POLYCITY Workshop

Energy Performance Directive – Benchmarking of Building Performance

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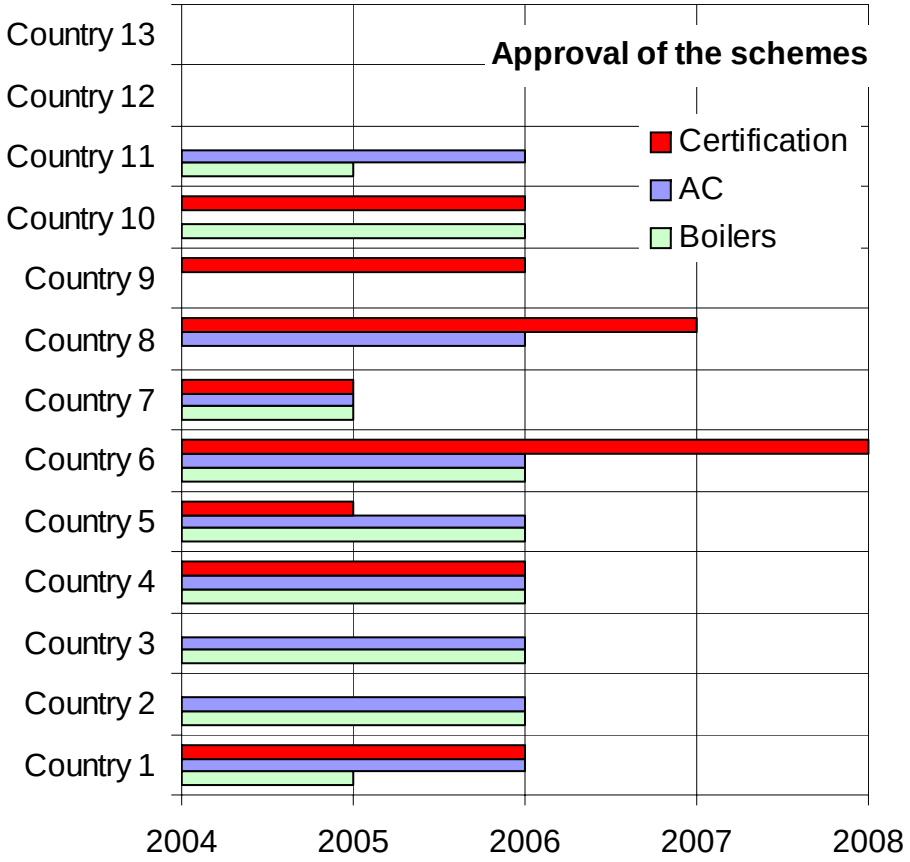
Fraunhofer Institut Systemtechnik und Innovationsforschung

Implementation of the European Energy Performance Directive for Building EPBD: Situation in EU Member States (as of 17 January 2006)

- Notification 9 MS: BE (partly), DK, DE (partly), IT, LT (partly), LIT (partly), AUS (partly), POL (partly), SLK (partly).
- 16 MS have not yet notified!
- Article 8 (inspection of boilers) 7 MS have chosen information approach: LT, EE, FIN, IRL, NL, SV, UK.
- Article 15.2 (request for extra time due to a lack of experts : all MS 0.5-3 years)!

- Many problems are still remaining.



Source: EU Commission

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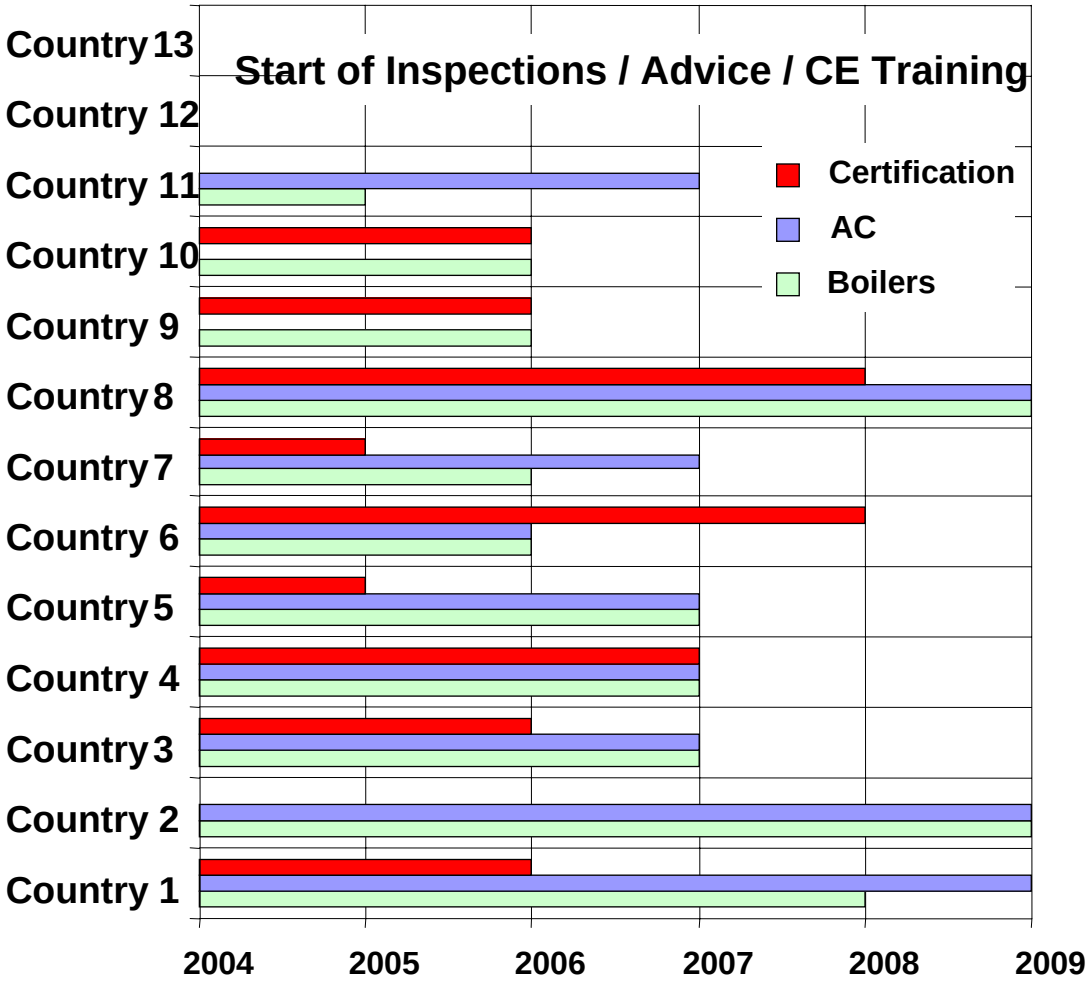
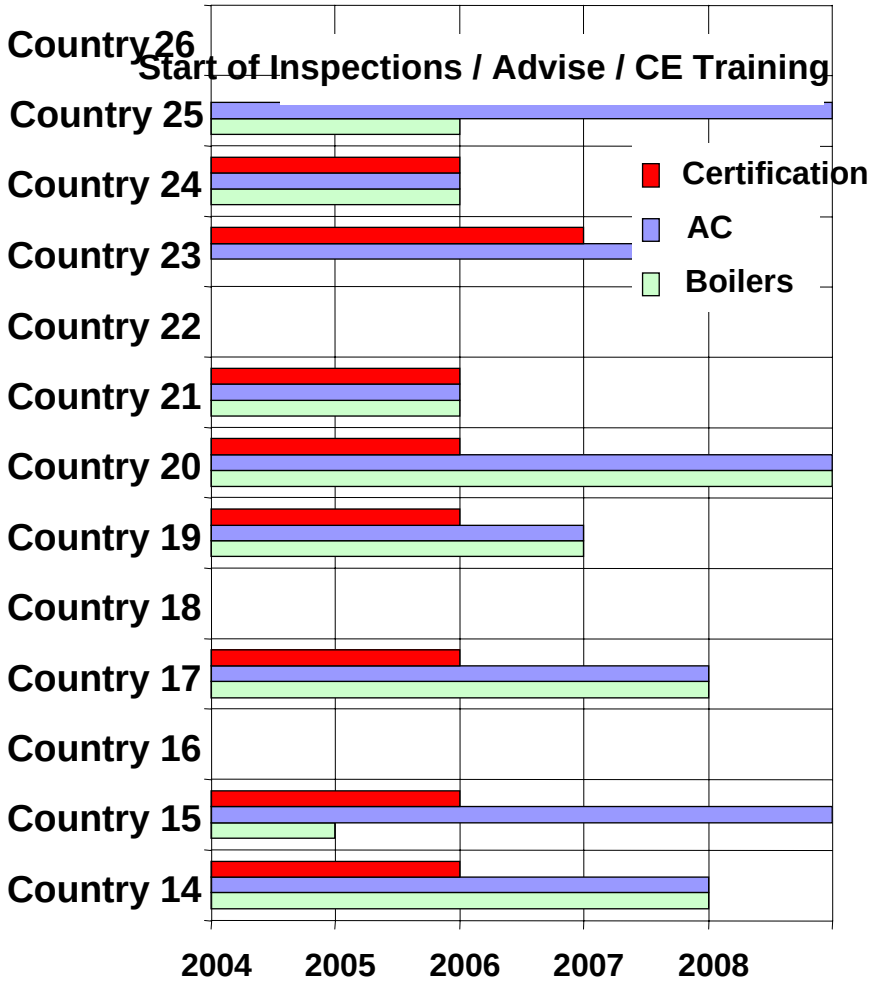
Implementation of Art. 7, Art. 8 and Art. 9 in MS





Source: EU Commission

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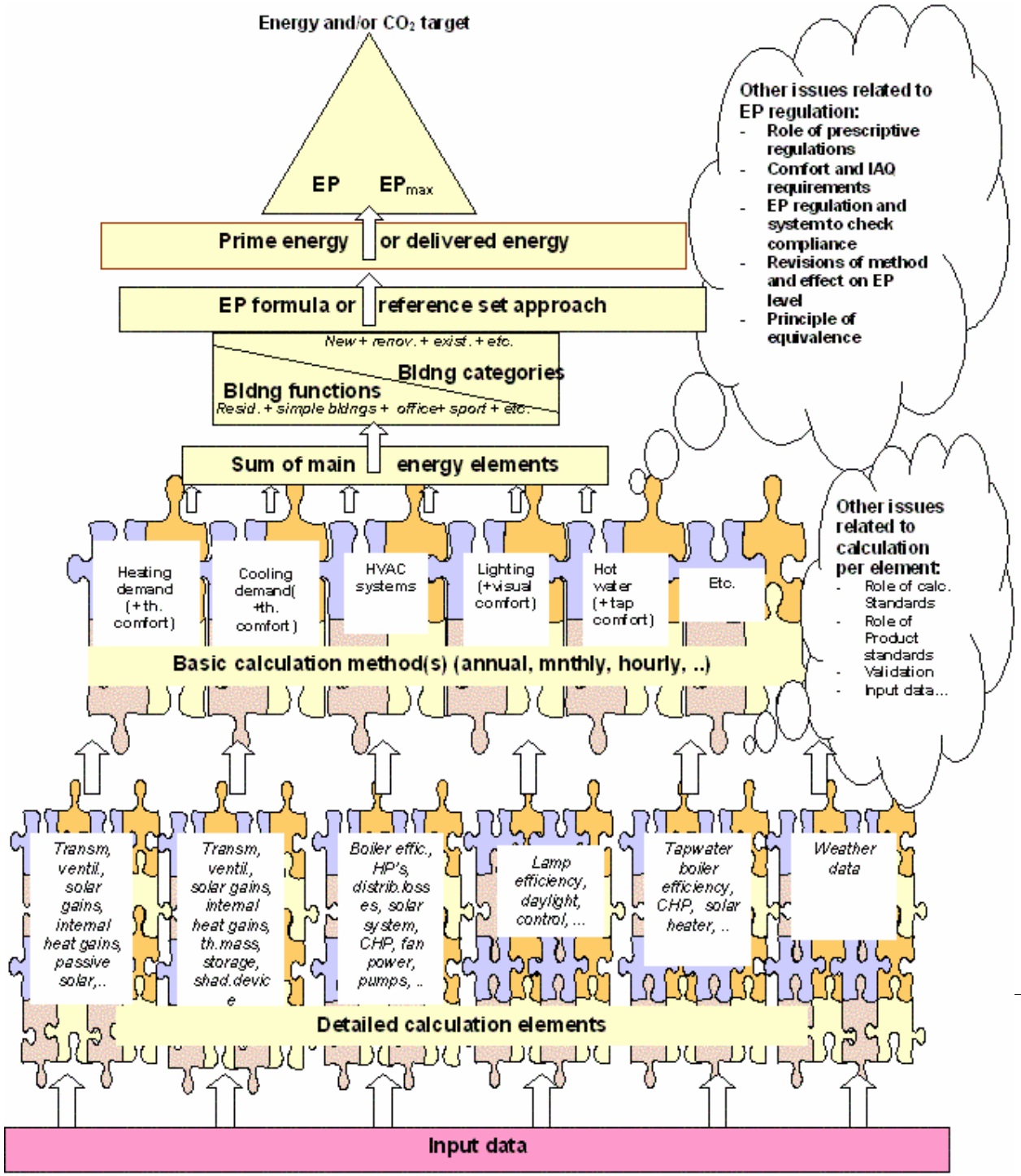
Expected start of certification and inspection

Status of the planned approaches in the EU countries (22 of 25 countries)

- 19 countries plan national procedures; 3 regional
- All countries plan comparable procedures for residential buildings, 19 plan more comprehensive procedures for non-residential buildings, 3 only for selected type of buildings
- 19 plan energy demand evaluation, 7 start to build up benchmarking systems, 7 countries have also energy consumption certification in preparation
- 9 countries refer to national standards, 12 to ordinances. CEN Standards are integrated in a pragmatic manner
- 2 countries have all documents ready, 11 have drafts, 9 are still working substantially on the drafts

Source: Fraunhofer IBP



Source: ENPER/TEBUC Project

Structure for the Determination of Energy Performance

Basics for Performance Benchmarking: Clear Message to the Consumer

- The building certificate has to be short and compact
- Primary and final energy should be visible
- Need a label with high acceptance ("Bandtacho" can better cope with simplifications in the procedure)

Reference Values:

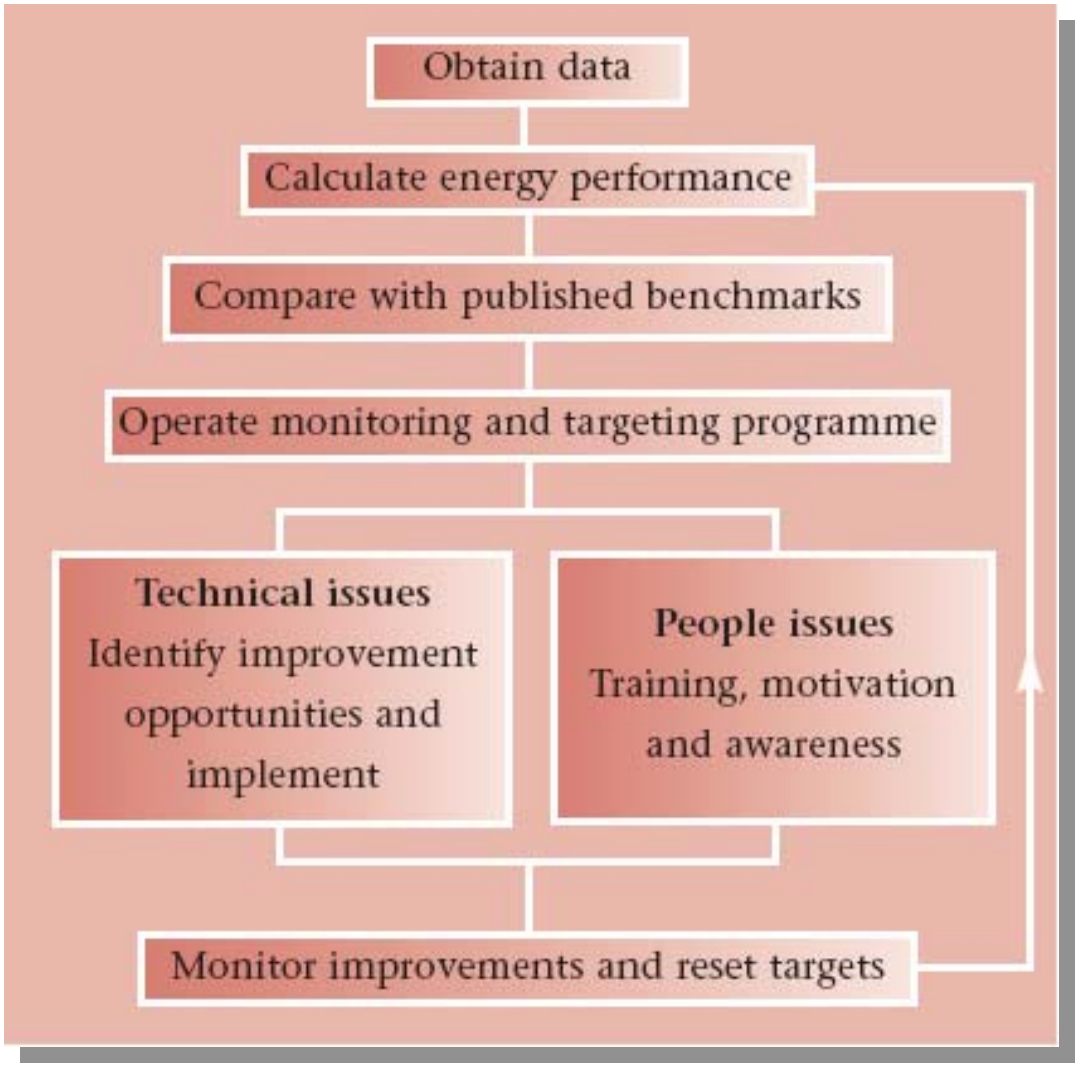
- In demand calculations comparison with the requirements of the regulation for new buildings (EnEV2006 in Germany), in field experiments with comparison values
- For consumption certificates comparison with benchmarks (Reference values); need to be found through statistical surveys (AMEV, ages, Bund)

Source: Hegner (2005)

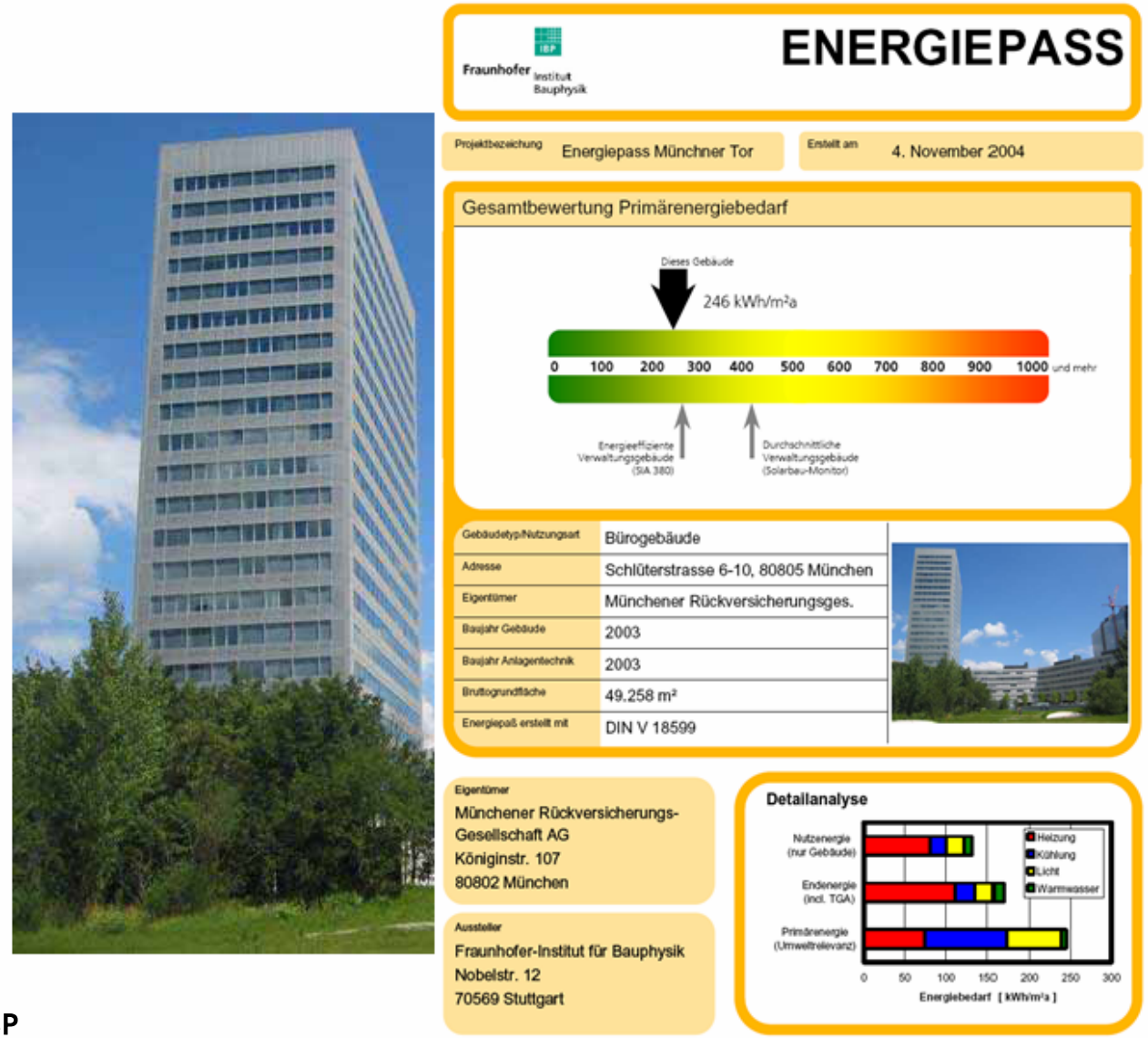
Diskussion zu Verbrauchsausweisen Referenzwerte

Ziffer BWZK	Gebäudegruppe	Referenzwert Heizung	Referenzwert Strom
		[kWh/(m^2_{NGF} a)]	[kWh/(m^2_{NGF} a)]
1200	Gerichtsgebäude	120	19
1300	Verwaltungsgebäude	105	24
2000	Geb. für wiss. Lehre und Forschung	120	18
	…	…	…
	…	…	…
4000	Schulen (gesamt)	120	14

Source: Hegner (2005)



Benchmarking : Part of an Integrated Approach to Energy Performance



Source: Fraunhofer IBP

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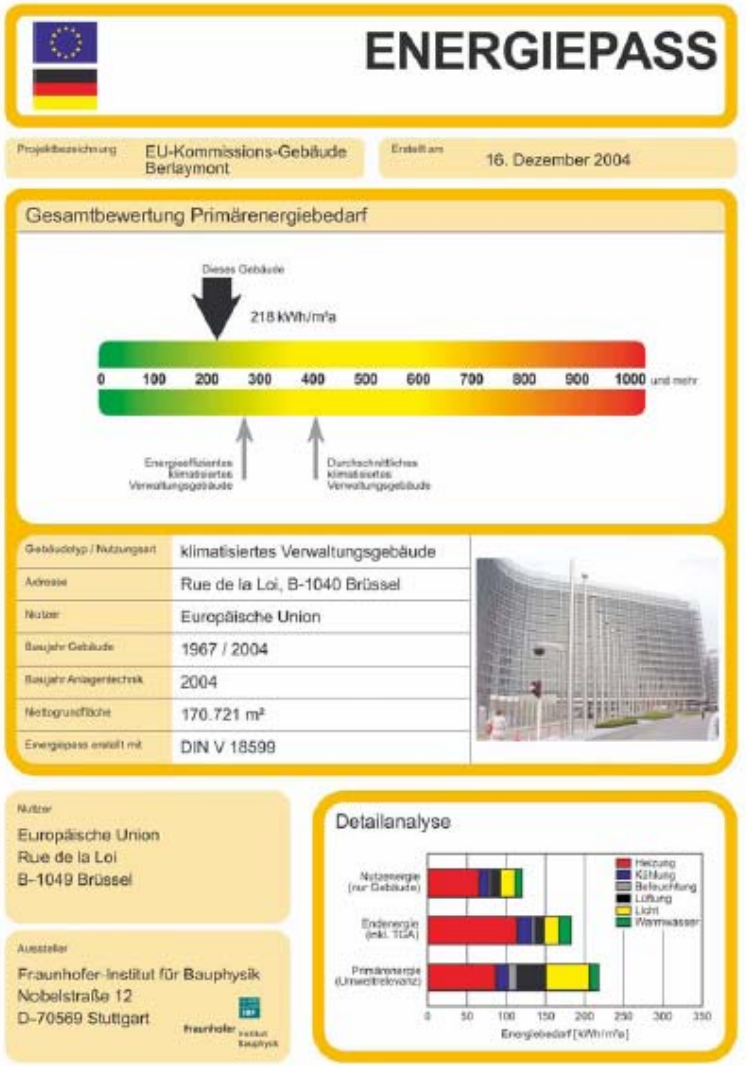
Benchmarking the Münchner Tor



Source: Fraunhofer IBP

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Benchmarking Berlaymont

Source: Fraunhofer IBP

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Benchmarking the German Reichstag

	Austria ▼	France ▼	Germany ▼	Netherlands ▼	Poland ▼	Portugal ▼
No. of Zones ►	19(144)	2	8	3	10	58
Net Energy (specify units)►	127,1 kWh/m²a		120,38 kWh/m²a		129,7 kWh/m²a	139,5 kWh/m²year
Final Energy (specify units)►	198,2 kWh/m²a		182,69 kWh/m²a		170,9 kWh/m²a	155,6 kWh/m²year
Primary Energy (sp. units)►		101 kWh/m²a	217,64 kWh/m²a	71.285.029 MJ/year	223,4 kWh/m²a	3.933.038 kgep/year
Net Energy (specify units)						
Heating►	63,12 kWh/m²a		65,31 kWh/m²a		35,8 kWh/m²a	1,1 kWh/m²year
Cooling►	13,24 kWh/m²a		12,72 kWh/m²a		30,1 kWh/m²a	50,6 kWh/m²year
AC moisture/humidifying►	7,39 kWh/m²a		2,68 kWh/m²a		7,4 kWh/m²a	(included in cooling)
Ventilation (mechanical) ►	16,55 kWh/m²a		12,12 kWh/m²a		5,9 kWh/m²a	(included in heating and cooling)
Lighting►	18,19 kWh/m²a		18,69 kWh/m²a		13,4 kWh/m²a	14,5 kWh/m²year
Domestic Hot Water►	8,57 kWh/m²a		8,86 kWh/m²a		8,7 kWh/m²a	-
Solar Energy►			n.a.			-
Cogeneration►			Included in primary energy conversion		74,7 kWh_e/m²a	Included in primary energy conversion
Equipment (if included) ►			n.a.		23,2 kWh/m²a	34,7 kWh/m²year
Pumps and Fans►			4,6 kWh/ m²a		3,3 kWh/m²a	27,2 kWh/m²year
Lifts and Parking►			5,57 kWh/ m²a (net parking energy)			11,4 kWh/m²year

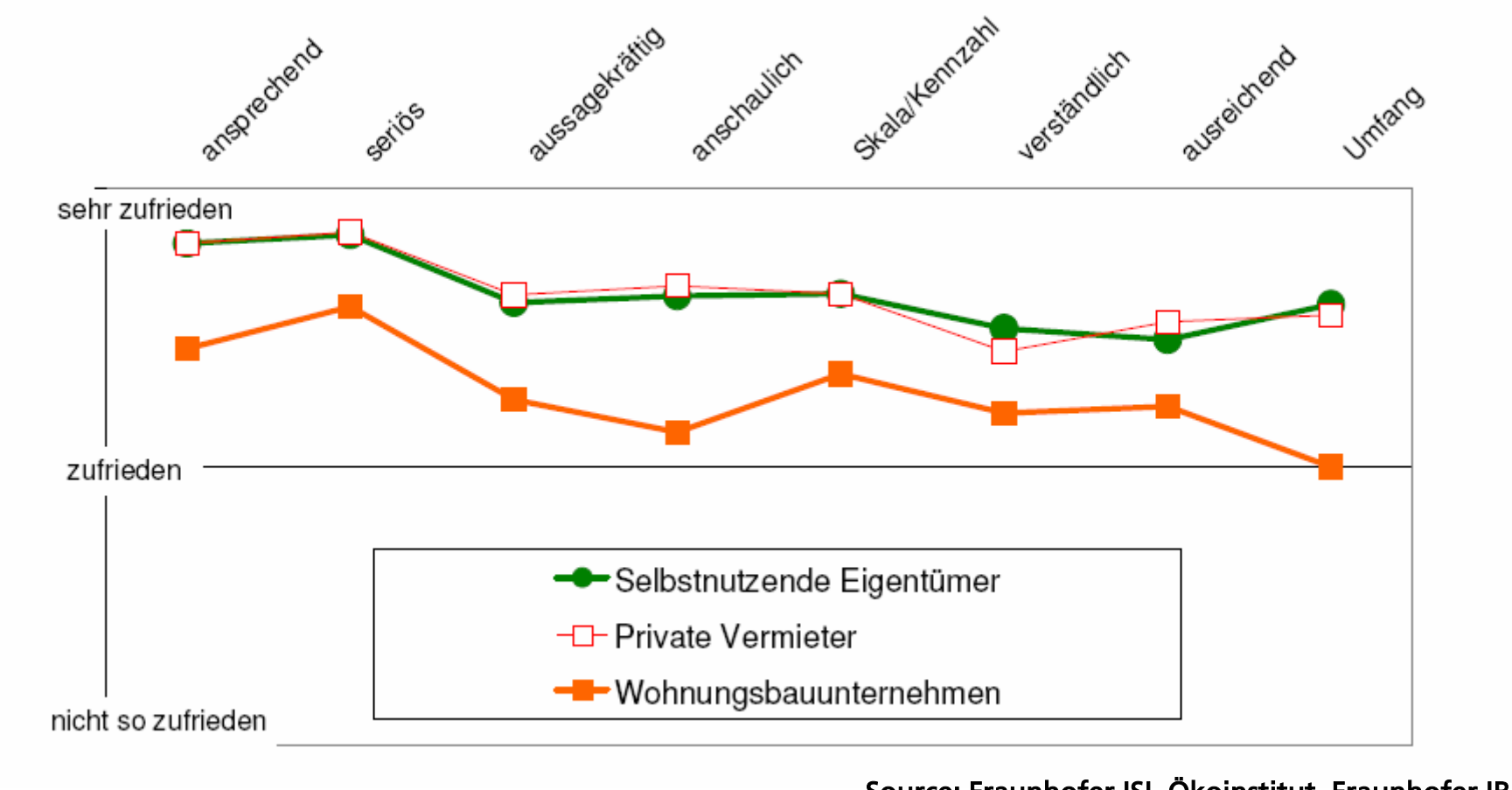
Source: European Commission, Berlaymont Report

Berlaymont Building

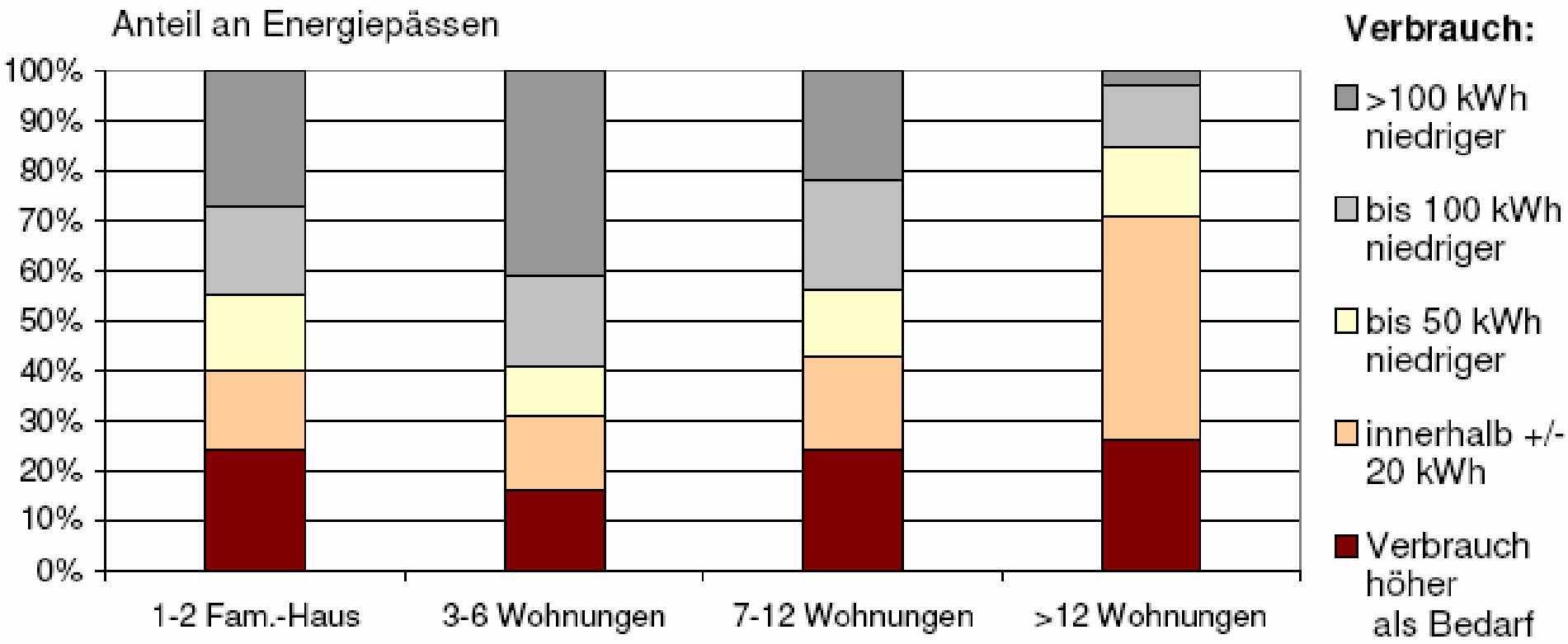
- The Member States experts participating at this exercise concluded that the certification of large and complex buildings, such as the Berlaymont, can be a challenge and the co-ordination and cooperation between Member States has been very useful to benchmark and test the different systems of certification that exist or that are new.
- As a follow up measure, the experts advanced that it may be interesting to repeat the certification in a few years using data on how the building actually performs so that a comparison can be made. The building could then be treated as "existing" rather than "new" or "major renovation", testing an operational rating against the initial asset rating, the only possibility at the opening of the building in November 2004.
- In addition, replicating the Berlaymont exercise, but using other key European buildings, or a "normal" type of building in each country, would be an interesting follow up measure in order to set up a matrix of different buildings, and use it to compare and extract conclusions, notably towards greater harmonisation.
- Finally, it results from the project that more work needs to be put on the accuracy, the methodologies as well as on technical issues related to the energy certification that are on the basis of its credibility.

Source: European Commission, Berlaymont Report

Judgement of the German Energy Certificate



Source: Fraunhofer ISI, Ökoinstitut, Fraunhofer IBP (2005)



Source: Fraunhofer ISI, Ökoinstitut, Fraunhofer IBP (2005)

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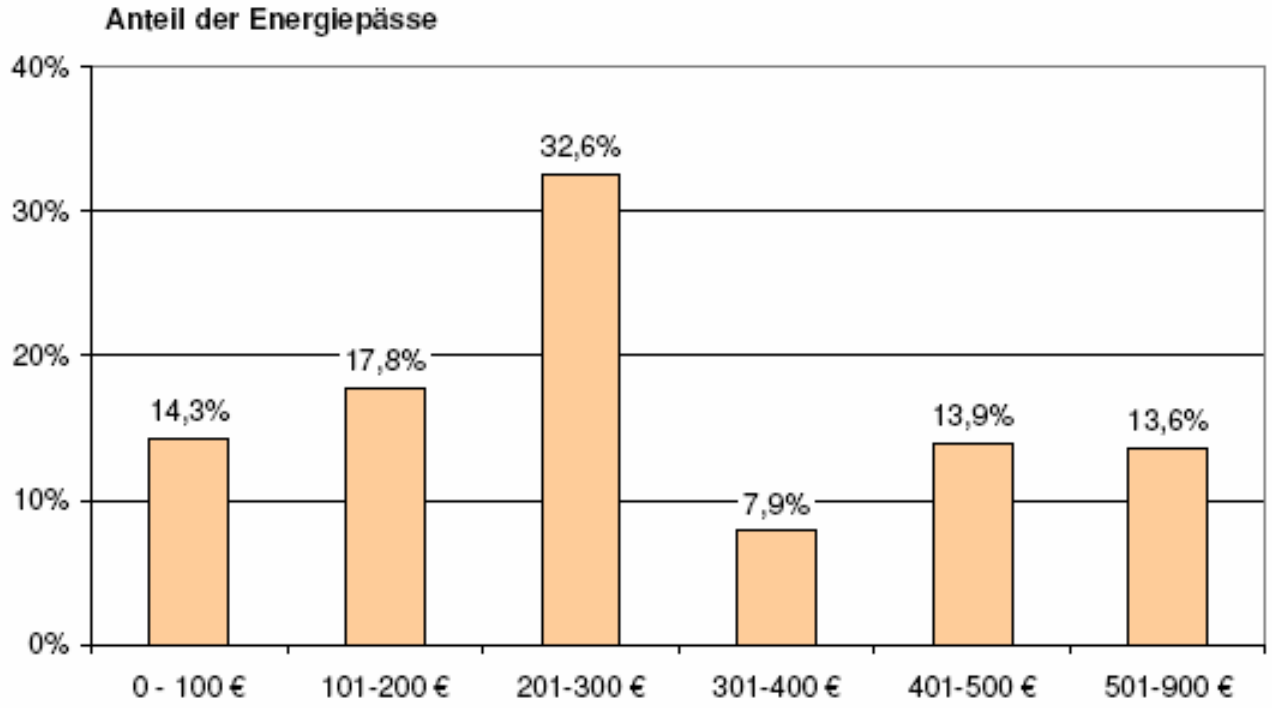
Deviation Energy Demand from Energy Consumption

Critics from the Building Management Companies

- Die Hauptgründe für die Ablehnung des Energiepasses durch Teile der Wohnungswirtschaft sind vor allem die Kosten des Passes bei umfangreichem Gebäudebestand und mögliche Unterschiede zwischen dem errechneten Energiebedarf und dem tatsächlichen Energieverbrauch bzw. den Heizkosten.
- Es wird außerdem befürchtet, dass infolge der Modernisierungsempfehlungen im Energiepass von Seiten der Mieter Druck auf die Wohnungsunternehmen ausgeübt werden könnte.
- Man kann aus den Befragungen schließen, dass einige Wohnungsbauunternehmen den Mietern unterstellen, dass sie den Pass in seiner jetzigen Form nicht verstehen und ihn als Druckmittel einsetzen würden – Vorurteile, die durch die wenigen verfügbaren Mieterinterviews nicht bestätigt werden konnten.

Source: Fraunhofer ISI, Ökoinstitut, Fraunhofer IBP (2005)

Costs of Energy Certificates (without subsidies)



Gesamt: 1.387 Energiepässe,

davon

32 % unter 200 €

65 % unter 300 €

Source: Fraunhofer ISI, Ökoinstitut, Fraunhofer IBP (2005)

Benchmarking Energy Performance in Minnesota Schools

- The State Energy Office is working with the Minnesota Department of Administration to develop a database to benchmark all Minnesota public buildings, including schools. Benchmarking school administrators and facilities managers identify buildings with the largest potential for improving energy performance.
- The State Energy Office has designed a database for benchmarking state buildings and has begun a pilot survey to collect information about public building energy use. Energy office staffs include tools for benchmarking as part of their workshops to facilities managers.
- Benchmarking means comparing energy consumption for a particular building with that of similar buildings to determine a rating, usually a scale of zero to 100 (percent). According to a national study, there is an energy cost savings potential of 50% or greater for buildings with a benchmark rating below 20%, and a savings potential of 35% to 50% for buildings with a benchmark rating between 20% and 40%.

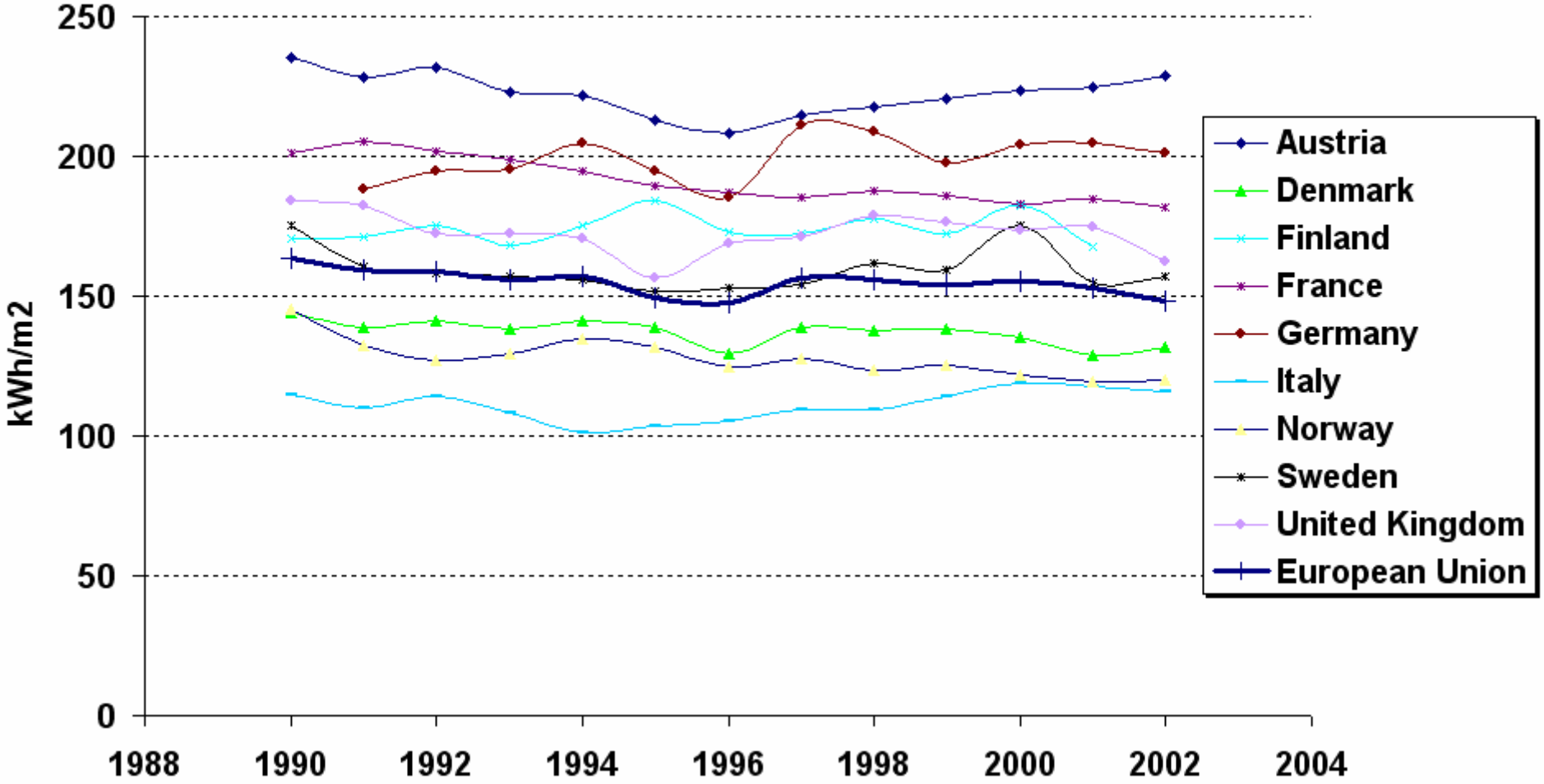
Source: http://www.eere.energy.gov/state_energy_program/project_brief_detail.cfm/pb_id=930

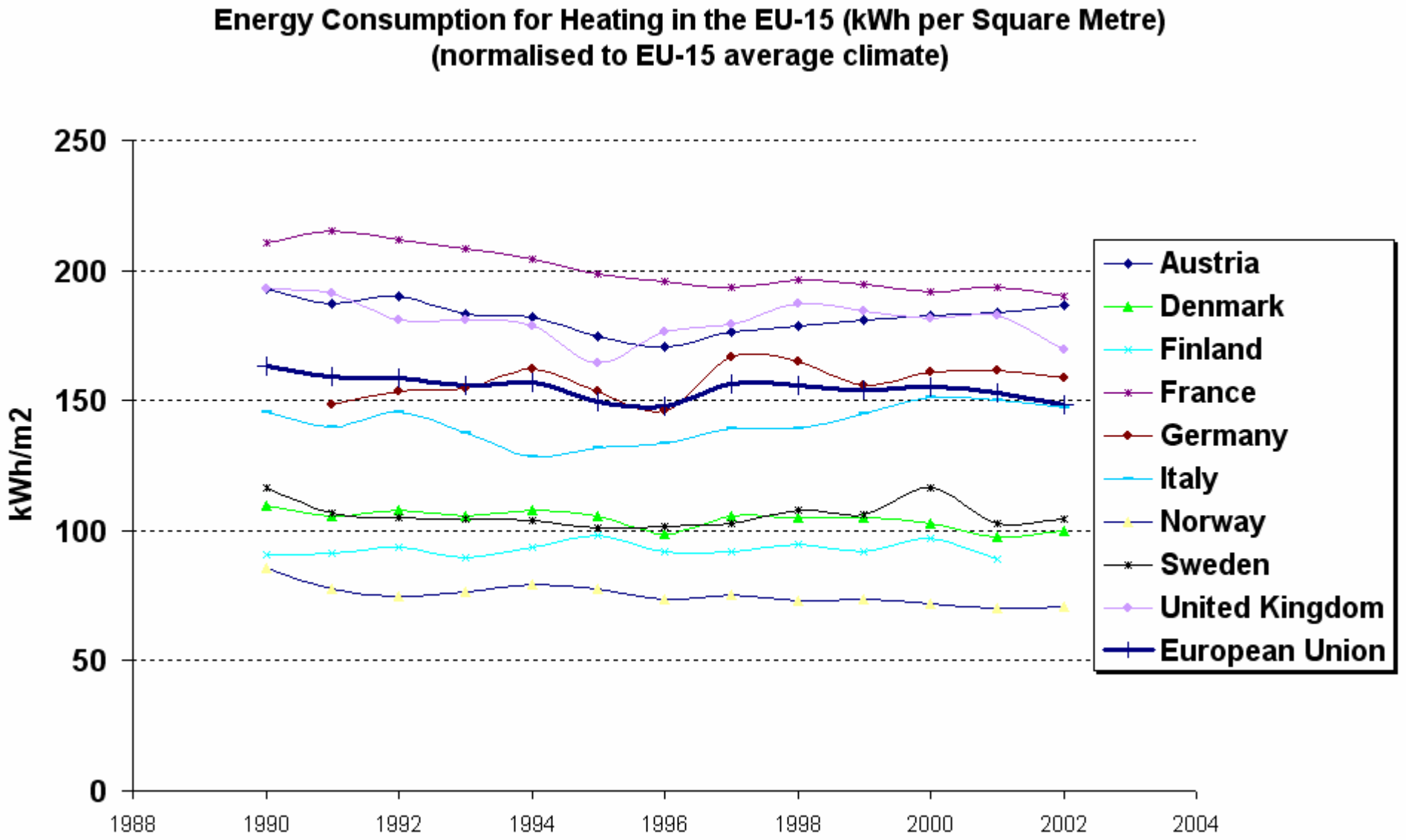
California to Benchmark the Energy Efficiency of State and Commercial Buildings (October 2005)

- The California Energy Commission (CEC) published in September a plan to implement Governor Arnold Schwarzenegger's directive to design an energy efficiency benchmarking system for California's public and commercial buildings. Schwarzenegger issued the order on December 14, 2004, that included more than 14 items (California's Executive Order S-20-04).
- Benchmarking measures a building's energy use and compares it with that of similar buildings. The CEC is developing a California-specific benchmarking tool that contains a database of thousands of commercial buildings in California. Until it is available, the CEC urges building owners and the California Department of General Services (DGS) to use in the meantime the U.S. Environmental Protection Agency's Energy Star® Portfolio Manager program for benchmarking. The EPA's benchmarking database contains data for more than 5,000 buildings, only 850 of which are located in California.
- DGS is collecting data that measure energy consumption and intensity, which is measured as consumption per square foot. The agency also helps local governments in California improve the energy efficiency of their buildings.

Source: /www.energy.ca.gov/2005publications/CEC-400-2005-051/CEC-400-2005-051-CMF.PDF

Energy Consumption for Heating in the EU-15 (kWh per Square Metre)
(climate corrected)





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Performance Benchmarking of the Building Stock