Introducing the JRC-IDEES database

Seville, 01/03/2016

Joint Research Centre
the European Commission's
in-house science service

JRC-IDEES

Integrated
Database of the
European
Energy
Sector

OVERVIEW

JRC-IDEES is a ***first-of-its-kind database*** that provides a very detailed decomposition of energy use in all sectors of the energy system

Geographical coverage:

EU Member States

Time horizon:

2000-latest statistical year on an annual basis

update with data up to 2014 on-going

ACCESSIBILITY

The database will be made ***publicly available***

- Enhancing transparency to Member States and stakeholders
- Improving the data quality through experts and scientific feedback
- Saving resources by avoiding redundant work on decomposing historical energy data
- Offering a *common reference* that could contribute in
  - better addressing energy futures
  - allowing for improved insights of the impact of historically implemented policies on the energy system

a preliminary version was circulated to experts in March, 2015

KEY FEATURES

By construction, the database *matches Eurostat* data (energy balances, macroeconomic and demographic data, pocketbooks etc.)

Consistent approach throughout all sectors

Takes into account Member States and sector specific characteristics

- the data decomposition within each sector is tailor-made for each country

Explicitly quantifies the contribution of non-energy equipment related factors in meeting energy service

- better identification of the characteristics of energy equipment

Incorporates a very high level of sectoral detail and disaggregation by end-use

- making it usable as input for many different models
- allowing a consistent matching of policies' scopes (e.g. ETS)

Decomposes energy consumption down to the level of one representative agent (e.g. household, appliance, car)

- explicitly distinguishes between technical and behavioural characteristics
- creates a basis for defining the scope for policy action

PRIMARY DATA SOURCES

- EUROSTAT
  - Energy balances
  - Power generation statistics
  - Transport statistics
  - Pocketbook publications
  - Macroeconomic data (nama_nace and structural business statistics)
  - Demographic data
- UN databases (UNFCC National GHG Inventory Submissions, FAOSTAT…)
- U.S. Geological Survey (USGS) Minerals Information Commodity Statistics and Information; European Minerals Statistics of the British Geological Survey
- EURELECTRIC
- EPIC database (installed power plants capacities)
- EurObserv'ER (renewable energy forms)
- Official national surveys and statistics

STUDIES CONSULTED

- EC projects and studies
  - 'Survey on Energy Consumption in Households' (SECH 2010)
  - BPIE, TABULA, ENTRANZE, EPISCOPE on buildings characteristics
  - TRACCS study
  - Preparatory studies of the eco-design for energy using products
  - ODYSSEE-MURE database
  - JRC studies and reports, including
    - BREFS
    - SETIS Technology maps
- IEA reports
- U.S. DOE studies and reports
- Industry associations statistics, studies and reports

RESIDENTIAL AND SERVICES

Characterisation of the energy installation at the level of the representative agent

Thermal uses link to the 'representative building cell' (square meters)

- Installed capacities of energy using equipment
- Explicit techno-economic characteristics
  - dynamically evolving over time
- Consumers behaviour (hours of use of equipment by energy use)

Identification of number of households by cluster type

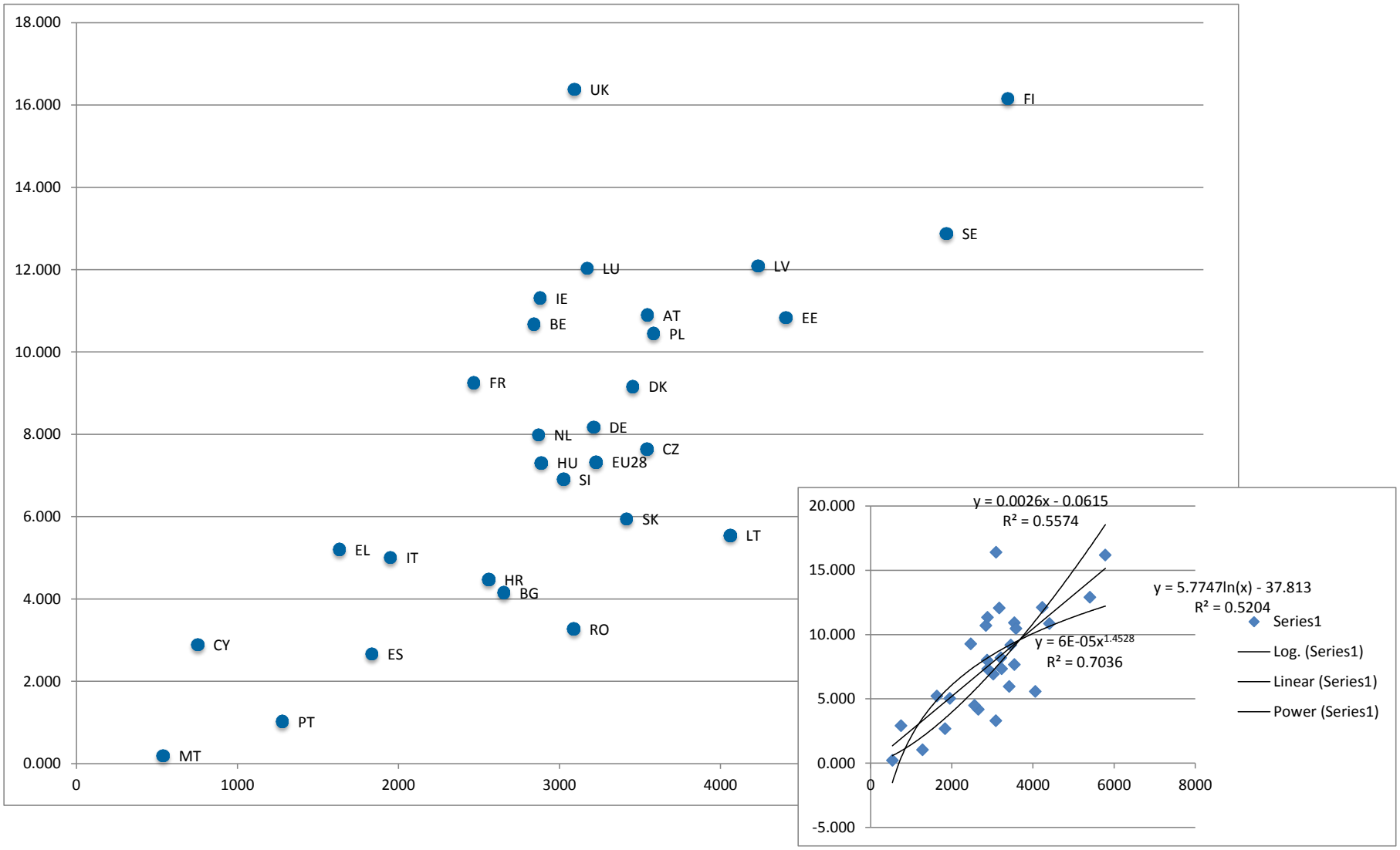
- Characterised through the combined space and water heating equipment
- Number of households equipped with solar thermal water heaters
- Different service requirements identified with explicit consideration of climate

Quantification of the contribution of non-energy equipment factors in meeting the total space heating comfort levels

Identification of heat transfer coefficient of the building shell ('u-value')

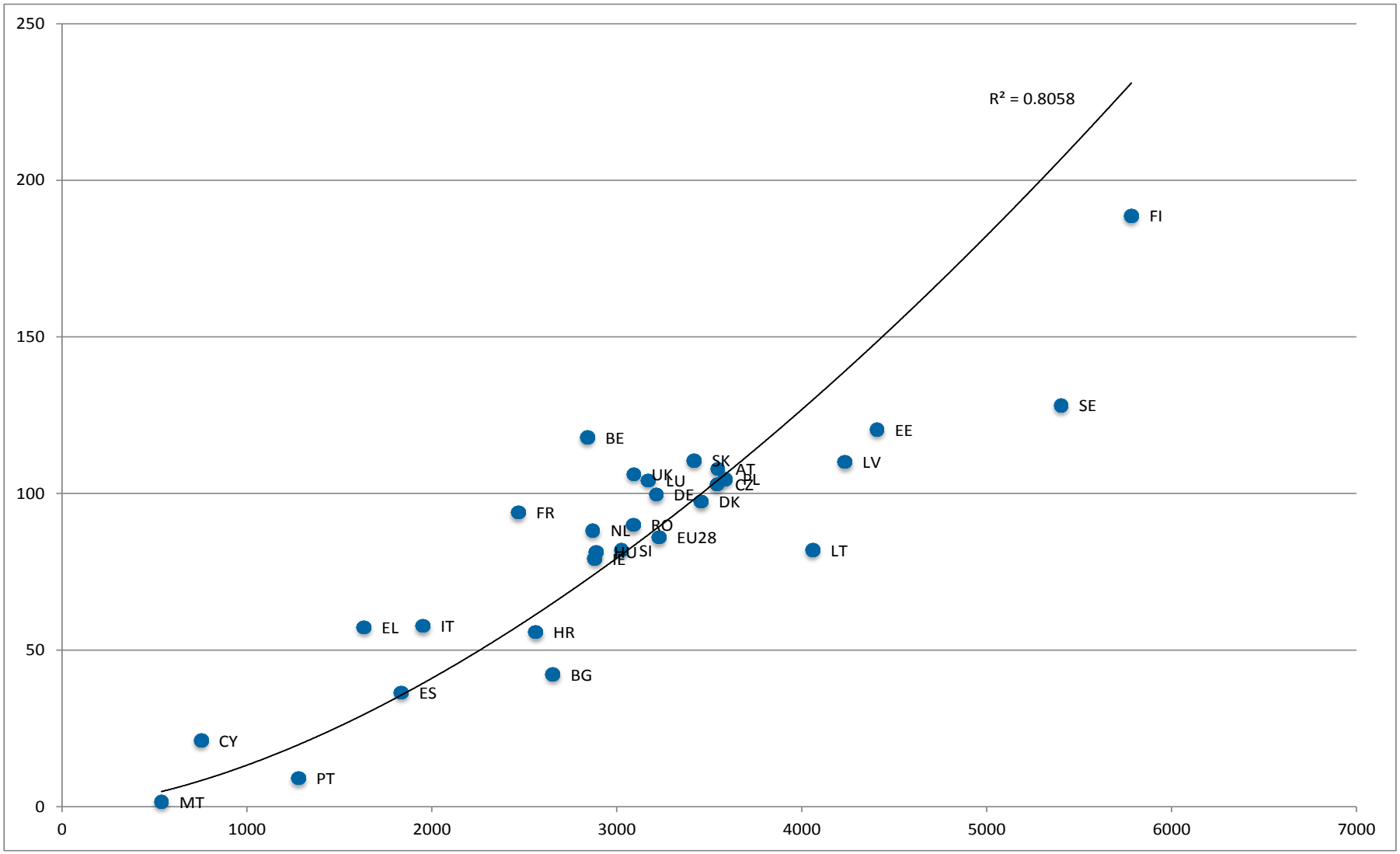
- distribution of different building types
- u-values of building's components
- develops dynamically (renovation rate and thermal properties of new buildings)

Energy use for space heating per dwelling (kWh/dwelling) over degree-days in 2010



European Commission

Energy use for space heating per m² (kWh/m²) for country specific weather conditions over degree-days in 2010



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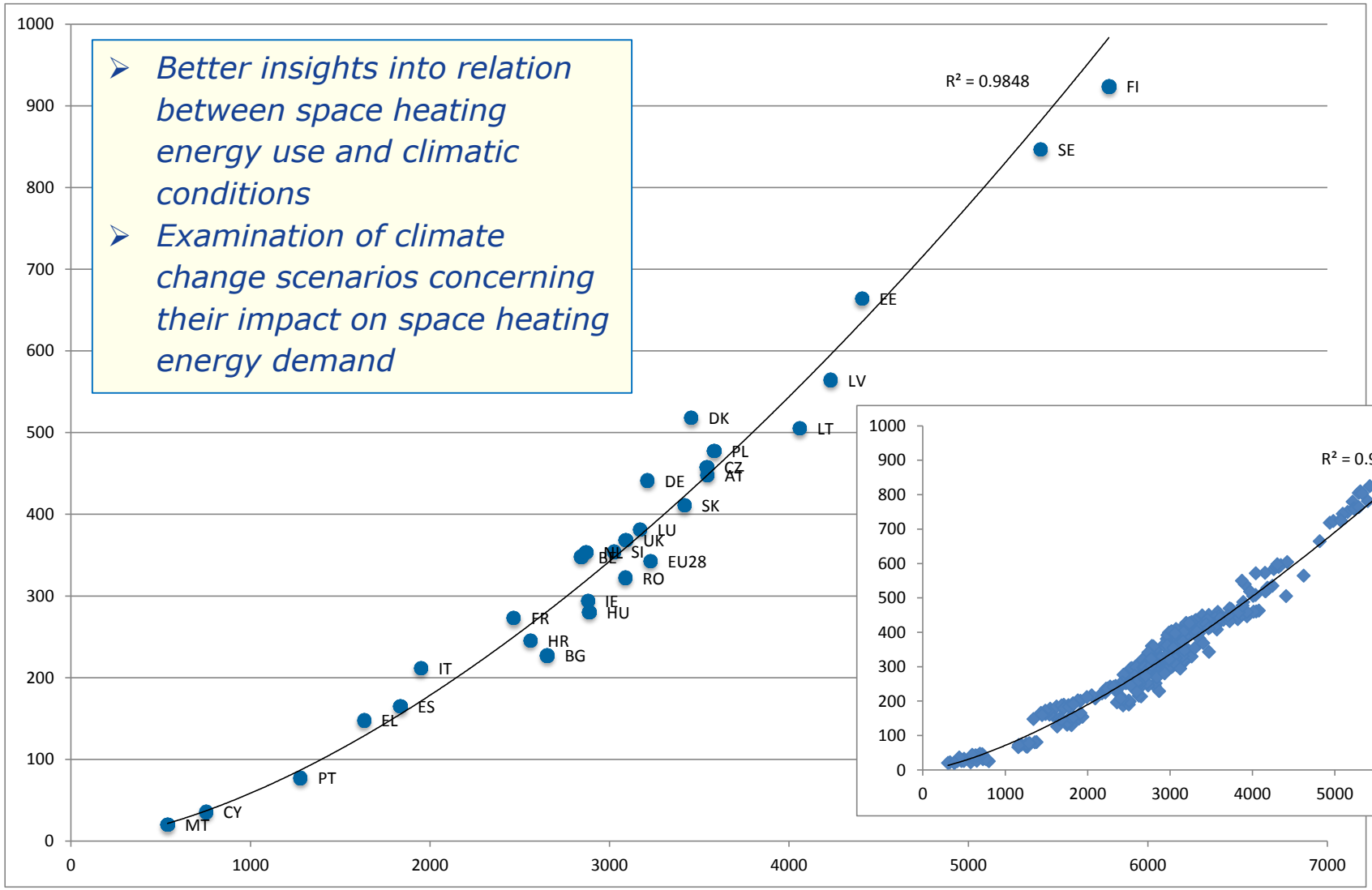
TOTAL SPACE HEATING COMFORT LEVEL PER M² (KWH/M²) FOR COUNTRY SPECIFIC WEATHER CONDITIONS OVER DEGREE-DAYS

- *Better insights into relation between space heating energy use and climatic conditions*
- *Examination of climate change scenarios concerning their impact on space heating energy demand*



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RESIDENTIAL AND SERVICES

Specific electricity uses characterised at the level of the unit

- appliance
- representative electric device (e.g. ICT equipment)

Decomposition to reflect the different drivers of energy consumption

- Operating hours
- Technical characteristics (Wattage)
- Penetration factor

Washing machine	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Consumption per household (kWh)	174.5	169.9	168.8	168.5	168.3	168.9	169.1	168.9	167.8	166.6	165.4
W per appliance (in average operating mode)	490.1	447.9	429.0	411.3	394.7	379.1	364.7	351.3	338.9	327.0	315.7
Operating hours per appliance	481.0	503.8	512.9	524.5	535.7	547.5	558.5	569.8	580.9	591.5	603.0
Penetration factor (appl. per household)	0.740	0.753	0.767	0.781	0.796	0.814	0.830	0.844	0.853	0.861	0.869

Preparatory studies under 'Eco-design of energy using products regulation' taken into consideration and matched at the EU level

INDUSTRY

Decomposition ***tailor-made*** for every Member State to account for specific characteristics

- Quantification of *structural* and *production* related differences across MS
  - Distinction between technical and structural differences
  - Explicit quantification of "physical output" equivalent for sectors with diverse products
- Country-specific production options (in order to match EUROSTAT)

Quantification of ***energy service requirements per unit of output***

- Installed capacities of energy using equipment
- Explicit techno-economic characteristics, dynamically evolving
- Differentiation between product and energy equipment efficiencies
- Operation of the equipment (rate of use)

Full consistency between energy (EUROSTAT), production statistics (USGS, UN etc.) and sector-specific technical studies

TRANSPORT

Representative "vehicle" configuration

- Explicit techno-economic characteristics (dynamically evolving over time)
- Activity expressed in km driven
  in aviation, further distinction into number of flights and flight length
- Vehicle's load factor

Identification of the stock of vehicles by technology type

Enhanced breakdown by transport mode

- Split of aviation activity between domestic, intra- and extra-EU (estimate)
  - freight aviation (intra- and extra-EU)
  - better match of scope of EU-ETS
  - captures differences in trip lengths, plane type and related fuel consumption
- Split of inland navigation in domestic coastal sea shipping and inland waterways
- Bunkers treated as a transport mode (distinction between intra- and extra-EU)

Full consistency between EUROSTAT energy and activity statistics

- Use of the newly available very detailed EUROSTAT statistics
- Territoriality principle

POWER GENERATION

Full picture of existing and under construction **stock** at *unit level*

- EPIC database
- Data crosschecked on a unit by unit level
- Consistent with EUROSTAT, EURELECTRIC and EUROBSERV'ER

500 000 power plant units in 2010

- 15 000 thermal power plant units
- 145 nuclear power plant units
- 76 000 wind turbine units
  - out of which 1150 off-shore
- 393 000 solar PV
  - out of which 293 000 with an average size of 22.1 kW
- 14 000 hydro units
  - Out of which 1 560 reservoir units
- 460 pumped storage units
- 47 geothermal
- 18 solar thermal
- 25 tidal/wave units

POWER GENERATION

Power plant stock (installed and under construction) disaggregated at the level of units by

- Fuel type
- Technology
- Electricity-only and cogeneration plants
- (CCS)
- up to four typical size classes
  - Flexible classification
  - Number of units
  - Average unit size
    - variable on an annual basis
    - reflecting commissioning and decommissioning of units
  - Explicit net & gross capacities

272 power plant types

Consistent decomposition of historical data on energy consumption and electricity/steam production

- CHP electricity
- Co-firing contribution explicitly quantified

ENERGY AND CO_2 BALANCES

JRC-IDEES provides a file that corresponds to EUROSTAT energy balances

- Easy to handle file in excel format
  - Fuel specific and sector specific versions available
- Minor inconsistencies corrected
  - Breaks in Member States time series
  - Discrepancies relative to activity data
  - Allocation of unspecified energy consumption to best match sectors

The corresponding CO_2 emissions balances are also produced

- CO_2 emissions factors in line with Commission decision 2007/589/EC
- Co-firing contribution explicitly quantified

FINAL REMARKS

The database provides a ***detailed decomposition*** of energy use by sector combining

- historical data series (statistics) and
- (generic) structural parameters derived from studies, projects and surveys

in a consistent manner

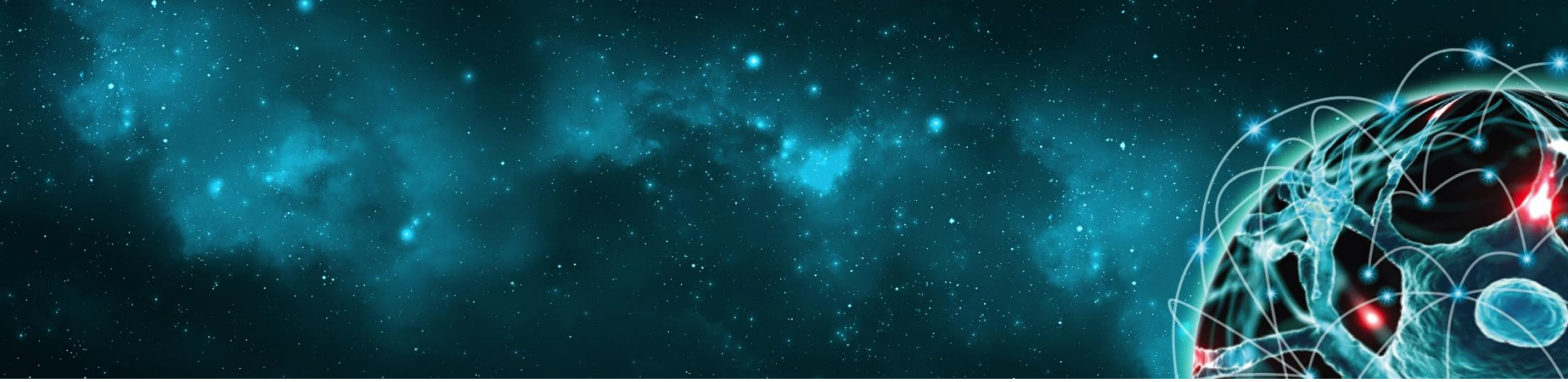
The bulk of the figures in the database are ***own estimates***

alternative quantifications of structural parameters can provide equivalently valid decompositions of data

The database can serve as a ***reference point*** both for the analysis of past trends as well as for energy modelling exercises for the future

- it quantifies the characteristics of the energy (and non-energy related) equipment in use
- it identifies different drivers and provides insights on their role by sector
- it defines a common (and flexible) basis for the EU energy system analysis

*Open access allows for improvements through a **consultation process** involving Member States experts, Stakeholders, and Academia*



Thank you for your attention

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