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Training Seminar

Evaluation of energy efficiency trends and potentials

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Indicators of energy efficiency and market analysis: the ODYSSEE-MURE project

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Why energy efficiency indicators

- **To** monitor energy efficiency / CO2 targets set up by governments or international organisations (EU Commission, UNFCCC); targets expressed:
  - in volume of savings (GWh, Mtoe, MtCO2 saved per year for a given year)
  - as ratios (e.g. , % of savings, % of renewables in energy consumption, gross electricity consumption
  - As yearly variation (%/year): target of energy intensity increase , of energy efficiency improvement

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Example of official targets: French energy efficiency and climate change strategies

(2005)

reduce GHG émissions by 3% yearly to reach the factor 4 by 2050 (and Kyoto targets in the middle term)

reduce energy intensity by 2% yearly in 2015

21% of renewable electricity in gross electricit consumption

50% increase of renewable heat

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The Energy Service Directive (ESD)

The content

- Objective: to increase energy efficiency and to transform & grow the market for energy services
- National mandatory energy savings target of 1% each year for a 6 year period
- Scope: All end-use sectors, except:
  - energy intensive industries and aviation and foreign shipping
- Sub-target on the public sector (1.5%)
- Obligations on distributors/retailers to be involved in promoting energy services to customers

Obligation of reporting with the use of indicators EU Decision 280/2004/CE (article *1)*

- To perform the GHGs inventory.
- To carried out a report on demonstrable progress on KP commitment
- Article 7 : Values of the indicators of the priority list , on a yearly basis (table II- 1; II-2 ; II-3 of annexe II)

Why energy efficiency indicators *(cont'd)*

- To evaluate energy/CO2 policy measures so as to improve the planning of future actions
- To compare the countries progress and performance in energy efficiency and assess potential for reduction (energy efficiency improvement/ CO2 abatement)
- To feed bottom-up demand forecasting models/

  Indicators = input variables of energy demand models

  Good understanding of past trends improve the forecasts

Overview of EU projects on energy efficiency evaluation:Odyssee-MURE (EU-15) and EEE-NMC (New Member Countries)

ODYSSEE-MURE and EEE-NMC

Two projects having in common to rely on comprehensive and detailed data bases:

- on energy efficiency indicators and CO2 indicators at macro or sectoral levels (1980-2003 for Odyssee, about 200 indicators)
- On policy measures by sector

Coverage of EU-15+ Norway and NMC's + Bulgaria

Main objectives:

- to analyse the past achievements in terms of energy efficiency progress and CO2 abatement
- to analyse and compare the policy measures implemented and their impact, based on existing evaluations

ODYSSEE-MURE and EEE-NMC (cont'd)

Both projects rely on a network of national energy efficiency agencies, sometimes formally associated to national statistical organisations (5 countries out of 25)

Publication of reports by country and for the E , country profiles and sectoral profiles

ODYSSEE and MURE data base: a framework for the compilation of:

- **all relevant data on energy efficiency/CO2 evaluation from multiple sources (national and EU level as SAVE monitoring studies)**
- **All policy measures implemented and their impact evaluation whenever available =>memory function**

The ODYSSEE-MURE network

ADEME

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Fraunhofer ISI Institute Systems and Innovation Research

AEA TECHNOLOGY ENVIRONMENT

ADENE AGÊNCIA PARA A ENERGIA

AUSTRIAN ENERGY AGENCY

KAПE CRES

DANISH ENERGY AUTHORITY

ECN

ECONOTEC

ENEA

IDAE Instituto para la Diversificación y Ahorro de la Energía

IFE

Motiva

sei SUSTAINABLE ENERGY IRELAND

Swedish Energy Agency

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The EEE-NMC network

9 energy efficiency agencies from NMC's and Bulgaria

2 Statistical offices

2 consultants from NMC's to assist their national agencies

1 University

Technical coordination: ADEME, with Enerdata (indicators), FhG-ISI (policy), DEA (Baltic countries), Energy Charter Secretariat (ECS) 5polcy analysis and dissemination)

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The energy efficiency indicators in the Odyssee-MURE and EEE-NMC project

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Different types of energy efficiency indicators depending on their role

- Indicators to monitor trends in energy efficiency and CO2 abatement by country: descriptive and explanatory indicators

  Indicators to compare the energy efficiency "performance" level of a country with other countries

  Diffusion indicators to measure the diffusion of efficient technologies and practices

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Energy efficiency indicators: several types depending on their units

- Economic ratios : energy intensities, carbon intensity
  => monetary indicators
- Technico-economic ratios : unit consumption or emissions
  => physical indicators
- Energy/CO2 savings (Mtoe, TWh, MtCO2)
- Index of progress

Descriptive indicators

- Describe overall “energy efficiency trends”

- Calculated from official statistics , as a direct ratio energy consumption/ macro-economic variable
  - Rather simple to calculate
  - Description of trends in index or annual growth rate
  - Limited interpretation

- Encompass the most simple intensities or unit consumption/emission

Explanatory indicators

- Go in more details (eg end-uses, transport modes,sub-sector)

- Aim at explaining trends with descriptive indicators,
  - Imply some calculations procedures
  - More complex and difficult to understand
  - Often combined with descriptive indicator to provide an interpretation
  - Can be based on estimates or surveys

- Encompass more complex intensities or unit consumption as well as energy/CO2 savings indicators as well as index of progress

Comparison indicators

Adjusted indicators from quantifiable differences in

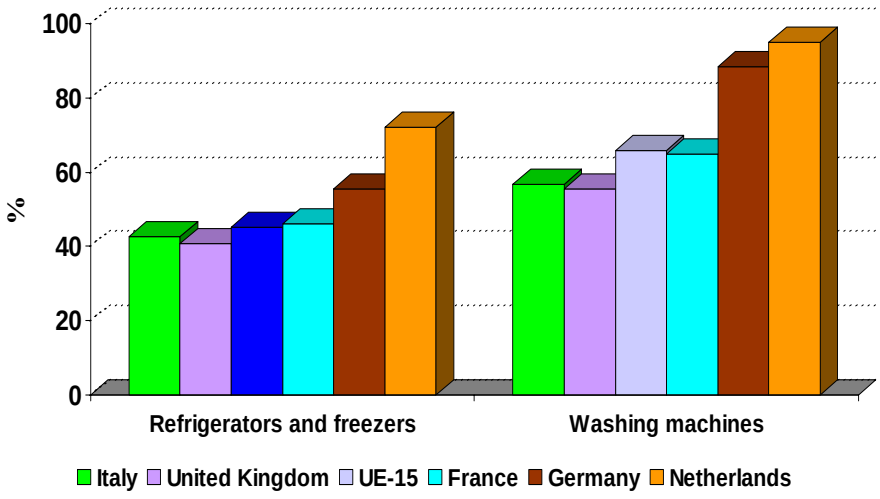
- Price difference for all monetary indicators
- Climate
- Industry structure (share of industrial branches in industrial activity)
- Economic structure
  - EU average taken as reference

Benchmark/target indicators : calculated for each country with the countries characteristics and the energy performance of "target countries" or benchmark values (eg the EU-15 performance for the NMC's)

- **Can show the potential of savings**

Example of diffusion indicators

Market shares of appliances labelled A (2003)



Indicators used to explain the trends observed in energy efficiency or to estimate savings (CFL, condensing boilers…)

Three types:

•Efficient equipment

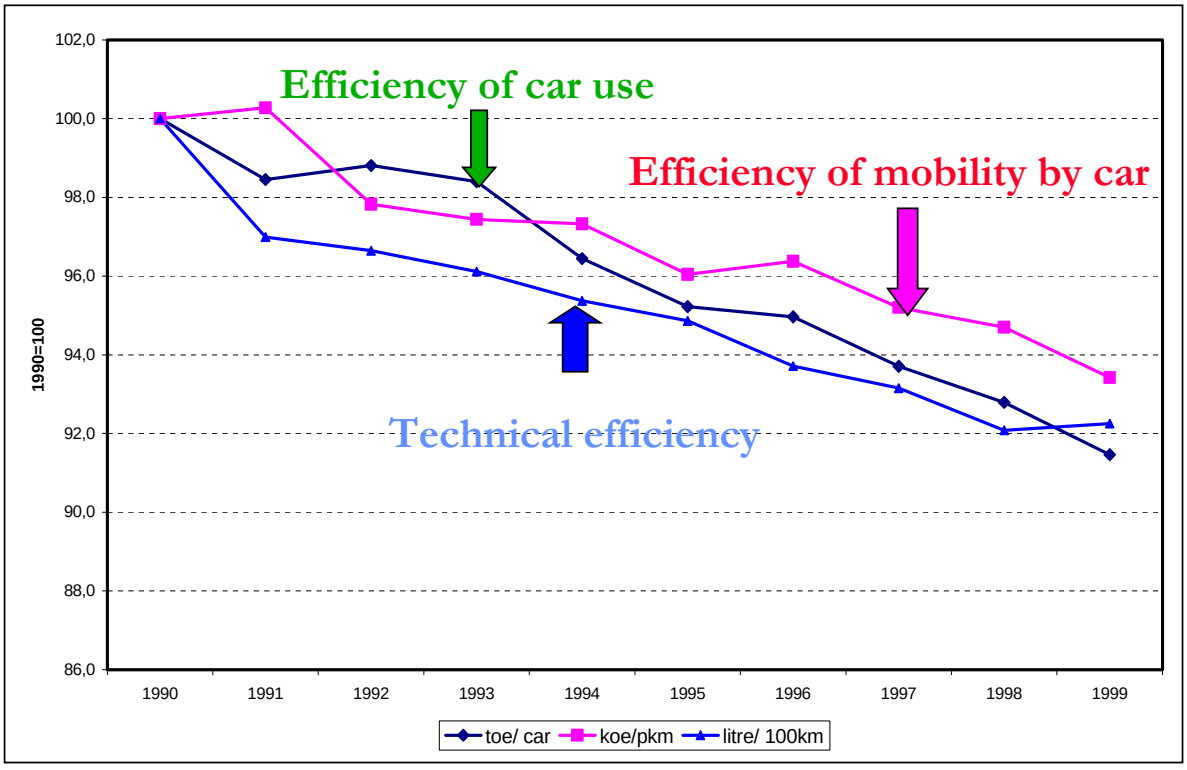
•Renewables

•Efficient practices (combined rail road freight traffic)

Why many indicators

- In the ODYSSEE project : about 200 indicators and number is increasing
- Each indicator answer to a specific question : depending on the question, one or several indicators can be considered
- Energy efficiency has different meaning and frontiers (economic efficiency versus technical efficiency)
- Several indicators often necessary to cope with possible data gaps (alternative indicators)
- Interpretation provided by comparing several indicators

Indicators to assess the energy efficiency of cars: : 3 ratios per car, per pkm, per 100km



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Originality of the ODYSSEE and EEE-NMC data base on indicators

Wider range of indicators than official indicators of monitoring, especially explanatory indicators; monitoring is important but understanding even more important

Decentralization of data collection => a guarantee to have the best data available in each country in the data base and a rapid updating to monitor the most recent trends

Great expertise and flexibility to develop new indicators to answer all new questions

Focus on quality control (regular reports on data problems)

Availability of indicators for the EU as a whole , much beyond what is currently available from existing data at Eurostat

Use of ODYSSEE indicators and expertise in the monitoring of ESD Directive, in the IEA work on indicators….

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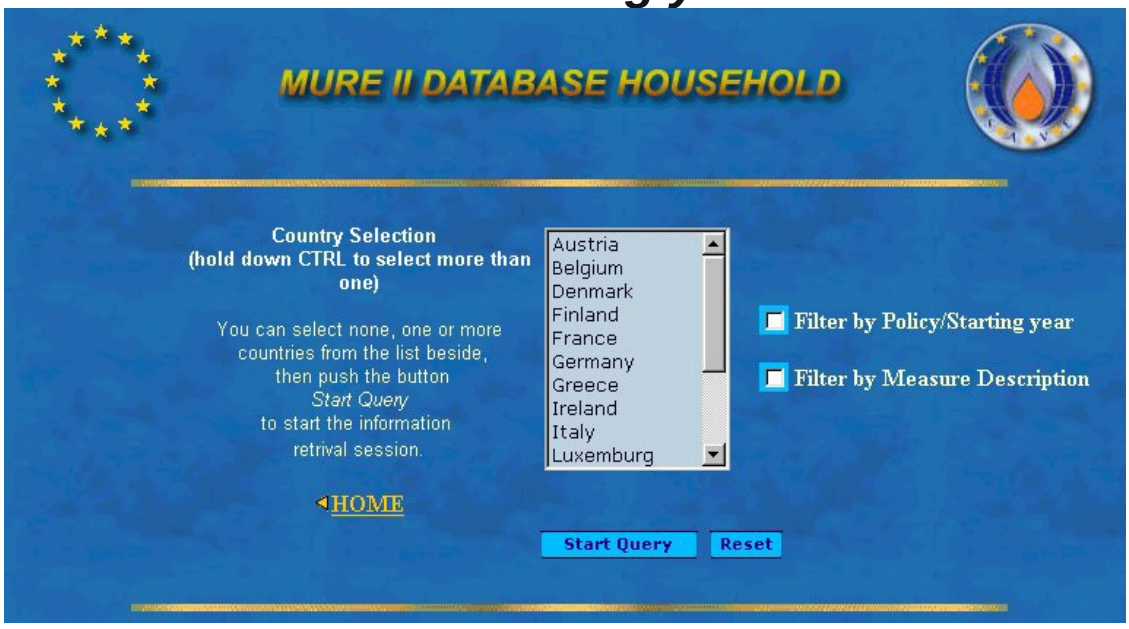
Data base on policy measures in the ODYSSEE-MURE and EEE-NMC projects

MURE in brief

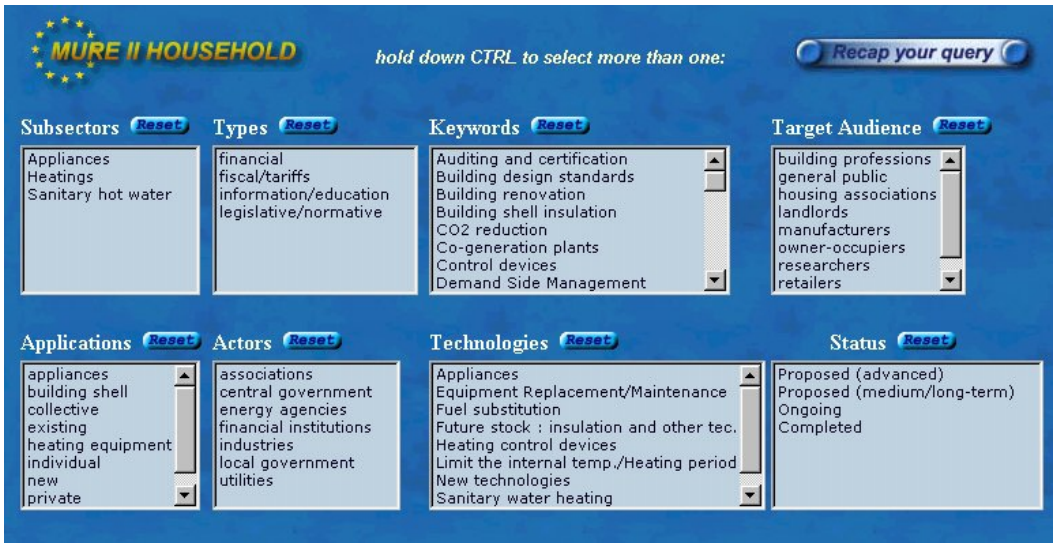
- **A comprehensive database of RUE measures, for each EU member state, for the EU, and for all end-use sectors (Household, Transport, Industry and Tertiary): on line access at www.mure2.com**

- **A simulation tool, allowing to build and run RUE scenarios to calculate potential costs and impacts associated to RUE policies and measures**

MURE data base: query by measure country and starting year



MURE data base: query by various criteria



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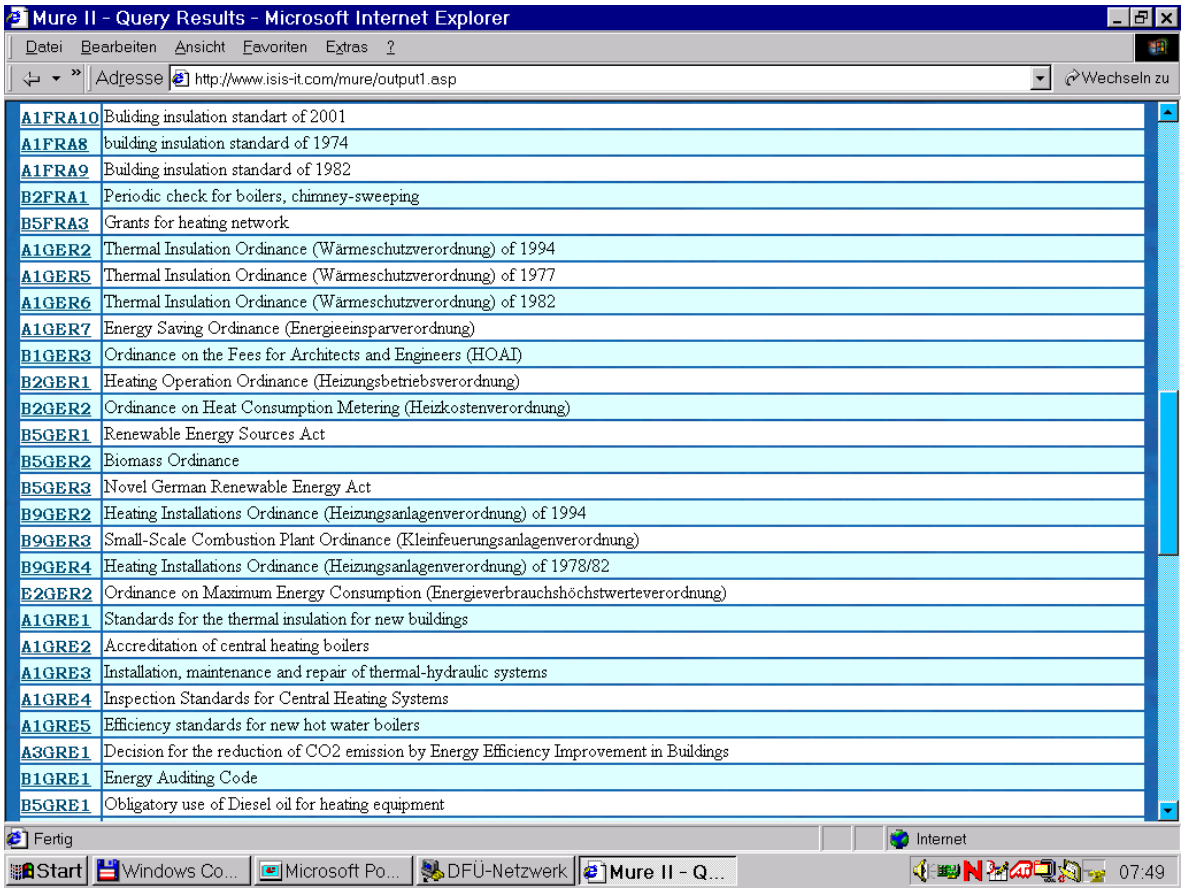
Mesures d'Utilisation Rationnelle de l'énergie



MURE data base: overview of measure

Original references of each measure is given (law..)

MURE II HOUSEHOLD

Synthetic Description

Title	Thermal insulation ordinance, past version from 1976 (the first one)
Measure Set	Design norms on heating equipment and building shell
Country	Finland
Reference	the Finnish Building Ordinance, C3+C4
Issuing Date	0/1976
Starting Date	0/1976

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MURE data base: detailed description

A 0ITA14 – Compulsory Inspection for Motor Vehicles

General description

A wide range of norms (both laws and law decrees) implemented and fine tuned the compulsory inspection motor vehicles in Italy, since the first one has been carried out in 1995 (see the Historical Data) and subsequently repeated in 1997.

Thus, general inspection for motor vehicles was defined chronologically by the following measures:

1. the New Highway Code 1993 *(Dlgs.30/4/1992 n. 285)* , art. 80 clause 4 and 12;
2. *D.M. 10/11/1994 n. 751*

The former defined the task for Ministries of both Transport and Finance to set tariffs and prices to be paid for a motor vehicles inspection. This inspection was to be carried out by:

⇒ Directorate-General for Road Traffic and Privately Operated Transport Services (MCTC – *Direzione generale della Motorizzazione Civile e dei Trasporti in Concessione*);
⇒ Specialist car workshops, authorised with license issued by the MCTC.

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MURE data base: detailed description plus a summary of evaluation impacts whenever available

Impact evaluation (methods and results)

Methods

According to some studies carried out by Transport Ministry and Environment Ministry, possibilities for bio-fuels use is highly profitable, mainly for the low CO_2 emissions, for urban public transport.
Indeed a mixture of bio-diesel with 5% of diesel oil – applied to the whole of national buses fleet – would lead to excellent results in terms of carbonic dioxide emissions.
These results are shown in the table below and they mean 3% of the total CO_2 emissions from national public transport buses fleet.

Results

Ex-post evaluation	1995	2000		
CO_2 (kt)				
Energy (TJ)				
Ex-ante evaluation	2003	2005	2010	
Quotas of reduced CO_2 emissions (targets) (kt)	33	50	100	
Energy (TJ)				

Source: ENEA and CIPE, 2001

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DATABASE

Total Number of Measures: 848

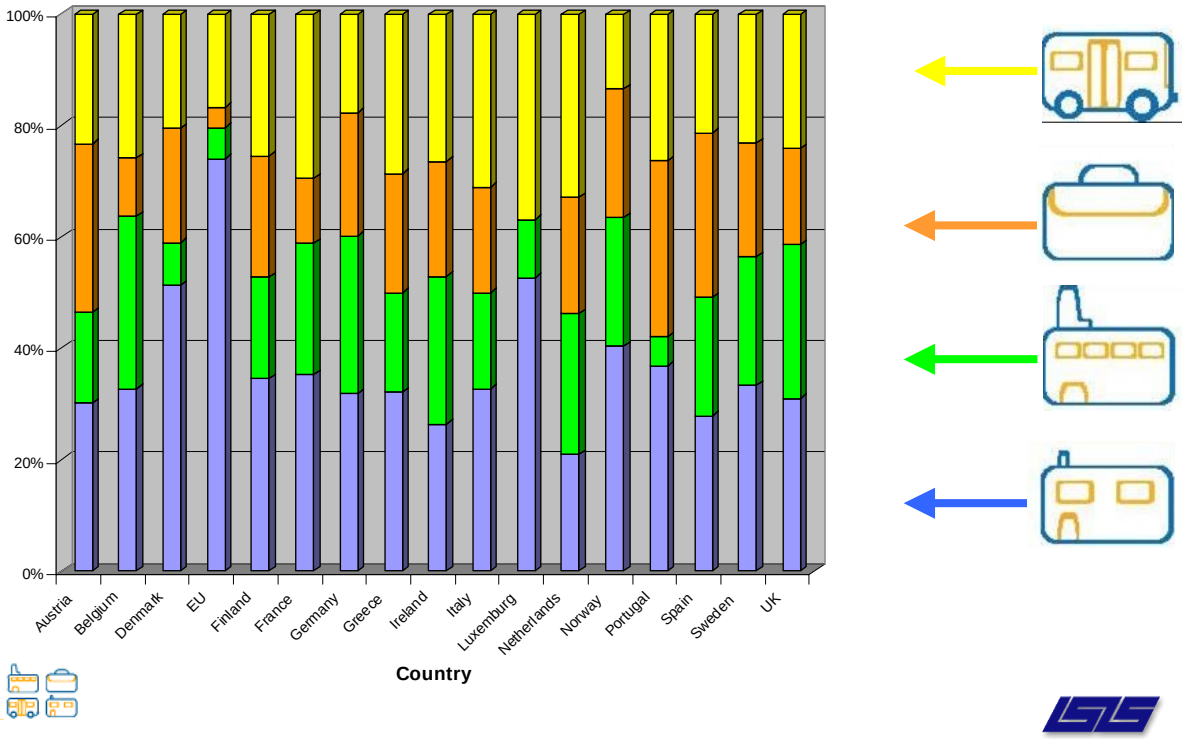
HOUSEHOLD 302

TRANSPORT 203

INDUSTRY 179

TERTIARY 164

Total Number of Measures by Country & Sector



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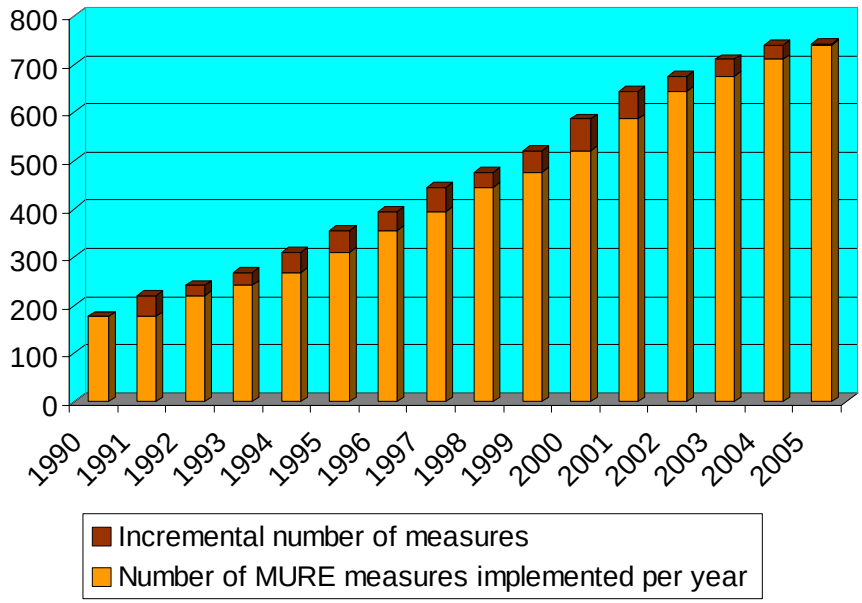
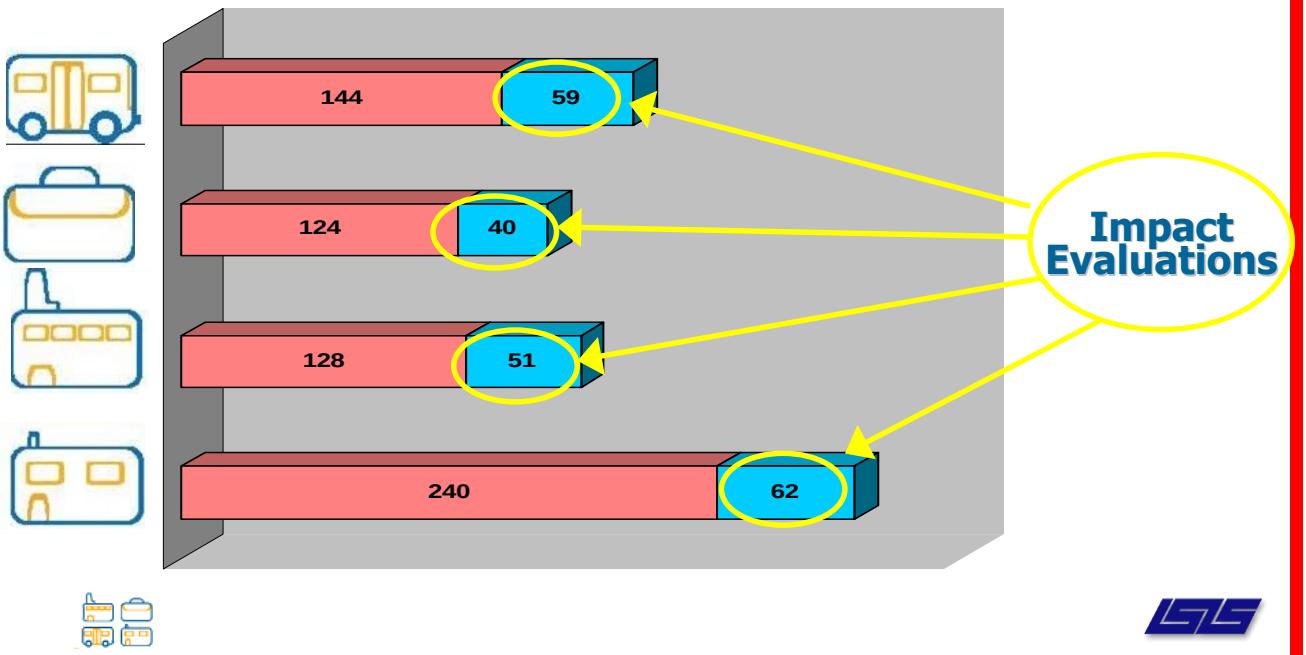
Measures Starting Years 1990-2005

Number of measures per year



Available Impact Evaluations number of measures with QUANTITATIVE impact evaluations



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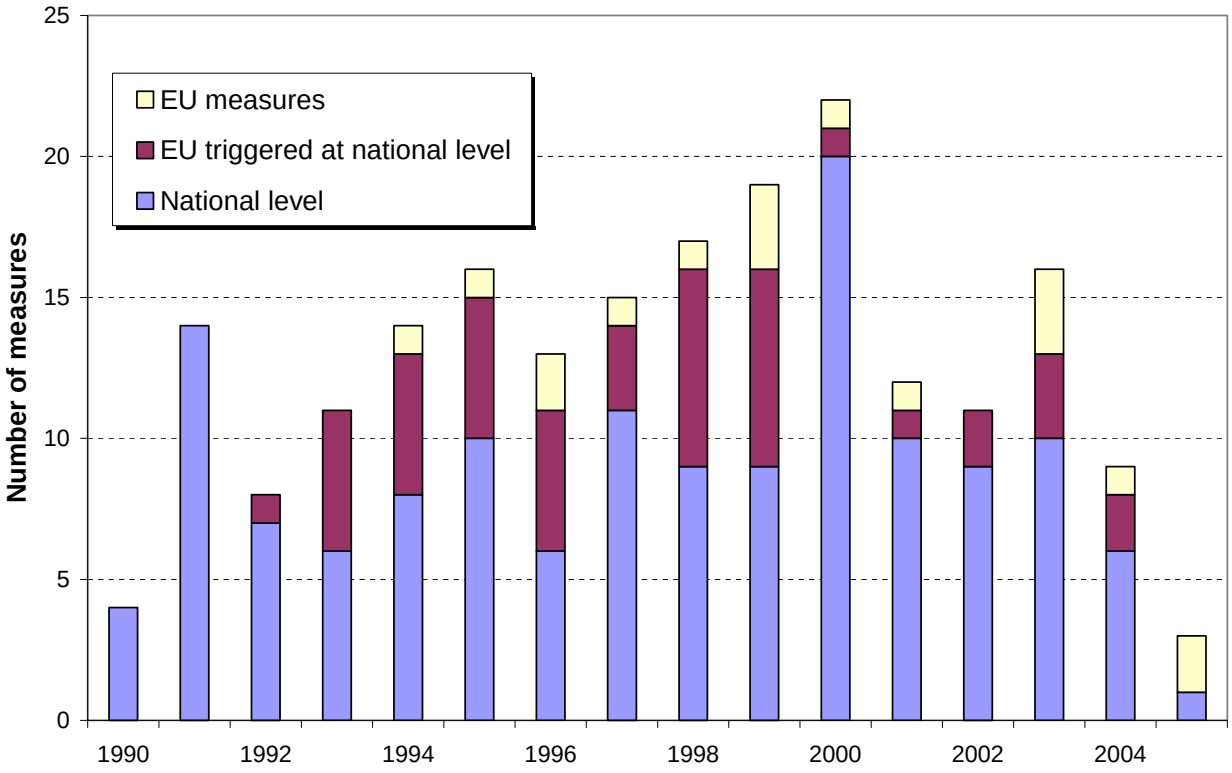
DATABASE

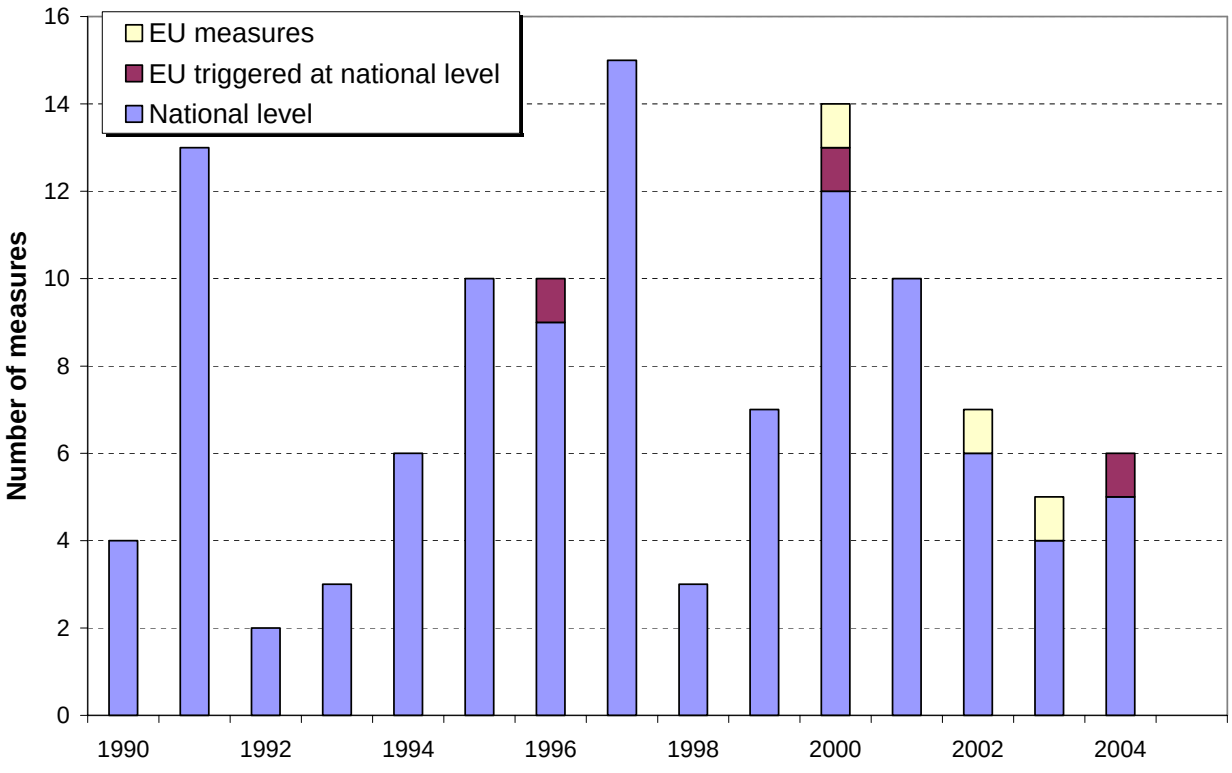
Instruments and Measures in the Residential Sector Implemented in the EU Member S

HH	Residential Sector *¤	A¤	B¤	Dk¤	Fin¤	F¤	D
	Legislative/Normative Measures¤	¤	¤	¤	¤	¤	¤
	Mandatory Standards for Buildings¤	¤	¤	¤	¤	¤	¤
1.	Energy Performance Standards¤	¤	3¤	3¤	¤	3¤	3
2.	Minimum thermal insulation standards¤	2¤	1¤	3¤	3¤	¤	¤
¤	*Regulation for Heating Systems CC*¤	¤	¤	¤	¤	¤	¤
3.	Minimum efficiency standards for boilers¤	3¤	3¤	1¤	2¤	2¤	1
4.	Compulsory replacement of old boilers above a certain age¤	¤	¤	¤	¤	¤	3
5.	Thermostatic zone control¤	¤	¤	¤	¤	¤	3
6.	Control systems for heating (Regulation)¤	-¤	¤	¤	-¤	¤	3
7.	Mandatory heating pipe insulation¤	-¤	¤	¤	-?¤	¤	3
8.	Periodic mandatory inspection of boilers¤	-¤	¤	3¤	¤	1¤	3
9.	Periodic mandatory inspection of Heat Ventilation AC (HVAC)¤	¤	¤	¤	¤	¤	¤
¤	*Other Regulation in the Field of Buildings*¤	¤	¤	¤	¤	¤	¤
10.	Individual billing (multi-family houses)¤	-¤	¤	¤	?¤	2¤	3
11.	Maximum indoor temperature limit(s)/limitation heating period¤	¤	¤	¤	1-?¤	1¤	¤
¤	*Mandatory Standards for Electrical Appliances*¤	¤	¤	¤	¤	¤	¤
12.	Minimum efficiency standards for electrical appliances¤	1¤	1¤	1¤	1¤	1¤	1
13.	Mandatory measures for efficient lighting¤	2¤	2¤	2¤	2¤	2¤	2
	Legislative/Informative Measures¤	¤	¤	¤	¤	¤	¤

Measure Dynamics: Residential Sector



Measure Dynamics: Industrial Sector



Energy efficiency measure patterns residential sector: overall picture