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Assistance in energy balance compilation and development of user-friendly tool Yerevan, 20 November 2013

BUILDING PARTNERSHIPS FOR ENERGY SECURITY

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Outline



- Demands to a modern energy statistics
- Data collection
- Data, compilation and methods
- The transformation sector
- Final energy consumption – In general
- Final energy consumption – Households
- Energy efficiency indicators
- Publication and dissemination of energy statistics
- Recommendations

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Demands to a modern energy statistics

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Demands to a modern statistics system



- In accordance with national and international standards and regulations
- Match between organisation and responsibility
- One national energy statistics – and data sharing
- Well functioning national and international networks
- Good co-operation with reporting companies
- Consistent and coherent – no redundant information
- Contain the data needed for monitoring national energy policies and for international reporting
- High degree of flexibility
- Timeliness
- Monthly and annual statistics at the web

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Key figures and energy efficiency indicators should be an integrated part of the energy statistics



Pure energy statistics cannot stand alone

Important supplements:

- Climate adjusted statistics to reveal the trends
- Key figures
- Factors and human activity behind the energy consumption
- Energy efficiency indicators
- International comparisons / Benchmarking
- CO₂ emissions



Data collection

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Questionnaires and data used in Armenia for the energy balance compilation (EASP, pp. 8-9)



- 1 monthly, 1 quarterly and 5 annual forms
- **Electricity:** Data are reliable
- **Natural gas:** Compared to electricity data are less transparent. **The major problem in Armenia is the lack of data on consumption side of energy balance** (most particularly in the agriculture and construction sector)
- **Oil:** All oil is imported. No data on consumption and stocks
- **Biomass:** A challenge. No trust in an UNDP survey
- **Recommendation:** Priority should be given to the supply statistics. But a better coverage of final energy consumption is also important

Electricity and heat questionnaire (DEA)



INOGATE
Name etc.

Fuel
consumption,
calorific
values etc.

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Unit data
from
previous
year

Survey of EI and DH-producing unit for the year 2000 30. Januar 2001

Plant-Data (applies for all units on the plant)		Internal code (2-1-3)	
Plant-name	Assels Fleivname	Number of units at the plant	3
Address	Støjbjergvej 4	Company no.	
Zip	5610 Assels	CVR-nr	61-87-72-15
Municipality	421 Assels Kommune	PIR	_____?

Unit-Data			
Unit name	Blok 1	Unit established date	(1) 01.02.84
Type of unit	Kedel	Heat capacity	18.9 MW
		E-capacity	MW
Only operated as a backup-unit [] Yes [] No			

Fuel-consumption on the unit 2000					
Fuel type	Consumption	Unit		Calorific value	
		Standard	Other unit	Standard	Actual
Coal	_____ GJ	[]	[]	25.0	_____ GJ/ton
Gas-oil	_____ m ³	[]	[]	42.7	_____ GJ/ton
Fuel-oil	_____ GJ	[]	[]	40.7	_____ GJ/ton
Waste-oil	_____ GJ	[]	[]	41.9	_____ GJ/ton
Natural gas	_____ Nm ³	[]	[]	_____	_____ GJ/1000 Nm ³
Bio-gas	_____ m ³	[]	[]	24.0	_____ GJ/1000m ³
Straw	_____ GJ	[]	[]	14.5	_____ GJ/ton
Wood-chips	_____ GJ	[]	[]	9.3	_____ GJ/ton
Wood-pellets	_____ GJ	[]	[]	17.5	_____ GJ/ton
Wood-waste	_____ GJ	[]	[]	14.7	_____ GJ/ton
Municipal waste	_____ GJ	[]	[]	10.4	_____ GJ/ton
Other	_____ GJ	[]	[]	_____	_____ GJ/ton
Unit receiving heat from other plant/company (please write amount) _____ TJ					
Name of company _____					

Energy production on the unit 2000				
Type of energy	Production	Standard	Other	Unit
Heat production ⁽²⁾	_____ TJ	[]	[]	Alternative units
delivered to net	_____ TJ	[]	[]	-> MWh, GJ, Gcal
Electricity produced	_____ MWh	[]	[]	-> MWh, GJ, Gcal
				-> GWh, kWh, GJ

Unit data reported in 1999				Efficiency 1999
Unit fuel-consumption 1999		Unit energy-production 1999		
Wood waste	30 802 GJ	Heat-production	GJ	95 %
Wood-pile	59 143 GJ	- delivered to net	GJ	
		El-production	MWh	
		- delivered to net	MWh	

Company	3	Assels Fleivname A.M.B.A.	Phone	6471 1024
Contact person	Johannes Jessen		_____ (Signature)	

Comments to be stated on the backpage (1), (2), (3) ref. guidance backpage

Unit data

Energy
production

Signature



Data, compilation and methods

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Topics for particular attention

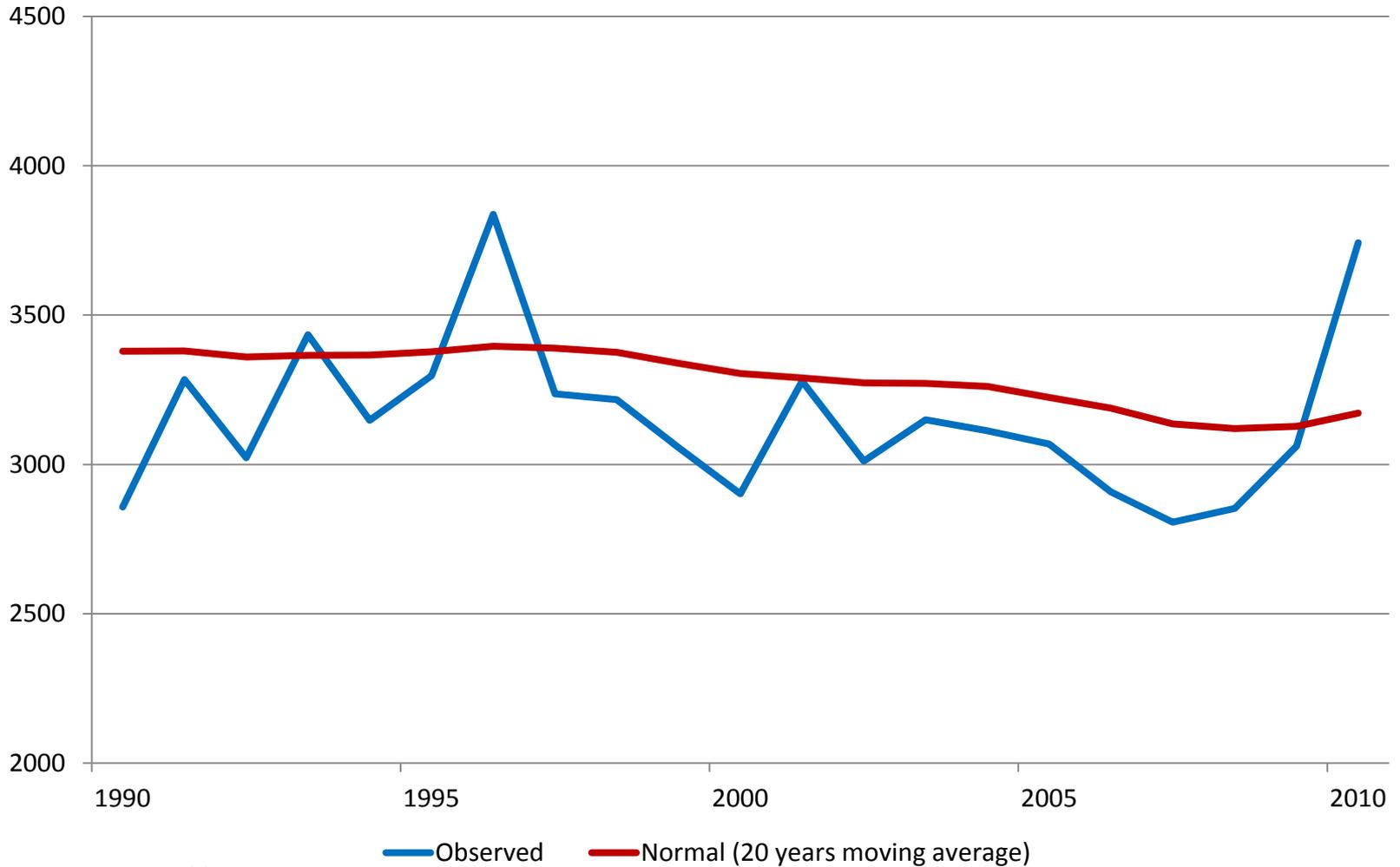


- Climate adjustment needed – Important to define a meaningful reference year
- CHP at autoproducers: Split between transformation sector and final energy
- Good statistics on biomass, especially firewood
- Other renewable sources. Small now but high politically attention (**Many sources and complex organisation**)
- Waste: Renewable and non renewable
- The split between energy consumption in the service sector and in households
- Quality checks: Time series and indicators are helpful
- Revisions are inevitable



Climate adjustment is needed

Degree days in Denmark



The climate adjustment factor used (DEA)



The climatic adjusted energy consumption for a year (B_n) is calculated as the product of the observed consumption in the the year (B) multiplied by a degree day factor (F_g), using the formula:

$$B_n = B \cdot F_g$$

where

$$F_g = 1/[1 - r \cdot a \cdot (1 - G/G_n)]$$

The adjustment factor depends on the four parameters:

- r the share of fuel consumption used for heating purposes
- a the share of heating which depends on degree days
- G the number of degree days
- G_n the number of degree days in the chosen reference year

If the energy statistics are to be reliable revisions are needed



- Revised national account statistics (ISIC-NACE)
- Changes in calorific values etc.
- Improved statistics on renewable energy
- Re-consideration of the transformation sector
- Change in definitions of final energy consumption
- Re-estimation of components in final energy consumption
- Introduction of new surveys

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Improvement of productivity



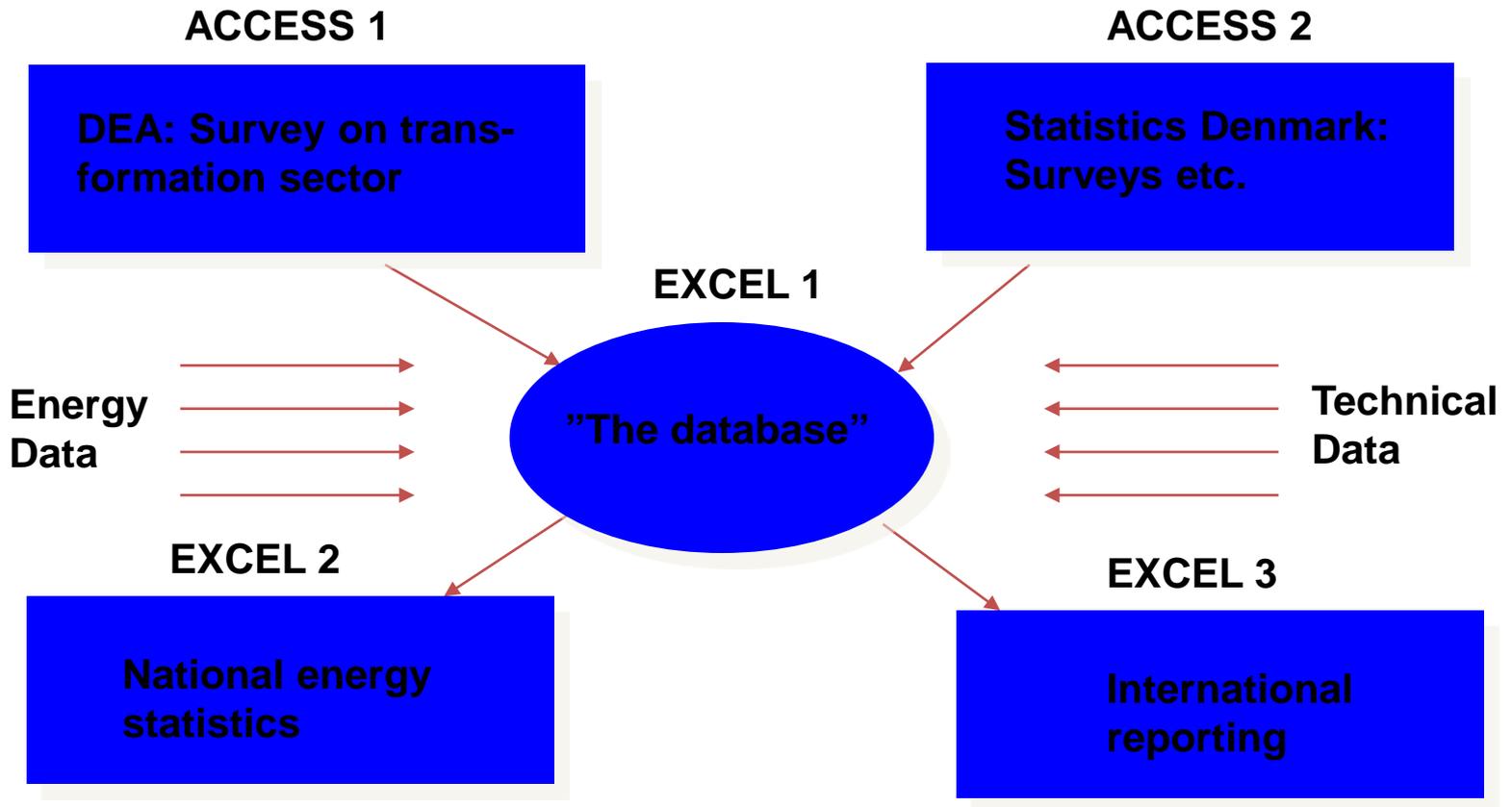
- The software used should not be too advanced
- Intensive use of internal and external networks
- Analytical skill and uses of modelling
- Estimation used when necessary
- Small errors/differences must not steal your time
- Quality control to avoid critical errors (Helpful to organize data and statistics in time series)
- Simultaneous national statistics and international reporting

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The Danish energy statistics system

All data arranged in time series (useful for quality control)

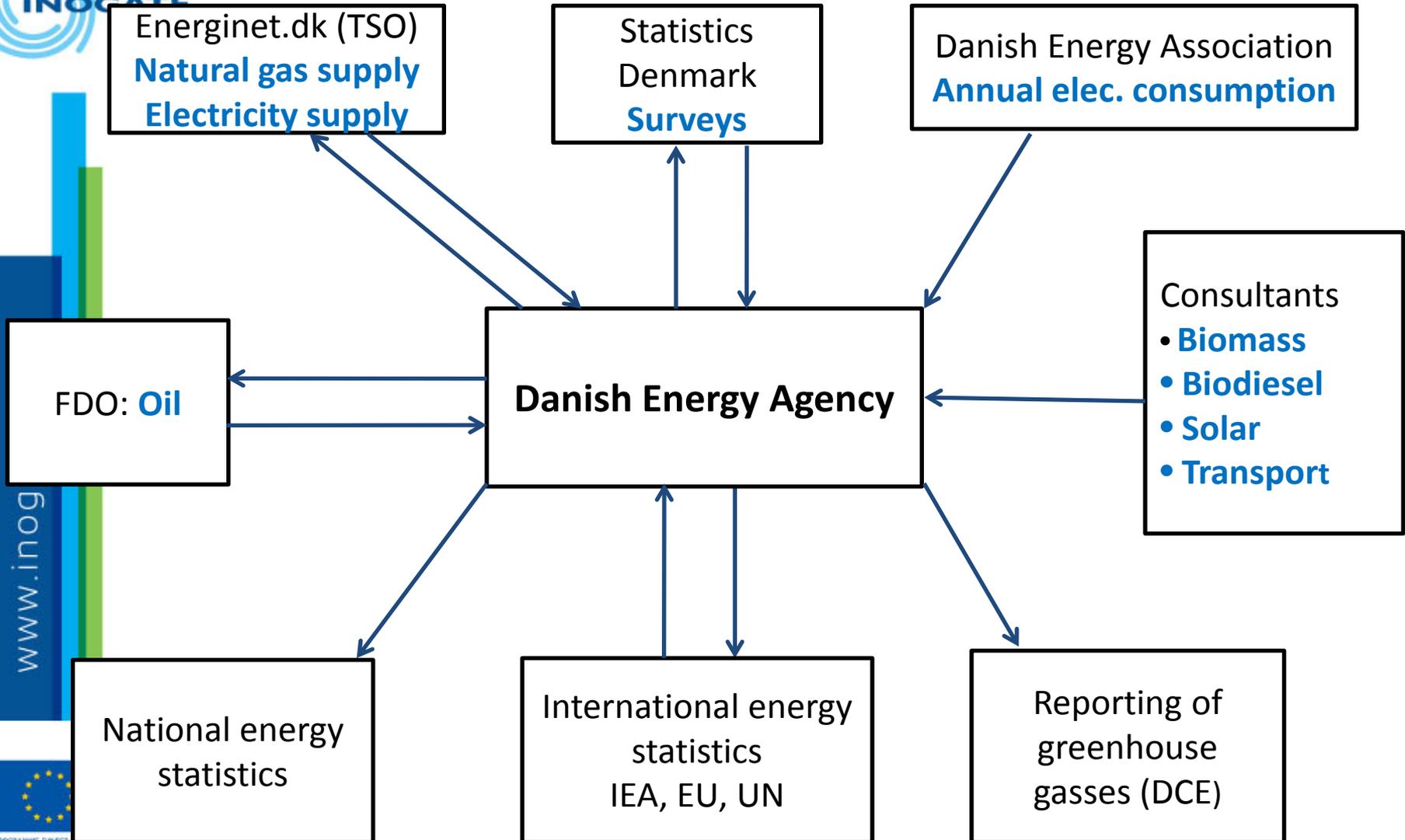


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Organisation of the Danish energy statistics



Organisation and sources of the Danish energy statistics on renewables



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Energinet.dk
Wind

Energinet.dk
Hydro

Statistics Denmark
Renewables in industry
Foreign trade statistics

FDO(Oil companies)
Biofuels

DEA: Statistics on renewables

Consultants
• Biomass
• Solar
• Biodiesel

DEA
Geothermal
Biogas

DEA
Electricity and heat survey
Biomass, biogas, waste etc.

DEA
Register of wind turbines

Manpower resources for the Danish energy statistics in 2012



	Man-years
Danish Energy Agency	
The energy statistics team	5
Specialists in DEA	0.5
External consultants	1
Statistics Denmark	1
Danish Energy association	1
Energinet.dk (TSO)	1
Danish Competition Council (prices)	0.5
Total	10



The transformation sector

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Challenges in the transformation sector

- Need for a new questionnaire?
- CHP: Fuel split between electricity and heat
- CHP: How to treat autoproducers
- Renewable energy, incl. wind, solar etc.
- Introduction of new key figures

Annual survey on electricity and heat production (DEA)



- Comprehensive survey covering all thermal electricity and heat delivered to a public net
- Production as well as fuel consumption
- Electricity and heat capacities
- Supplemented by statistics on wind power, hydro power, solar and geothermal energy

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Eurostat / IEA requirements for statistics in the transformation sector



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	Electricity only	CHP	Heat only
Public Production			
Autoproducer		The subject here	



CHP by autoproducers: An example



Fuel use: 100 TJ natural gas in a CHP-producing industry company

Production: 40 TJ electricity
40 TJ heat, of which 20 TJ is sold for district heating

Loss: 20 TJ

Proportionally fuel split (Eurostat/IEA):

Natural gas used for electricity production:	50 TJ
Natural gas used for heat production:	50 TJ
Used for district heat production	25 TJ
Used in the company:	25 TJ (final consump)

200% heat-efficiency (DEA):

Natural gas used for electricity production:	80 TJ
Natural gas used for heat production:	20 TJ
Used for district heat production	10 TJ
Used in the company:	10 TJ (final consump)

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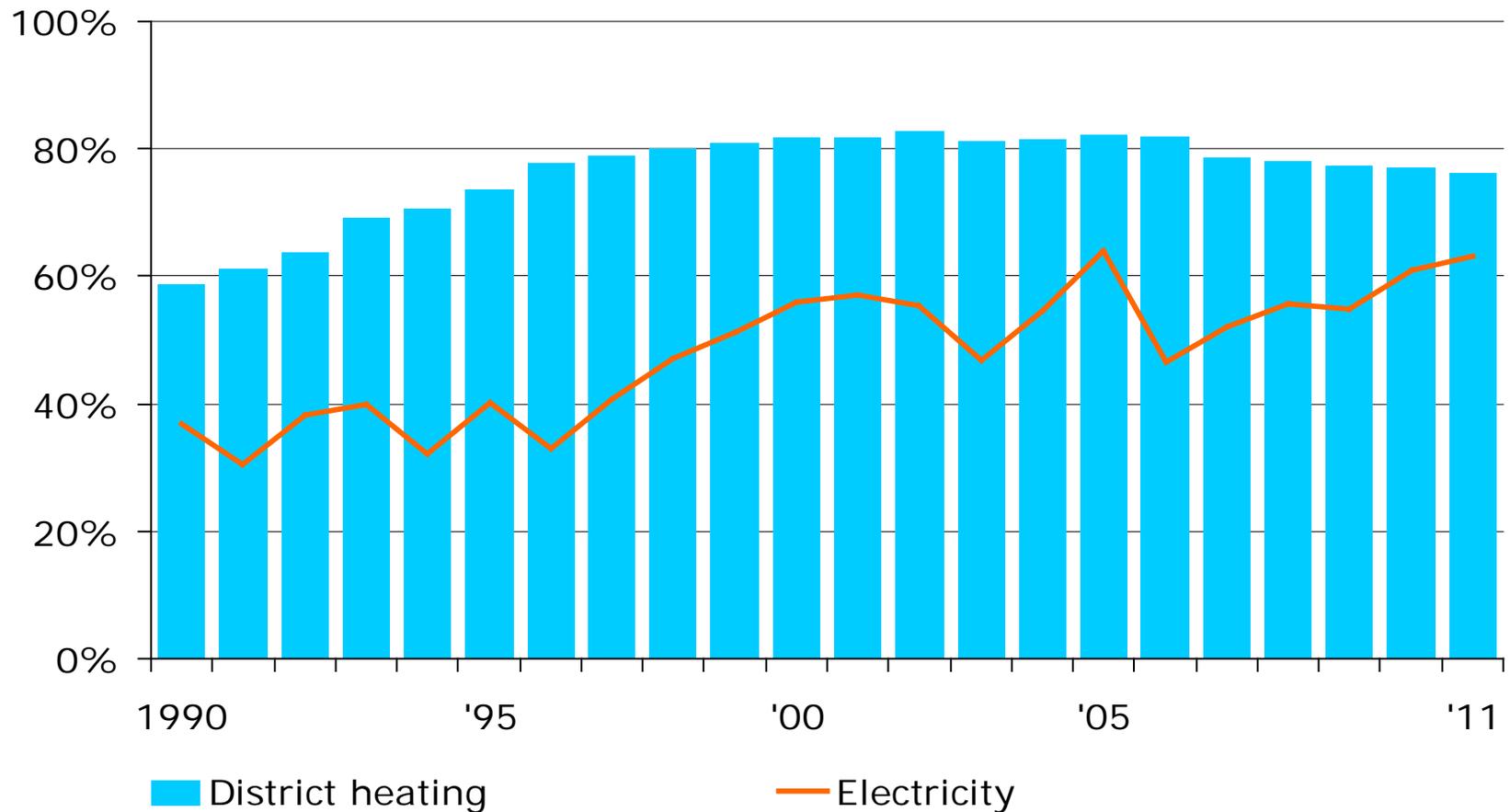
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Conclusion on autoproducers' CHP

- The assumption how to treat fuel consumption in CHP units may differ from country to country
- Regarding autoproducers: Eurostat and IEA has no knowledge about the split between the transformation sector and final energy consumption
- The Danish assumption means more fuel consumption in the transformation sector and less fuel consumption in final energy (which has an effect on energy efficiency in final energy)

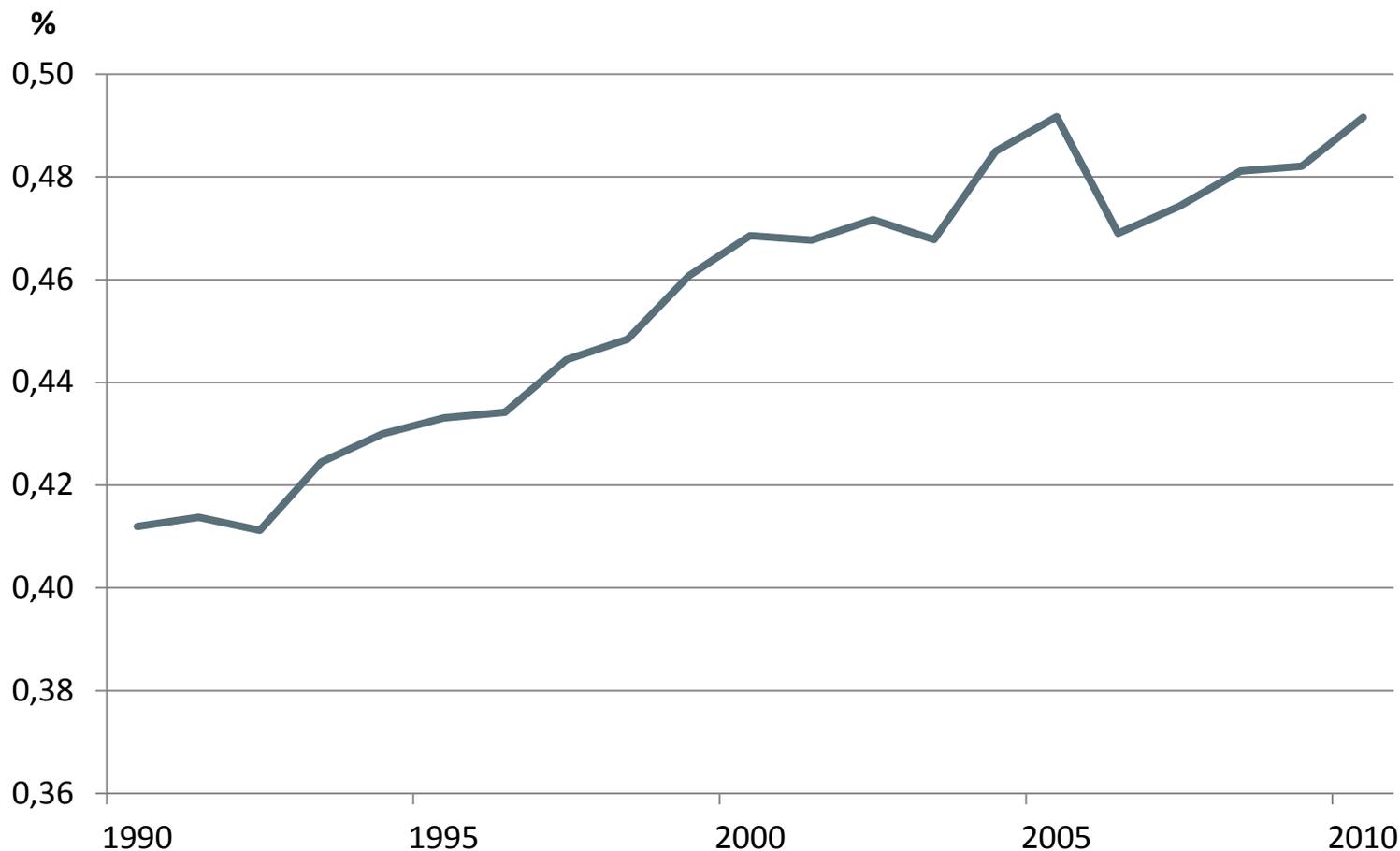
New key figures

CHP share of thermal power and district heating production in Denmark



Efficiency in gross electricity production (DK)

First CHP and later wind turbines





Final energy consumption In general

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Challenges in final energy consumption

- Wood consumption (especially in household) can be difficult to measure
- Households and trade and services have to be split properly
- More detailed data needed for energy efficiency indicators
- EU-decision: More detailed data in households
- Need for new questionnaires?
- Introduction of new key figures (e.g. shares of renewable)

New surveys are needed



- To address the challenges new surveys have to be added
- A comprehensive survey on energy consumption in household could be very useful (high priority in more Partner Countries) but
- Comprehensive surveys are very costly and can only be prepared every 3 to 5 years
- Transport: More data are needed – but a new survey?
- For firewood consumption in households two other possibilities exist:
 - Inserting a question in an existing questionnaire (e.g. as in Belarus, *the Living Standard Measurement Survey*)
 - A separate survey on firewood

An alternative approach



To meet the challenges an alternative approach can be considered:

Electricity and natural gas supply companies can be given an obligation to deliver annual consumption data for all companies according to the NACE code

This approach will provide very disaggregated data on an annual basis

There will be starting costs - in money terms and data treatment – but subsequent it will be cheaper and easier

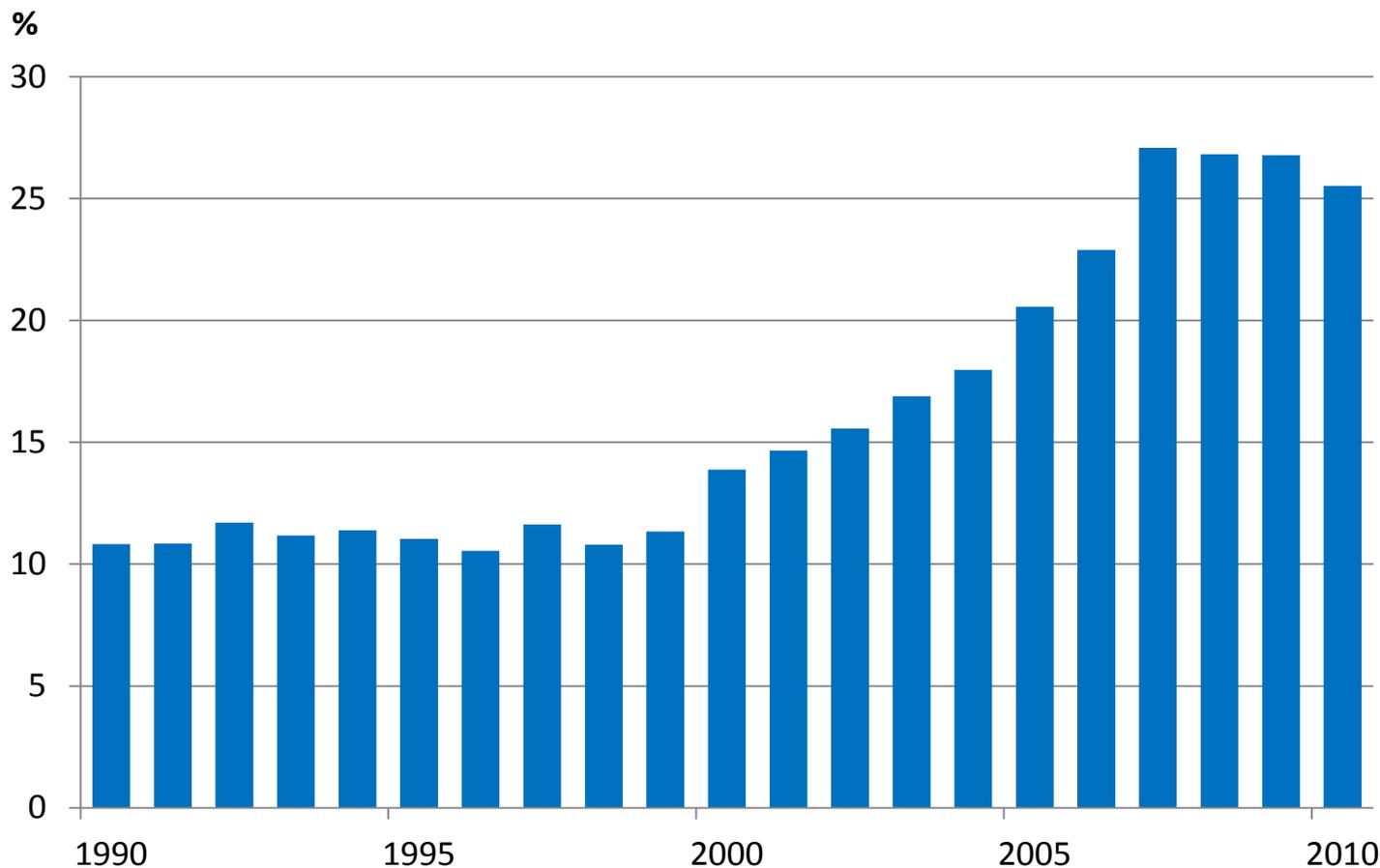


Final energy consumption Households

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Energy consumption in households for space heating: Share of renewables

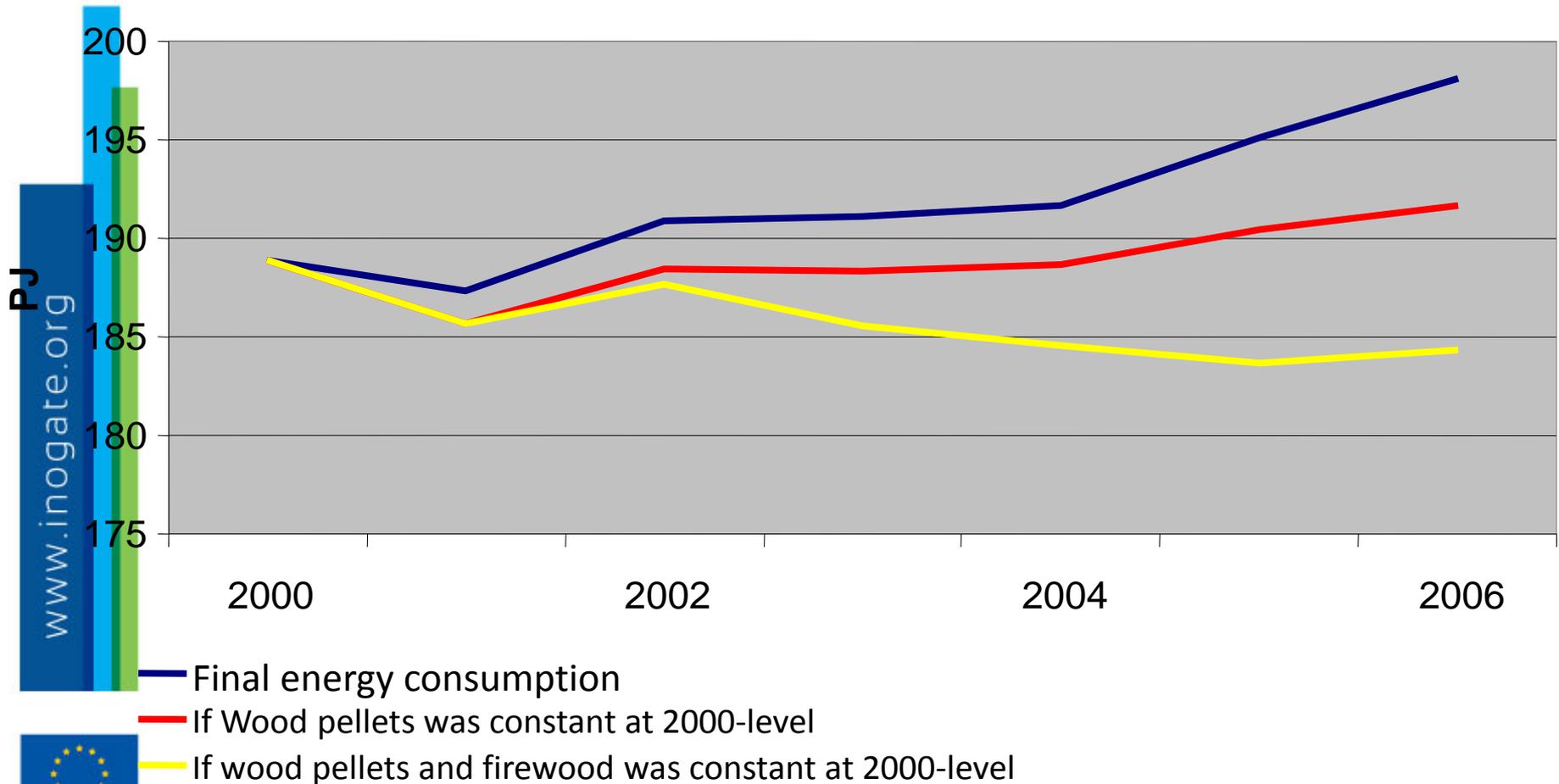


Energy consumption in households

Good statistics on wood consumption is very important



Climate adjusted



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Consumption of wood in households

Impact on total consumption and efficiency



- The energy statistics will give a false picture of the development of energy consumption - **and energy efficiency** - if wood pellets and firewood are not treated correctly. This is especially important for households.
- Without surveys on wood pellets and firewood the Danish consumption of biomass in households had been seriously underestimated.
- The energy consumption in households has increased 2000-2008. Instead of reductions in the energy consumption we have seen fuel shifts.
- A shift towards wood has a negative impact on the unit consumption in households.

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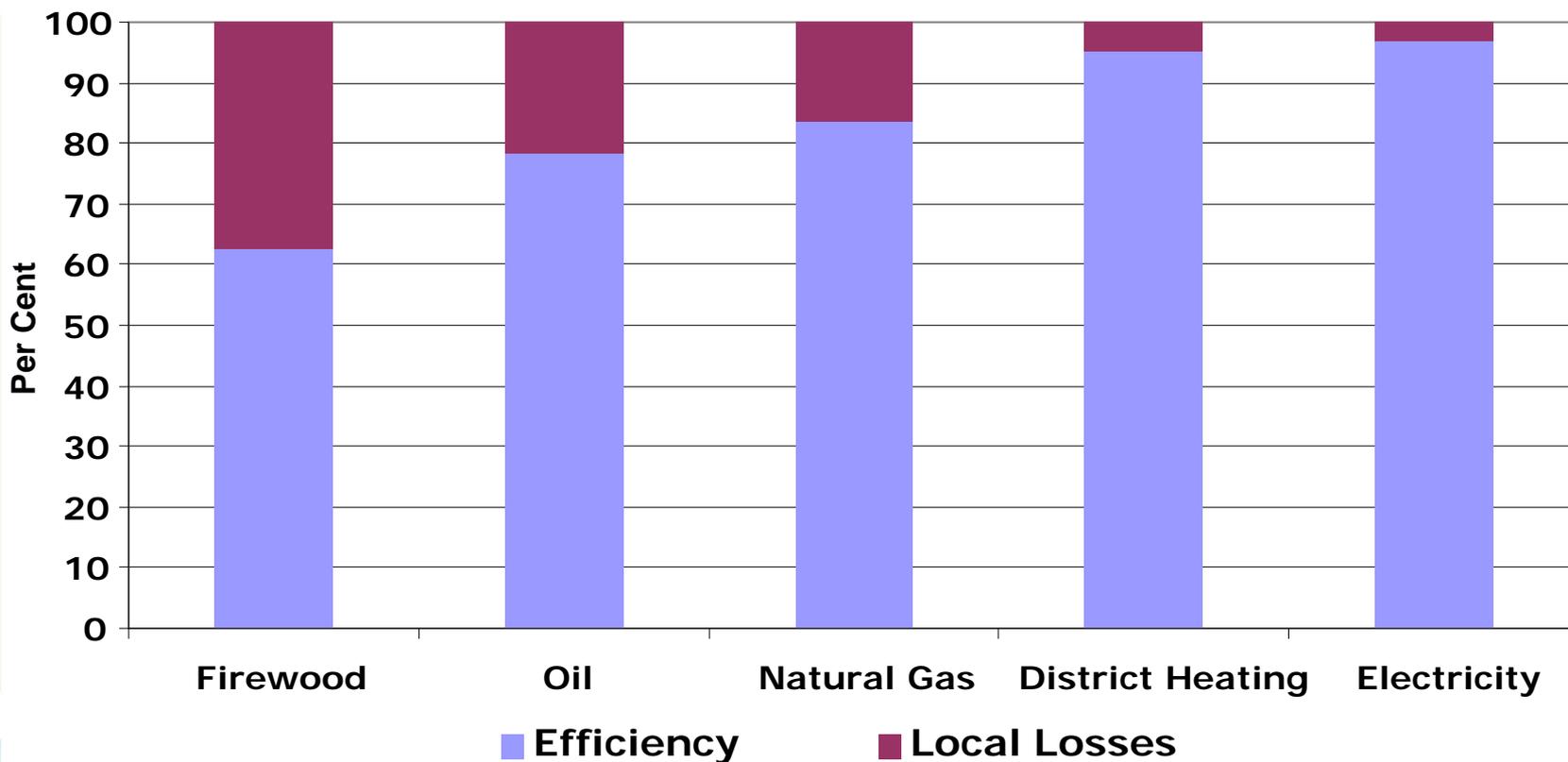
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Efficiency of heating devices in households



Shifts from oil to district heating means lower energy consumption

Shifts from natural gas to firewood means higher energy consumption



Decision in Eurostat: Disaggregated reporting of energy consumption in households



Energy consumption in households by end use for main fuels:

- Space heating
- Space cooling
- Water heating
- Cooking
- Electricity only: other electrical appliances

Eurostat: The aim would be to conclude the legal proceedings by the end of 2013 (Extension of EC Regulation 1099/2008).

To support member countries: Establishment of **MESH**



Manual for energy consumption in households “the MESH project” initiated by Eurostat



The project was launched on January 2012 and will finish in December 2013. A training work shop will be held in Madrid in the 4th quarter of 2013.

<http://www.cros-portal.eu/content/mesh-production-manual-statistics-energy-consumption-households>

Objectives:

- Review of national practices
- Best practices/lessons learned
- Manual
- Training



Energy efficiency indicators: Need for more data

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Energy efficiency indicators:

More detailed energy statistics is needed



Only a few examples:

- For households energy consumption for **space heating, space cooling, water heating, cooking and appliances** has to be separated
- Introduction of **net energy consumption** in household
- Statistics for households on **electrical appliances** equipment and specific consumption
- Energy consumption to transport has to be split between **passenger transport and freight transport** and **by cars and trucks**

Energy efficiency indicators: Odyssee

Get inspired: Important information on political use of energy statistics and indicators in member countries

Odyssee home page

- <http://www.odyssee-indicators.org/>

National reports, 2012

- http://www.odyssee-indicators.org/publications/national_reports.php

Country profiles, 2012

- http://www.odyssee-indicators.org/publications/country_profiles.php



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Publication and dissemination of energy statistics

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Topics of special attention



- Policy for publication and dissemination of energy statistics
- Key figures and energy efficiency indicators should be an integrated part of the energy statistics
- Energy statistics has to be politically useful
- Mass media and the public are interested in political oriented statistics
- Monthly and annual statistics at the web
- Links to IEA and other <http://www.iea.org/countries/non-membercountries/armenia/>

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Energy statistics has to be politically useful



- Energy is an important sector of the national economy (energy supply, employment etc.)
- Monitoring of energy policies: Self-sufficiency, renewable energy, energy efficiency and emissions
- Financial aspects in the annual international reporting because of UN commitments (CO₂)
- Inclusion of energy statistics in political and economic reports
- Mass media and the public are interested in political oriented statistics

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Press release 24 September, 2012



Renewables now cover more than 40% of electricity consumption

Large decrease in observed energy consumption and in greenhouse gas emissions in 2011, and consumption of renewable energy continues to grow.

The February 2008 energy agreement included the goal that renewable energy was to cover at least 20% of adjusted gross energy consumption by 2011. This goal was met in that the percentage of renewable energy was actually 21.8% in 2011.

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Do we use too many units in energy statistics?



- **It is not easy to have a good general view of energy statistics. The diversity of units used do not make it easier**
- Eurostat: Joule >< IEA: toe
- Electricity statistics: GWh
- Oil production: m³ >< metric tons >< barrel/day

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Recommendations

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Recommendations (1)



- The statistics should be in accordance with national and international standards and regulations ... and contain the data needed for monitoring national energy policies and international reporting
- System design: Use a rather simple model for data collection and preparing of the energy balance.
- Highest priority: Improvement and complementation of the supply statistics
- Review of the present set of questionnaires and addition of new questionnaires
- Improved statistics of renewable energy in general
- Improved statistics of the transformation sector



Recommendations (2)

- Improved and more disaggregated statistics on final energy consumption is also important
- Need for climate adjusted time series
- More detailed data needed for energy efficiency indicators (both for the nominator and the denominator)
- A comprehensive surveys on households
- Revisions to the energy statistics is inevitable
- Consider an alternative approach: Electricity and natural gas supply companies can be given an obligation to deliver annual consumption data for all companies according to the NACE code
- Enhancement of analytical skill and more/better uses of modelling



Recommendations (3)



- Formulation of a policy for publication and dissemination of energy statistics
- Key figures and energy efficiency indicators should be an integrated part of the energy statistics
- Energy statistics has to be politically useful
- Mass media and the public are interested in political oriented statistics
- Monthly and annual statistics at the web

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Thank you for attention!

Peter Dal

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**INOGATE Technical Secretariat and Integrated Programme
in support of the Baku Initiative and the Eastern
Partnership energy objectives**

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