

# *A key to success: Improved statistics on energy end use in buildings*

## **eceee Summer Study 2007**

Author:

Agneta Persson, WSP Environmental

([agneta.persson@wspgroup.se](mailto:agneta.persson@wspgroup.se))


[agneta.persson@enterprise.ministry.se](mailto:agneta.persson@enterprise.ministry.se)

Co-authors:

Heini-Marja Suvilehto, Swedish Energy Agency

Monica Gullberg, ÅF-Process AB

Anders Göransson, Profu



## *A key to success: Improved statistics on energy end use in buildings*

### **Background**

*Multiple need for improved detailed building sector energy statistics:*

- *EC directives addressing energy (EPBD, ESD, Eco-design...)*
- *National environmental objectives e.g. “Reduced climate impact”, “Clean air”, and “A good built environment”*
- *Detailed statistics on energy end-use patterns in buildings is a prerequisite for structured energy and facility management*
- *Needed for successful creation, impact prediction, implementation and monitoring of energy policies and actions*
- *Lack of evaluation significance is often used as an argument against energy-efficiency actions*

# *A key to success: Improved statistics on energy end use in buildings*


## **Background**

- *Quality of national building energy statistics has during recent years declined*
- *To improve this, the Swedish National Energy Agency is carrying out a major programme on improved energy statistics*
- *STIL2 (“Statistik i lokaler 2”, “Non-domestic buildings statistics 2”), dealing with improved energy statistics in non-residential buildings, is a part of this programme*
- *Most recent available energy-statistics for non-domestic buildings before the STIL2 programme were collected in 1990*
- *Apart from delivering up to date energy statistics, the STIL2 programme also enables comparisons between energy end use in buildings between 1990 and today*



## The new Swedish energy-statistics programme


- Studies should be repeated at acceptably long intervals, providing **time series**
- Should build on common **definitions**, enabling use of and combine input from different sources (e.g. building id instead of name of building)
- Terminology should be shared with the implemented **directive of declaration of energy performance of buildings** (e.g. area  $A_{temp}$ )
- Results should be included in the **national official energy statistics**
- De-identified information should be made **available** for researchers and other actors



## *A key to success: Improved statistics on energy end use in buildings*

### **Methodology**

- STIL2 project runs in six year cycles
- Covers step-wise all categories of tertiary buildings
- End use will in detail be mapped out in approximately 1 000 buildings during six-year periods
- Priority is given to electricity, and its allocation between different end use categories (heating, cooling, lighting, ventilation, etc)
- Total energy end use is also noted
- The first audits were carried out in 2005, including 123 offices and administration buildings
- In 2006 (second year) audits in school buildings were performed
- In 2007 audits will be carried out in health care buildings



## *A key to success: Improved statistics on energy end use in buildings*

### **Methodology**

- A special audit model has been developed for the STIL2 programme
- The model includes detailed information on all kinds of energy end use
- The model includes a spread sheet where all key indicators and important information is summarized + calculation support for a number of key performance indicators

# *A key to success: Improved statistics on energy end use in buildings*

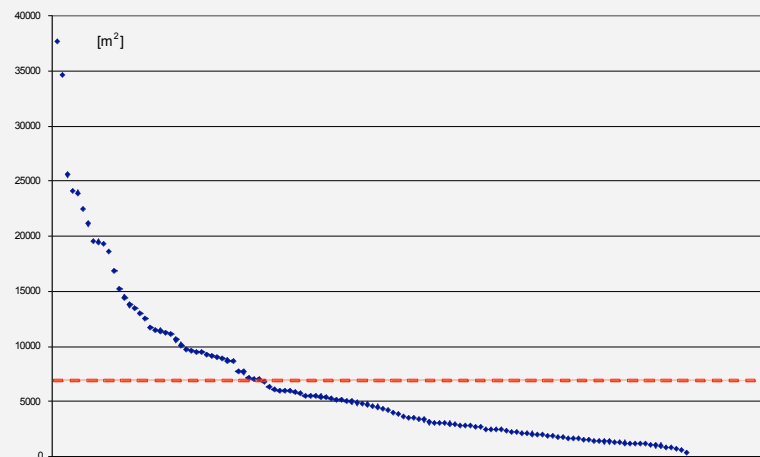
## **Statistical selection**

- Random sampling by Statistics Sweden
- In total 127 office buildings were audited in 2005
- The following criteria were applied:
  - The building area should be between 200 and 30 000 m<sup>2</sup>
  - At least 80 % of the building should be occupied
  - Buildings included in the study should preferably not sub-deliver energy for heating purposes or electricity to other buildings
  - A full year statistical data on the building's delivered energy should be available (including tenants' end use)
  - Buildings should not include too many tenants with individual electrical metering (limit 12-15)
- A prerequisite for the audits is that property owners and/or facility managers provide support when auditing and provide data on delivered energy and water consumption.

# *A key to success: Improved statistics on energy end use in buildings*

## **Statistical selection**

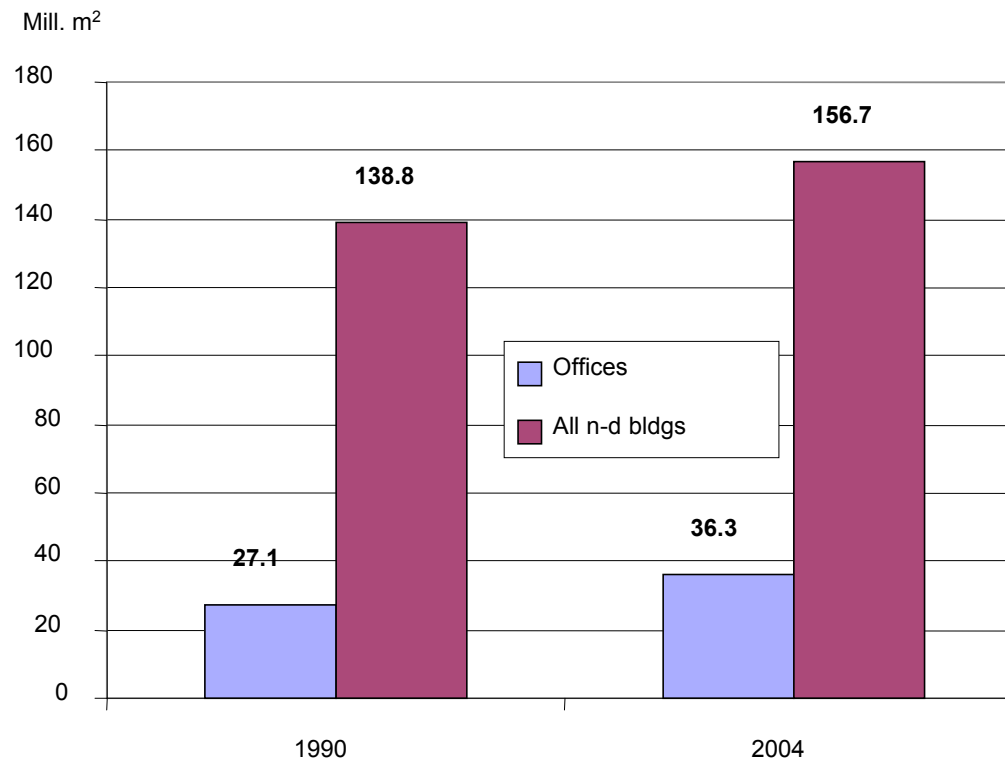
- The audited office buildings comprises in total 834 000 m<sup>2</sup> (2.3 % of total national office building area)
- Average building area in the study is 6 790 m<sup>2</sup>, national average office building area is 3 200 m<sup>2</sup>
- In the audited buildings 90 % of the area was on average used for office purposes. Other occurring businesses were shops and restaurants



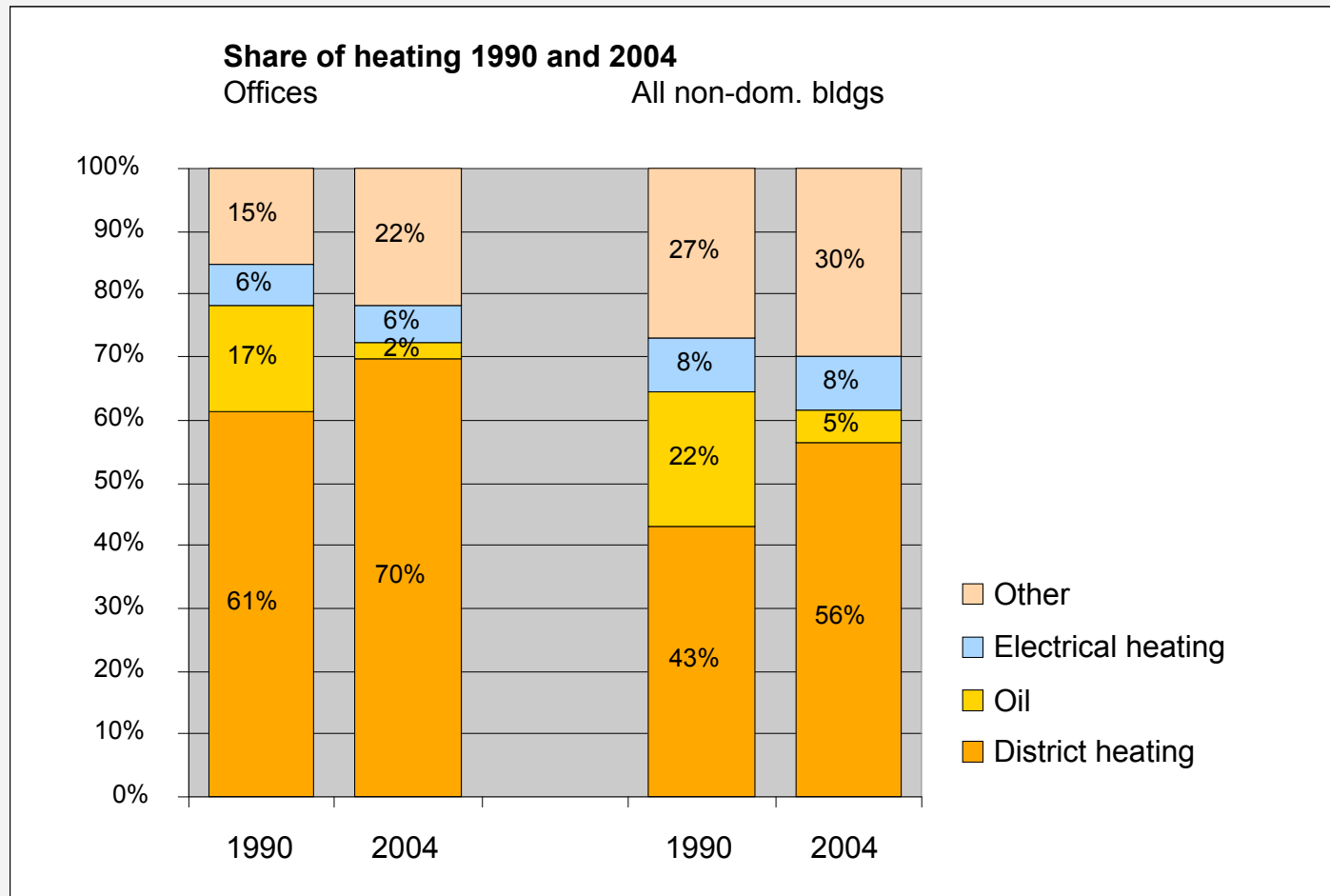
# *A key to success: Improved statistics on energy end use in buildings, Results*

## Results

Offices and all non-domestic buildings 1990 to 2004

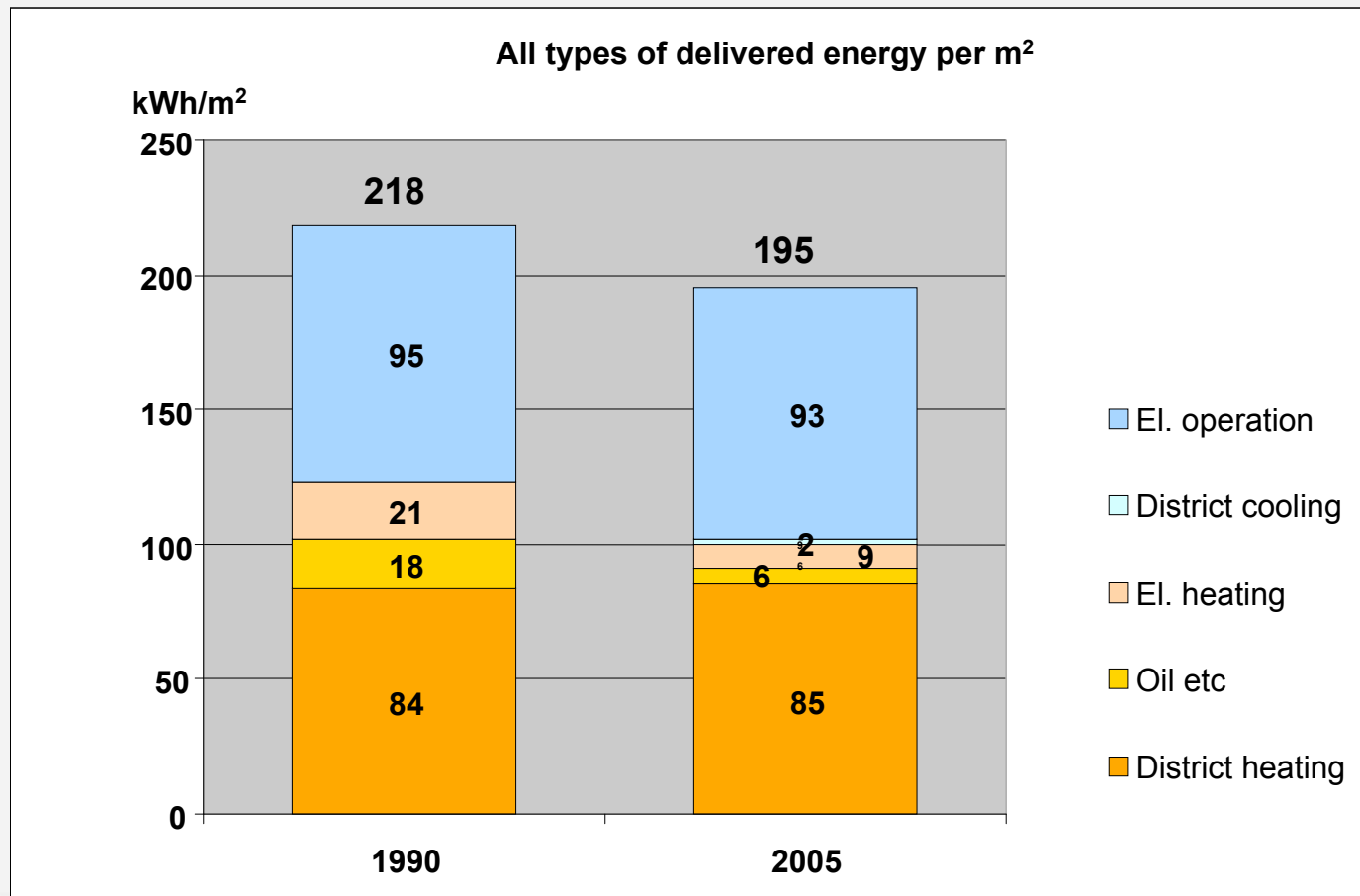


## *A key to success: Improved statistics on energy end use in buildings, Results*



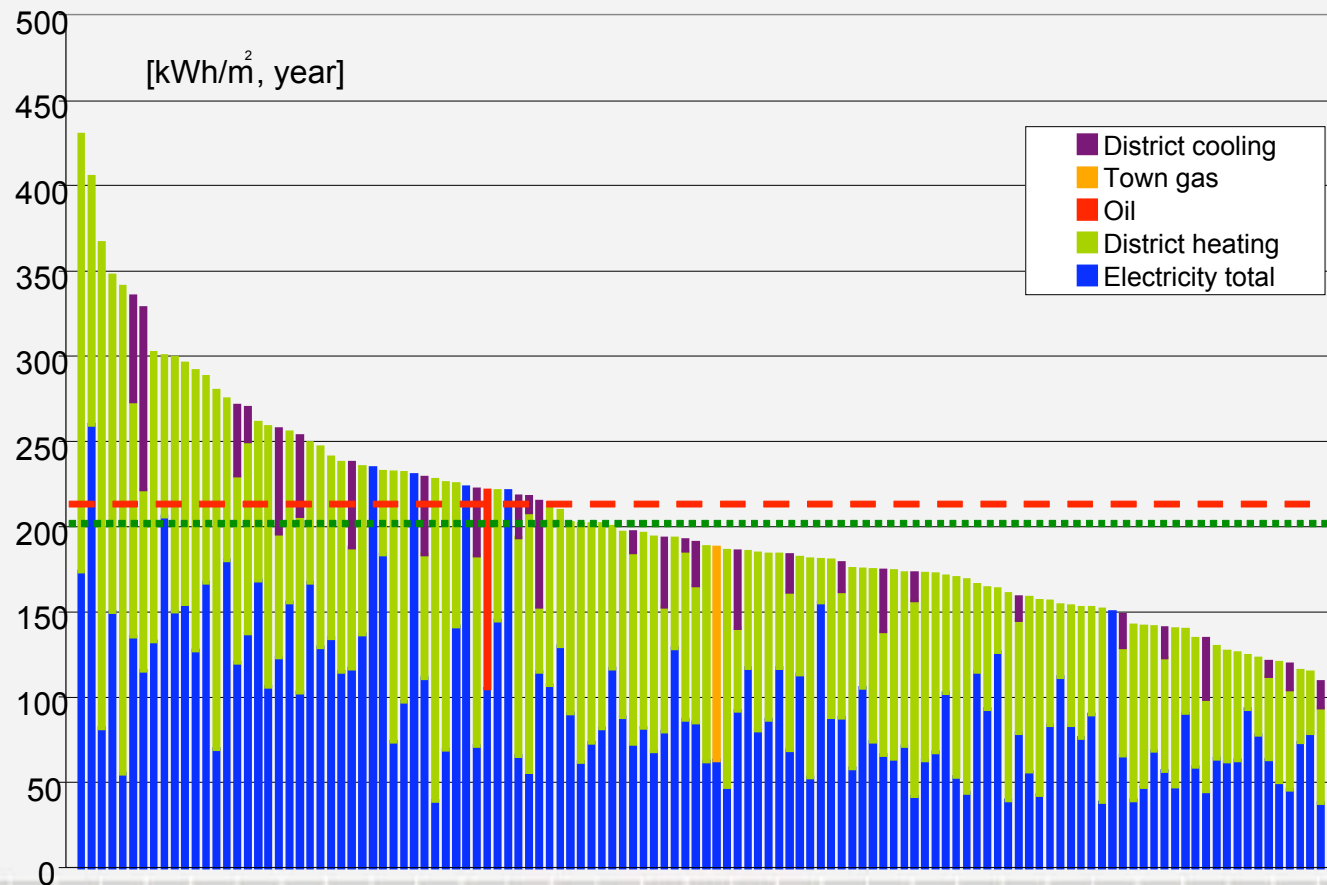
# A key to success: Improved statistics on energy end use in buildings, Results

## ■ Decreased relative energy end use in offices



# *A key to success: Improved statistics on energy end use in buildings, Results*

## ■ Variation in relative energy end use in offices

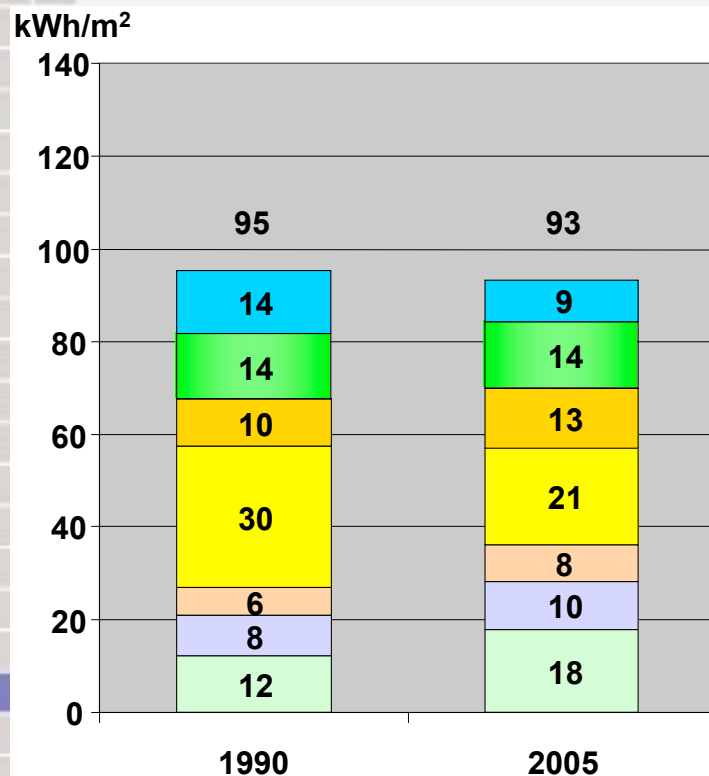


# A key to success: Improved statistics on energy end use in buildings, Results

## ■ Relative energy end use in offices, 1990 vs 2005

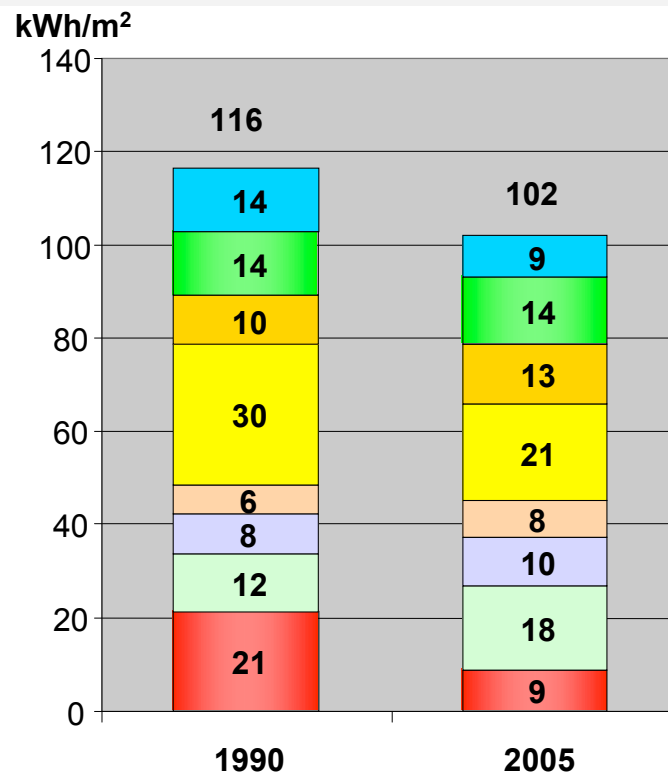
End user and operation electricity

Excl. el. heating



End user and operation electricity

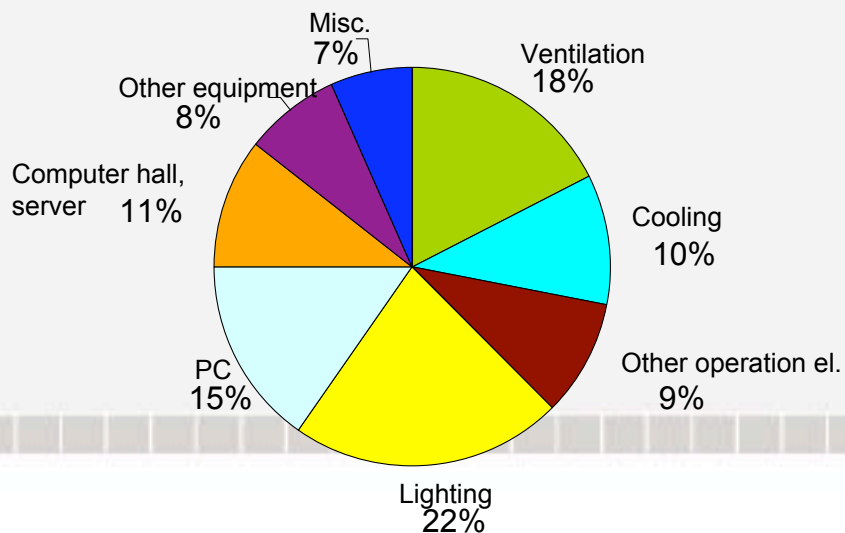
Incl el. heating



- Misc.
- PC, office equip.
- Computer hall, server
- Lighting
- Other operation el.
- Cooling
- Ventilation
- Heating and tapwater

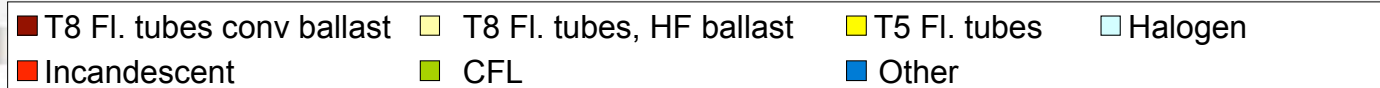
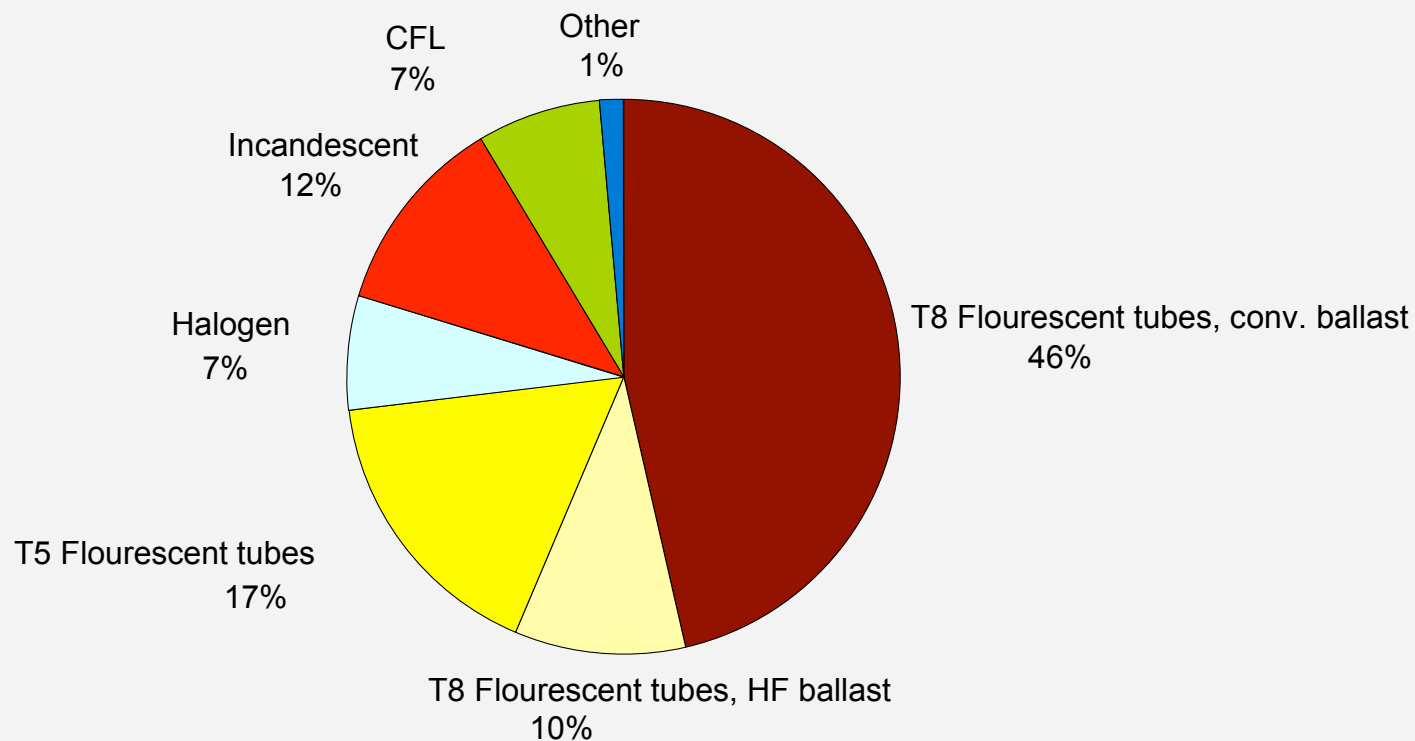
## *A key to success: Improved statistics on energy end use in buildings, Results*

- Important finding: total average **electrical end use** in office buildings **has not increased** during the last 15 years.
- **Electricity for lighting has decreased significantly** while electricity for **ventilation has increased** since 1990
- Lighting and ventilation are the largest single electrical end users, together 42 % of total electrical end use in office buildings in 2005
- PC and office equipment is the third largest end user in offices



# *A key to success: Improved statistics on energy end use in buildings, Results*

## ■ *Relative energy end use for lighting in offices*



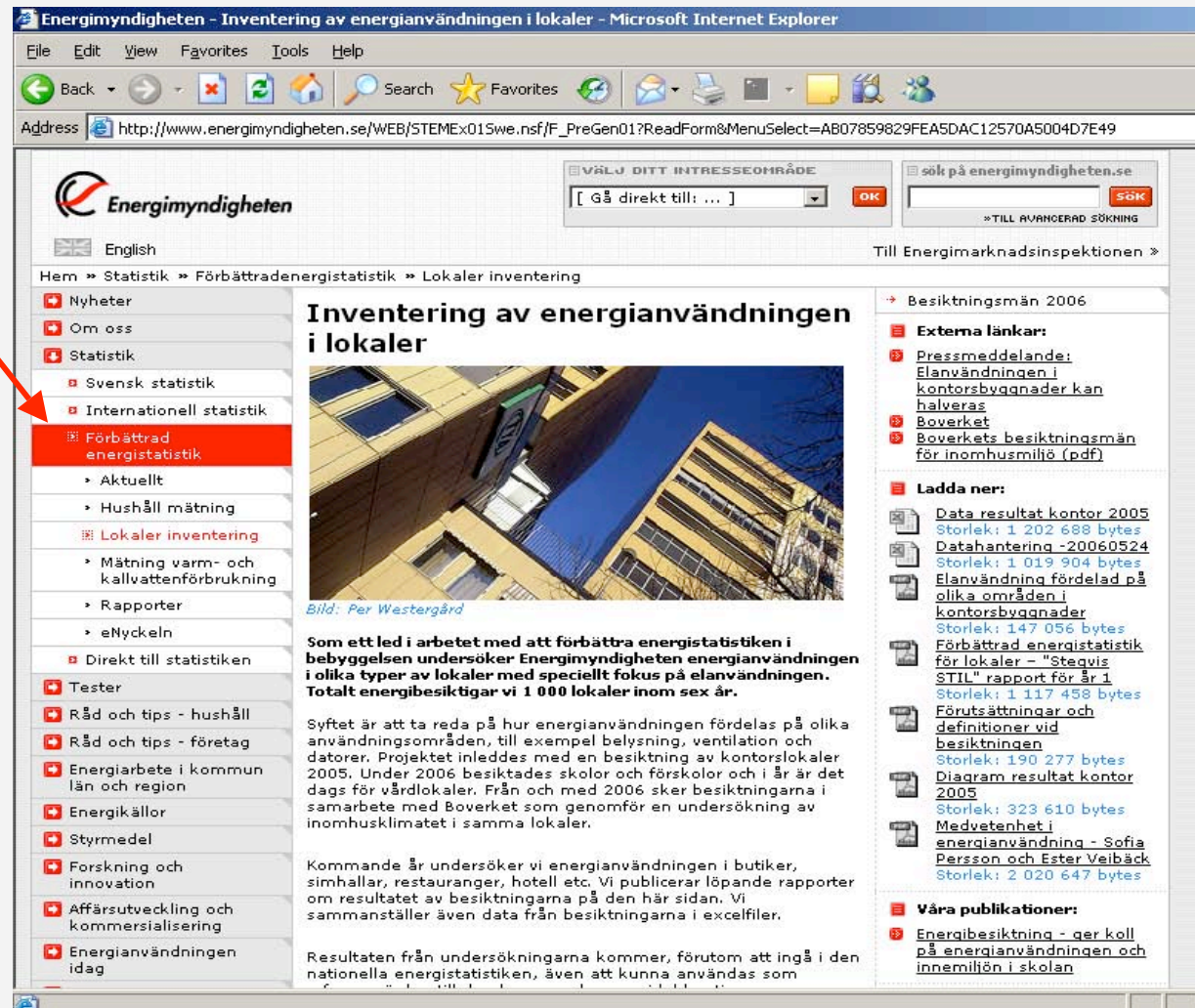


## *A key to success: Improved statistics on energy end use in buildings, Conclusions*

- *Lighting is much more energy efficient now*
- *Ventilation has increased*
- *Cooling has increased*
- *Computers and office equipment has increased surprisingly little*
- *Electrical heating significantly reduced*

# More information on STIL2

**www.energimyndigheten.se**  
**Statistik -**  
**Förbättrad energistatistik -**  
**Lokaler**



**Energimyndigheten - Inventering av energianvändningen i lokaler - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Address [http://www.energimyndigheten.se/WEB/STEMEX015we.nsf/F\\_PreGen01?ReadForm&MenuSelect=AB07859829FEA5DAC12570A5004D7E49](http://www.energimyndigheten.se/WEB/STEMEX015we.nsf/F_PreGen01?ReadForm&MenuSelect=AB07859829FEA5DAC12570A5004D7E49)

**VÄLJ DITT INTERESSEOMRÅDE**  
[ Gå direkt till: ... ] **OK**

**sök på energimyndigheten.se**  
\*TILL AVANCERAD SÖKNING **OK**

**English** Till Energimarknadsinspektionen >

Hem > Statistik > Förbättrad energistatistik > Lokaler inventering

- Nyheter
- Om oss
- Statistik
  - Svensk statistik
  - Internationell statistik
  - Förbättrad energistatistik**
    - Aktuellt
    - Hushåll mätning
    - Lokaler inventering**
    - Mätning varm- och kallvattenförbrukning
    - Rapporter
    - eNyckeln
  - Direkt till statistiken
- Tester
  - Råd och tips - hushåll
  - Råd och tips - företag
  - Energiarbete i kommun, län och region
  - Energikällor
  - Styrmedel
  - Forskning och innovation
  - Affärsutveckling och kommersialisering
  - Energianvändningen idag

## Inventering av energianvändningen i lokaler

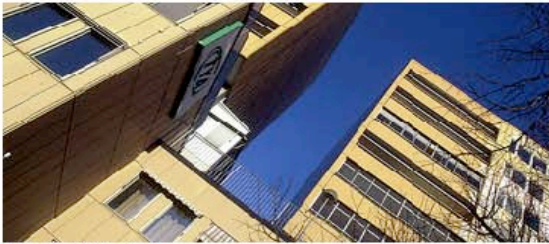


Bild: Per Westergård

**Som ett led i arbetet med att förbättra energistatistiken i bebyggelsen undersöker Energimyndigheten energianvändningen i olika typer av lokaler med speciellt fokus på elanvändningen. Totalt energibesiktigar vi 1 000 lokaler inom sex år.**

Syftet är att ta reda på hur energianvändningen fördelas på olika användningsområden, till exempel belysning, ventilation och datorer. Projektet inleddes med en besiktning av kontorslokaler 2005. Under 2006 besiktades skolor och förskolor och i år är det dags för vårdlokaler. Från och med 2006 sker besiktningarna i samarbete med Boverket som genomför en undersökning av inomhusklimatet i samma lokaler.

Kommande år undersöker vi energianvändningen i butiker, simhallar, restauranger, hotell etc. Vi publicerar löpande rapporter om resultatet av besiktningarna på den här sidan. Vi sammanställer även data från besiktningarna i excelfiler.

Resultaten från undersökningarna kommer, förutom att ingå i den nationella energistatistiken, även att kunna användas som

**Besiktningarna 2006**

**Externa länkar:**


- Pressmeddelande: Elanvändningen i kontorsbyggnader kan halveras
- Boverket
- Boverkets besiktningarna för inomhusmiljö (pdf)

**Ladda ner:**

- Data resultat kontor 2005  
Storlek: 1 202 688 bytes
- Datahantering -20060524  
Storlek: 1 019 904 bytes
- Elanvändning fördelad på olika områden i kontorsbyggnader  
Storlek: 147 056 bytes
- Förbättrad energistatistik för lokaler - "Stegvis STIL" rapport för år 1  
Storlek: 1 117 458 bytes
- Förutsättningar och definitioner vid besiktningen  
Storlek: 190 277 bytes
- Diagram resultat kontor 2005  
Storlek: 323 610 bytes
- Medvetenhet i energianvändning - Sofia Persson och Ester Veibäck  
Storlek: 2 020 647 bytes

**Våra publikationer:**

- Energibesiktning - ger koll på energianvändningen och inomhusmiljön i skolan

A decorative vertical grid on the left side of the slide, composed of small squares. Most are light gray, but several are colored: a red square, an orange square, a yellow square, a blue square, a green square, and a purple square.

*A key to success: Improved statistics  
on energy end use in buildings*

Thank you for your attention!