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
Demands to a modern energy statistics
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
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
Available methodologies applied in the process of collecting, elaborating and processing energy statistics data: Draft Plan for 2013 (Ukrainian ESAP 3.4)

The draft Plan of the State Statistics Observation for 2013 envisages the following actions for the compilation of monthly and annual energy statistics:

- Statistics on production of industrial products by type
- Statistics on production of electricity, heat, gas and energy capacities
- Statistics on consumption of fuel, heat and electricity
- Statistics on imports and exports
- Energy balance of Ukraine
Annual energy statistics

Questionnaires, reporting instructions and links

- Eurostat: Questionnaires and instruction

- IEA: Annual questionnaires 2013 and documentations

- IEA: Manual on energy and several topics

- IEA: Glossary - Balance definitions

- IEA: InterEnerStat (international energy stat. Cooperation: Definition on flows and products)
Data, compilation and methods
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
1990 very warm – 1996 and 2010 very cold
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 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
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
The Danish energy statistics system

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

ACCESS 1
DEA: Survey on transformation sector

ACCESS 2-3
Statistics Denmark: Surveys
FDO: Monthly oil statistics

EXCEL 1
"The database"

EXCEL 2
Energy Data

EXCEL 3
National energy statistics

EXCEL 2
International reporting

Technical Data
Organisation of the Danish energy statistics

- Energinet.dk (TSO)
  - Natural gas supply
  - Electricity supply, Solar

- Statistics Denmark Surveys

- Danish Energy Association
  - Annual elec. consumption

- Danish Energy Agency
  - Consultants
    - Biomass
    - Biodiesel
    - Solar heat
    - Transport
  - International energy statistics
    - IEA, EU, UN
  - National energy statistics
  - Reporting of greenhouse gasses (DCE)
  - FDO: Oil
Organisation and sources of the Danish energy statistics on renewables

- Energinet.dk
  - Wind, Solar
- Energinet.dk
  - Hydro
- Statistics Denmark
  - Renewables in industry
  - Foreign trade statistics
- Consultants
  - Biomass
  - Solar heat
  - Biodiesel
- FDO (Oil companies)
  - Biofuels
- DEA: Statistics on renewables
  - Geothermal
  - Biogas
- DEA
  - Electricity and heat survey
  - Biomass, biogas, waste etc.
- DEA
  - Register of wind turbines
## Manpower resources for the Danish energy statistics in 2013

<table>
<thead>
<tr>
<th>Organization</th>
<th>Man-years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danish Energy Agency (DEA)</td>
<td></td>
</tr>
<tr>
<td>The energy statistics team</td>
<td>4.5</td>
</tr>
<tr>
<td>Specialists in DEA</td>
<td>0.5</td>
</tr>
<tr>
<td>External consultants</td>
<td>0.5</td>
</tr>
<tr>
<td>The Danish Central Oil Stockholding Entity (FDO)</td>
<td>2</td>
</tr>
<tr>
<td>Statistics Denmark</td>
<td>1</td>
</tr>
<tr>
<td>Danish Energy association</td>
<td>1</td>
</tr>
<tr>
<td>Energinet.dk (TSO)</td>
<td>1</td>
</tr>
<tr>
<td>Danish Competition Council (prices)</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>
The transformation sector
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
Electricity and heat questionnaire (DEA)

Survey of EI and DH-producing unit for the year 2000

<table>
<thead>
<tr>
<th>Plant-Name</th>
<th>Assens Fjernname</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Stejlholmen 4</td>
</tr>
<tr>
<td>Zip</td>
<td>5610 Assens</td>
</tr>
<tr>
<td>Municipality</td>
<td>421 Assens Kommune</td>
</tr>
<tr>
<td>Number of units at the plant</td>
<td>3</td>
</tr>
<tr>
<td>Company no.</td>
<td>CVR-nr 61-67-72-15</td>
</tr>
<tr>
<td>P-nr</td>
<td>511419</td>
</tr>
</tbody>
</table>

**Unit Data**

<table>
<thead>
<tr>
<th>Unit-name</th>
<th>Birk 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of unit</td>
<td>Iedel</td>
</tr>
<tr>
<td>Unit established date</td>
<td>01.02.84</td>
</tr>
<tr>
<td>Heat capacity</td>
<td>18.9 MJ/tn</td>
</tr>
<tr>
<td>B-capacity</td>
<td>Mw</td>
</tr>
<tr>
<td>Only operated as a backup-unit</td>
<td>[ ] Yes [ ] No</td>
</tr>
</tbody>
</table>

**Fuel Consumption**

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>Consumption</th>
<th>Other unit</th>
<th>Calorific value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas-oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste-oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro-gas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straw</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood-chips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood-pilets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood-waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal waste</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Other unit      |            |            |                 |

**Energy Production**

<table>
<thead>
<tr>
<th>Type of Energy</th>
<th>Production</th>
<th>Other</th>
<th>Alembie units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat production</td>
<td></td>
<td></td>
<td>MWh, GJ, Ocal</td>
</tr>
<tr>
<td>delivered to net</td>
<td></td>
<td></td>
<td>MWh, GJ, Ocal</td>
</tr>
<tr>
<td>Electricity produced</td>
<td>MWh</td>
<td></td>
<td>GWh, kWh, GJ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>Assens Fjernname A.m.b.a.</th>
<th>Phone</th>
<th>647 11024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact person</td>
<td>John</td>
<td>85%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>Energy production 1999</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments to be stated on the backpage (12,23) etc. guidelines backpage
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
Eurostat / IEA requirements for statistics in the transformation sector

<table>
<thead>
<tr>
<th></th>
<th>Electricity only</th>
<th>CHP</th>
<th>Heat only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autoproducer</td>
<td></td>
<td>The subject here</td>
<td></td>
</tr>
</tbody>
</table>
**CHP by autoproducers: An example**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel use:</strong></td>
<td>100 TJ</td>
</tr>
<tr>
<td><strong>Production:</strong></td>
<td>40 TJ</td>
</tr>
<tr>
<td><strong>Loss:</strong></td>
<td>20 TJ</td>
</tr>
<tr>
<td><strong>Proportionally fuel split (Eurostat/IEA):</strong></td>
<td></td>
</tr>
<tr>
<td>Natural gas used for electricity production:</td>
<td>50 TJ</td>
</tr>
<tr>
<td>Natural gas used for heat production:</td>
<td>50 TJ</td>
</tr>
<tr>
<td>Used for district heat production</td>
<td>25 TJ</td>
</tr>
<tr>
<td>Used in the company:</td>
<td>25 TJ (final consump)</td>
</tr>
<tr>
<td><strong>200% heat-efficiency (DEA):</strong></td>
<td></td>
</tr>
<tr>
<td>Natural gas used for electricity production:</td>
<td>80 TJ</td>
</tr>
<tr>
<td>Natural gas used for heat production:</td>
<td>20 TJ</td>
</tr>
<tr>
<td>Used for district heat production</td>
<td>10 TJ</td>
</tr>
<tr>
<td>Used in the company:</td>
<td>10 TJ (final consump)</td>
</tr>
</tbody>
</table>
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

District heating
Electricity
Efficiency in gross electricity production (DK)

First CHP and later wind turbines

%
Final energy consumption
In general
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
Energy consumption in households for space heating: Share of renewables in DK

- 1990: 0%
- 1995: 10%
- 2000: 15%
- 2005: 20%
- 2010: 25%
Energy consumption in households

Good statistics on wood consumption is very important

Climate adjusted

Final energy consumption
- If Wood pellets was constant at 2000-level
- If wood pellets and firewood were constant at 2000-level
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.
Efficiency of heating devices in households

Shifts from oil to district heating means lower final energy consumption

Shifts from natural gas to firewood means higher final 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

This need was laid down in EC Regulation no. 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 finished end of 2013 - main result is the manual:
“Manual for statistics on energy consumption in households”


Objectives:
• Definitions
• Description of methods
• Practical examples of methods
• Country case studies
• Other issues
Energy efficiency indicators: Need for more data
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
• Market diffusion: Data on the diffusion of energy efficiency technologies and practices (Odyssee)
Energy efficiency indicators: Odyssee

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

Odyssee home page


National reports, 2012


Country profiles, 2012

Publication and dissemination of energy statistics
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
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 (CO$_2$)
- Inclusion of energy statistics in political and economic reports
- Mass media and the public are interested in political oriented statistics
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.
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 $\gg$ IEA: toe
- Electricity statistics: GWh
- Oil production: $m^3 \gg$ metric tons $\gg$ barrel/day
Recommendations
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**: Final energy consumption by sectors - improvements and organisation and of surveys
- Review of the present set of questionnaires and – if needed - addition of new questionnaires
- More disaggregated statistics on final energy consumption in households needed, cf. EU decision.
Recommendations (2)

Consider alternative approaches to surveys:

- 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
  - Improved statistics for renewable energy, especially wood
  - Need for climate adjusted time series
  - More detailed data needed for energy efficiency indicators (both for the nominator and the denominator)

- Revisions to the energy statistics is inevitable
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
Thank you for attention!

Peter Dal
Senior Expert, Energy Statistics

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