Green IT projects in Switzerland.
Measurement concept and user groups.

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Overview/Summary

History

- 1985-1995: taming of main frame computers by new technologies
- 1995-2005: dotcom bubble interrupts fast growth of server farms
- 2005-: “green IT”

Measurement concept

User groups
History: 1985-1995

Fast increase of electricity demand by large computer centres in the financial sector (1985-1990)

Energy analysis at ETH Zürich
- Power flow in large computer centres (Spreng/Aebischer, 1990)

Formation program RAVEL (1992, p. 67)
- Free cooling, modular design, inlet temperature, metering

User group (ERFA RZ)
- Benchmarking of energy efficiency of infrastructure:
  \[ K = \frac{\text{el. power IT rooms}}{\text{total el. power}} = C1 = DCiE = 1\text{/PUE} \]

Technology breakthrough (CMOS, architecture, software)
- Decrease of electricity demand in large computer centres (1990-1995)
- Other priorities!
K = C1 = DCiE = 1/PUE is a good indicator

... but a good enough measurement concept – with energy and not power to be measured - is essential

DCiE in 1994 and 1995 in 14 computer centres in Switzerland


DCiE (energy) in function of outdoor temperature

Source:
Swiss DCEE Group, 2007;
Bänninger, 2007
**History: 1995-2005**

Diffusion of use and applications of Internet → server farms, collocation sites

Projects with locally potential huge increases of power and energy demand
- Geneva: +(10-20)% of total electricity demand.
  
  Study: indicators and target values for energy efficiency in data centres → voluntary agreements or legal requirements (Aebischer et al. 2003)

Case study of efficiency improvements in existing data centre: (Altenburger, 2004)

Dotcom bubble bursts after 2000
- Geneva: very little built → other priorities!

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**Efficiency indicators for Geneva: CEE = C1 * c2**

Indicator for over-all energy efficiency:

\[
CEE = \frac{u}{T} = \frac{U}{T} \times \frac{u}{t} = C1 \times c2
\]

- \(C1\) = indicator for energy efficiency of central infrastruct = DCiE
- \(c2\) = indicator for energy efficiency of infrastructure of ICT-equipment : nok

Source: Aebischer et al., 2003
Data flow increases faster than technical progress → new data centre capacities

Oil price increase → electricity price

W/m² increase → problems heat evacuation (no technological breakthrough in view)

Climate change discussion

→ worldwide “green IT initiatives”

Geneva goes towards “standard” for data centres
- Benchmarking to define minimal requirement for DCiE
- Standardised measurement concept needed

ERFA RZ → policy process: SwissEnergy Programme

Swiss DCEE (data centre energy efficiency) Group
- Shares information
- elaborates tools (e.g. „Stromeffiziente Rechenzentren durch Sensibilisierung über eine transparente Kostenrechnung“ with support of SFOE)
- makes assessments (e.g. new data centre of the city of Zurich)

SWKI (Swiss Society of Heating and Air-Conditioning Engineers): adaptation of ASHRAE recommendations for data centres (temperature and humidity)

Demonstration: 100% free cooling in telecommunications centres (Singy, 2005)
Measurement concept for DCiE

- Energy consumption
- Well defined measurement points

Following two characteristics of data centres:
1. Reliability: Tier levels I – IV defined by Uptime Institute
2. Cooling by equipment
   - dedicated to data centre
   - used for the whole (office) building

→ Maucoronel et al., 2008

Measurement concept for Tier IV with dedicated cooling

Source:
Uptime Institute, 2006
and Maucoronel et al., 2008
Frequency of read out and reporting

Automatic read-out:
- read out locally or from distance
- frequency no problem (except amount of data)
- electronic data base

Read-out by hand (low investment costs):
- read out at least once a month (at least monthly data points needed for analysis)
- reported in tables

User groups (active)

ERFA RZ participating in Swiss policy projects:
- Grossverbrauchermode (Canton of Zürich)
- Energie-Modell Schweiz (Switzerland)

Voluntary agreements between cantonal/federal governments and large companies to reduce energy consumption and CO₂-emissions by well defined measures – e.g. in data centres.
- For large companies: targets in % per year reduction of specific variable;
- For data centres: planned/realised savings/reductions in absolute terms.
User groups (in preparation)

Sitic (Swiss IT Intelligence Community) [www.sitic.ch](http://www.sitic.ch)

- The Swiss IT Intelligence Community sitic is a vendor-independent peer-to-peer network. It fosters the sharing of ideas and best practices among IT departments of Swiss-based companies.
- Sitic is composed by a number of communities covering different aspects of IT in the companies.
- The Infrastructure & Operations Community is a new sitic community with focus on operations aspects of IT. It addresses Data Center Managers, Environmental and Green IT officers as logistics managers.
- The Swiss DCEE Group will participate by sharing their experience and tools.

"Infrastructure & Operations" and the other communities; [http://www.sitic.ch/community.html](http://www.sitic.ch/community.html)
User groups (planned)

Integration of SME in “green data centres” movement

- 1st interested target group: data centres of cities/communities (Energiestadt / cité de l’énergie)
- Use experience and output of sitic user group
- Use experience of “Lernende Netzwerke” in Germany (Jochem/Gruber, 2007; Jochem, 2007; Weissenbach, 2008)

Data centres in Geneva

- Benchmarking process in order to define minimal requirements and/or target values for DCiE in new and existing data centres

Energy cities in Switzerland
Conclusions

History

- 2005-2015: “green IT” more than a hype?

Measurement concept

- Metering ENERGY (not power) is essential

User groups

- THE way for diffusion of energy efficient solutions

References/literature/web sites

http://www.cepe.ethz.ch/publications/Aebischer_Data-Centre_ScanE_26-10-07.pdf


Baenninger M., 1996. Mitteilung, SBG, Zürich

EnAW Energie-Modell (Switzerland) http://www.enaw.ch/webexplorer.cfm?id=5&tid=1

Energiestadt / cité de l’énergie www.energiestadt.ch

Grossverbrauchermodell (Canton of Zürich)
http://www.energie.zh.ch/internet/bd/awel/energie/de/Fachinfo/grossverbraucher-doku.html
References/literature/web sites


Sitic www.sitic.ch


SWKI www.swki.ch

