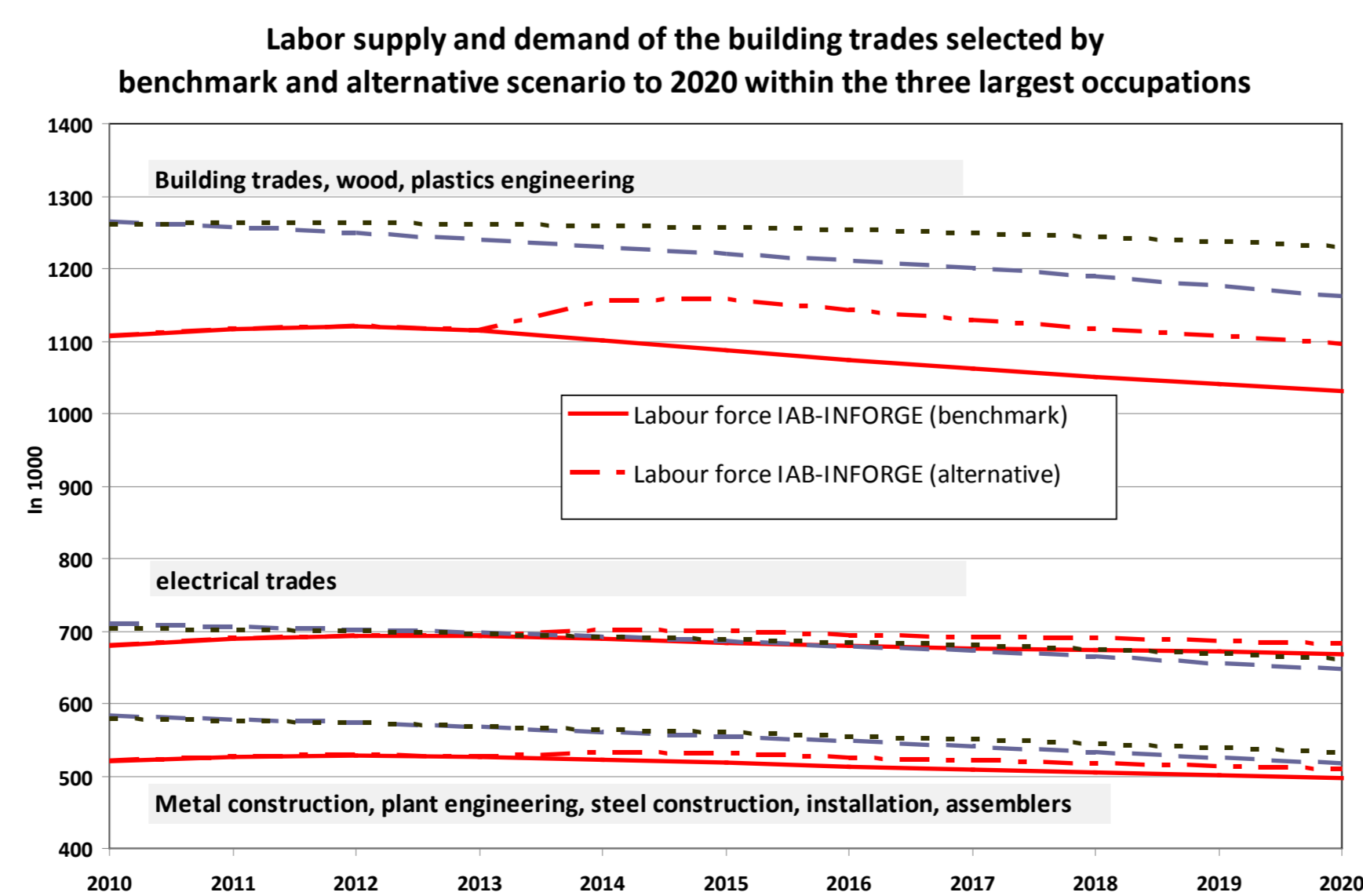
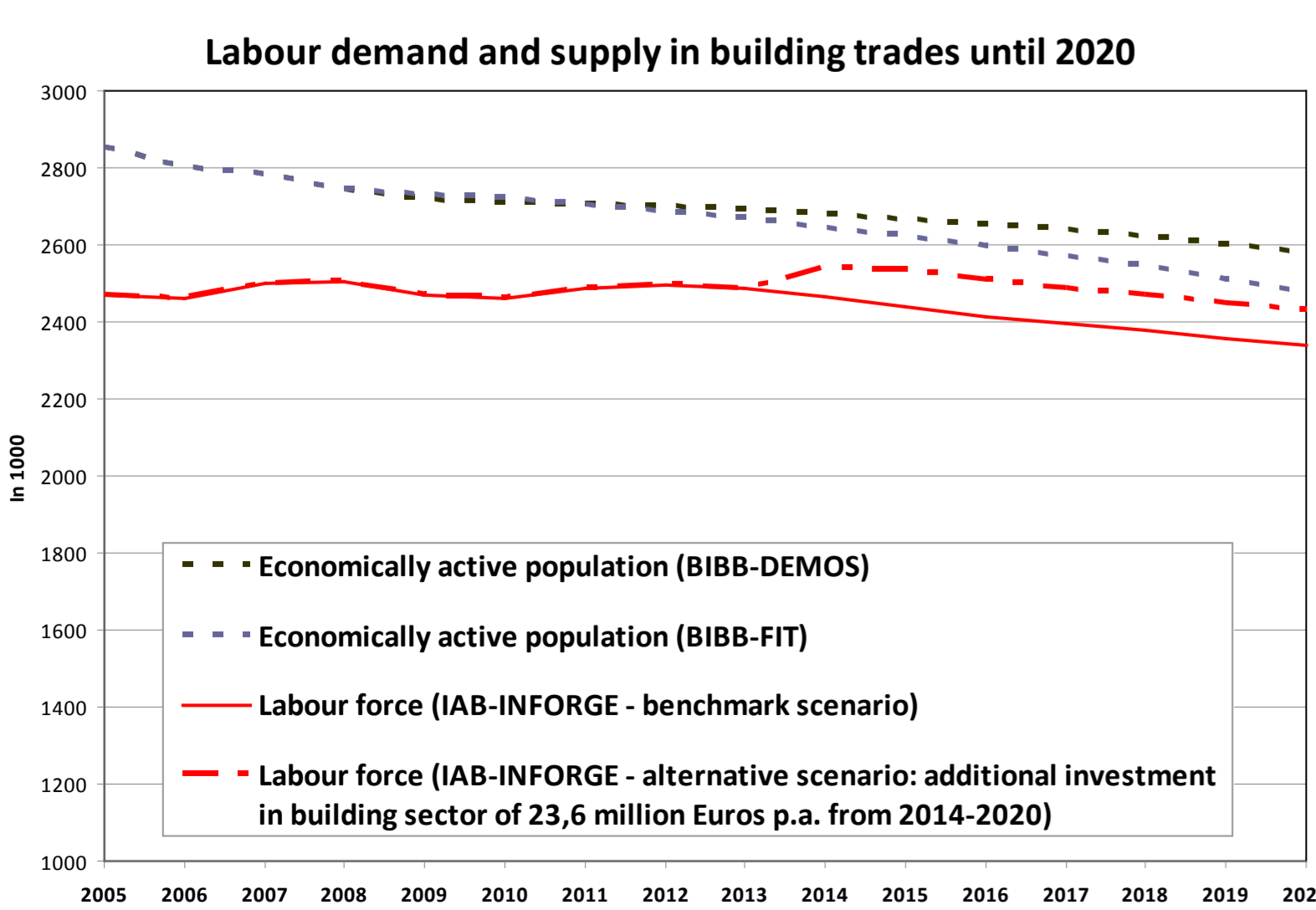
### Quantitative analysis of continuing VET offers in Germany

- survey in the German crafts sector and in German industry
- around 300 different courses for renewable energies and energy efficiency in the German crafts sector and in industry
- more than 200 courses alone in the crafts sector
- focus on courses with a) 5 to 50 hours and b) 200 hours and more

## Analysis of labor supply and demand in construction trades until 2020

### Quantitative demand for skilled workers by 2020

- **Benchmark scenario** (projection of current trends without additional investment)
  - no nationwide shortage of skilled workers
  - increasing employment of older persons
  - higher labor force participation of women
- **Alternative scenario** (modelled calculations for additional investments of € 23.6 billion a year (2014-2020))
  - consideration of all building trades: mathematically, the labor supply meets the demand
  - But: In some selected professions shortages may occur
    - electrical trades
    - Metal construction, plant engineering, steel construction, installation, assemblers
    - Regional differences cannot be mapped, but are very likely
  - From 2020 on there will be increasing nationwide shortages in the construction labor markets



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## Statistics on the building and the construction sector

### The German building sector

- Goals in the building sector until 2020: analysis of residential and nonresidential buildings
  - approximately 18 million residential buildings (2.7 to 3.4 billion square meters space)
  - around 2.5 million non-residential buildings (2.2 to 2.7 billion square meters space)

### Building sector - statistics

#### DHI

### German building sector

- approx. 40% end energy consumption and 30% of greenhouse gases (CO<sub>2</sub> equivalent)
- ≈ 20.5 million buildings
  - 75% built before 1977; 90% below ENEV-2009 (German energy saving regulation) level
- Potential for energetic refurbishments with a high chance of fast energy savings, **700 PJ need to be saved**

### German building construction sector

- Approx. 500.000 companies with 2.4 million employees, more than 80% of employees are qualified or highly qualified workers



## Technological-political scenario until 2020

### Technological-political scenario until 2020

#### DHI

- Relevant technologies and processes are available regarding: building shell; building infrastructure; energy supply
  - ➔ Technology leaps not expected until 2020
- Feasibility of climate protection goals and objectives until 2020
  - Increasing the share of renewable energy sources feasible due to national laws and regulations (EEG)
  - Reduction of greenhouse gases (40%) feasible
  - Reduction of energy consumption (20%) in the building sector not feasible without additional investments
  - ➔ The annual investment of €57.5 billion for refurbishment measures must be increased

### Technological-political scenario until 2020

#### DHI

- Scenario considers type, construction year & energy demand to calculate total surface area [m<sup>2</sup>] for restoration actions as well as costs for replacement of installation engineering
- | Step 1: Definition of basic conditions for restoration  | Step 2: Classification/calculation for restoration to save 700 PJ   |                  |              |                            |        |                  |                     |                            |           |        |                            |                |                            |          |        |                           |                     |                            |           |        |                            |                |                            |          |        |                           |       |                            |          |        |                           |       |                            |          |        |                  |       |                            |          |       |                  |
|---|---|------------------|--------------|----------------------------|--------|------------------|---------------------|----------------------------|-----------|--------|----------------------------|----------------|----------------------------|----------|--------|---------------------------|---------------------|----------------------------|-----------|--------|----------------------------|----------------|----------------------------|----------|--------|---------------------------|-------|----------------------------|----------|--------|---------------------------|-------|----------------------------|----------|--------|------------------|-------|----------------------------|----------|-------|------------------|
| <ul style="list-style-type: none"> <li>• +3.4 billion m<sup>2</sup> habitable surface</li> <li>• +2.5 billion m<sup>2</sup> useable surface</li> <li>• Residential before 1996</li> <li>• Non-residential before 1977</li> <li>• 50% of insulated buildings</li> <li>• Demanded saving: 700 PJ</li> </ul> | <table border="1"> <thead> <tr> <th>1/2-family house</th> <th>surface area</th> <th>energy use</th> <th>impact</th> <th>restoration area</th> </tr> </thead> <tbody> <tr> <td>&lt;1949 non-insulated</td> <td>389.366.400 m<sup>2</sup></td> <td>180 kWh/a</td> <td>80,6 %</td> <td>124.336.279 m<sup>2</sup></td> </tr> <tr> <td>&lt;1949 isolated</td> <td>151.653.600 m<sup>2</sup></td> <td>90 kWh/a</td> <td>61,1 %</td> <td>25.932.766 m<sup>2</sup></td> </tr> <tr> <td>&lt;1979 non-insulated</td> <td>621.057.600 m<sup>2</sup></td> <td>180 kWh/a</td> <td>80,6 %</td> <td>164.252.493 m<sup>2</sup></td> </tr> <tr> <td>&lt;1979 isolated</td> <td>241.522.400 m<sup>2</sup></td> <td>90 kWh/a</td> <td>61,1 %</td> <td>41.300.530 m<sup>2</sup></td> </tr> <tr> <td>&lt;1996</td> <td>381.080.000 m<sup>2</sup></td> <td>80 kWh/a</td> <td>56,3 %</td> <td>67.080.640 m<sup>2</sup></td> </tr> <tr> <td>&gt;2001</td> <td>120.360.000 m<sup>2</sup></td> <td>50 kWh/a</td> <td>30,0 %</td> <td>0 m<sup>2</sup></td> </tr> <tr> <td>&gt;2001</td> <td>120.360.000 m<sup>2</sup></td> <td>35 kWh/a</td> <td>0,0 %</td> <td>0 m<sup>2</sup></td> </tr> </tbody> </table> | 1/2-family house | surface area | energy use                 | impact | restoration area | <1949 non-insulated | 389.366.400 m <sup>2</sup> | 180 kWh/a | 80,6 % | 124.336.279 m <sup>2</sup> | <1949 isolated | 151.653.600 m <sup>2</sup> | 90 kWh/a | 61,1 % | 25.932.766 m <sup>2</sup> | <1979 non-insulated | 621.057.600 m <sup>2</sup> | 180 kWh/a | 80,6 % | 164.252.493 m <sup>2</sup> | <1979 isolated | 241.522.400 m <sup>2</sup> | 90 kWh/a | 61,1 % | 41.300.530 m <sup>2</sup> | <1996 | 381.080.000 m <sup>2</sup> | 80 kWh/a | 56,3 % | 67.080.640 m <sup>2</sup> | >2001 | 120.360.000 m <sup>2</sup> | 50 kWh/a | 30,0 % | 0 m <sup>2</sup> | >2001 | 120.360.000 m <sup>2</sup> | 35 kWh/a | 0,0 % | 0 m <sup>2</sup> |
| 1/2-family house  | surface area  | energy use       | impact       | restoration area           |        |                  |                     |                            |           |        |                            |                |                            |          |        |                           |                     |                            |           |        |                            |                |                            |          |        |                           |       |                            |          |        |                           |       |                            |          |        |                  |       |                            |          |       |                  |
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- Restoration and installation efforts sum up to costs in €/m<sup>2</sup>: residential buildings: €500/m<sup>2</sup>, non-residential: €380/m<sup>2</sup>
    - ➔ €372.8 billion residential, €195.4 billion non-residential
    - ➔ Total current investment of €57.5 bn./a for refurbishments must be increased to €11.1 bn./a to achieve 2020 goals
  - **Additional investment of €23.6 billion/a necessary (11 bn. in residential and 12.6 bn. Euros in non-residential)**

## Institutional work

### Meetings and events

- Kick-off-meeting 12.01.2011
- 3 consortium meetings
- Presentation of interim results 05.31.2012

### National platform

- 56 suppliers (incl. consortium)
- from different types of society

### Website [www.bauinitiative.de](http://www.bauinitiative.de)

