

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

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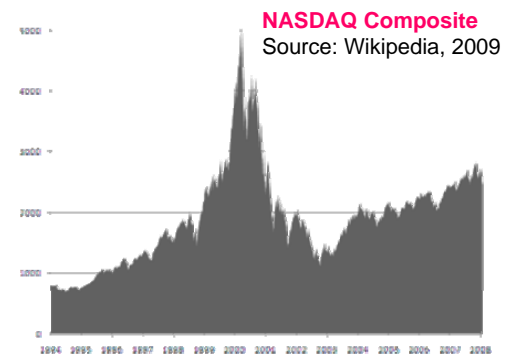
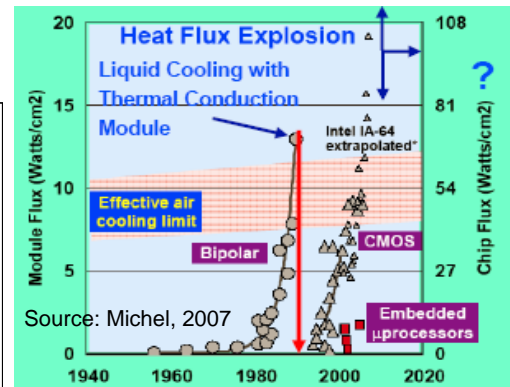
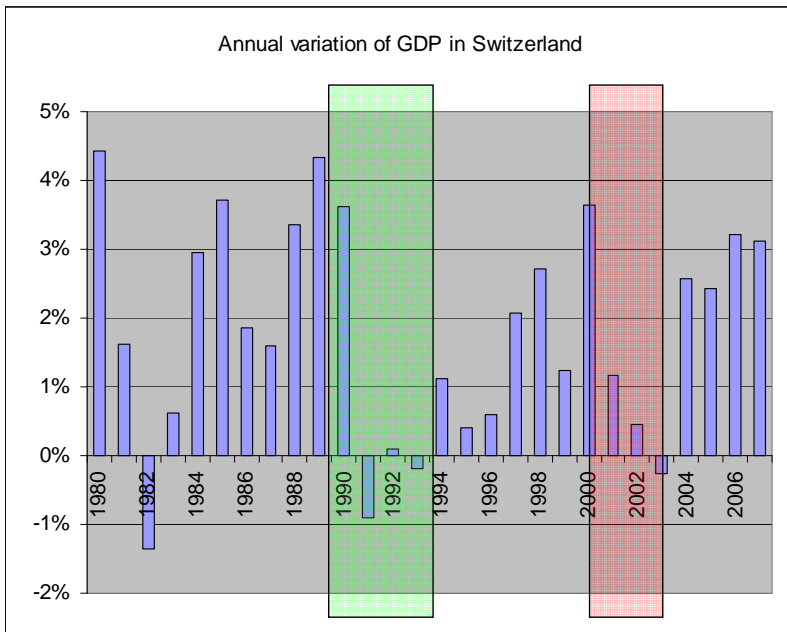
Overview/Summary

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:

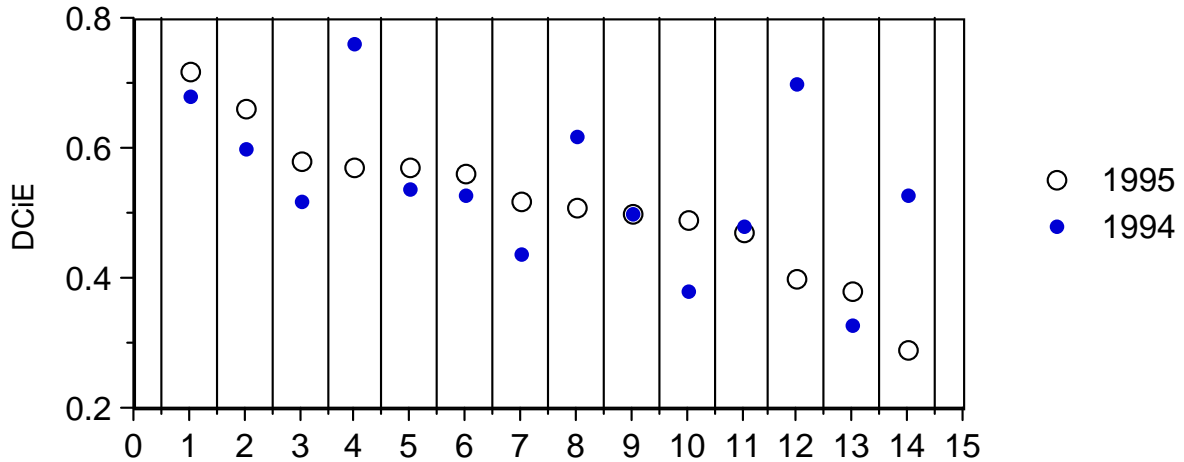
$$K = (\text{el. power IT rooms}) / (\text{total el. power}) = C1 = DCiE = 1/PUE$$

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

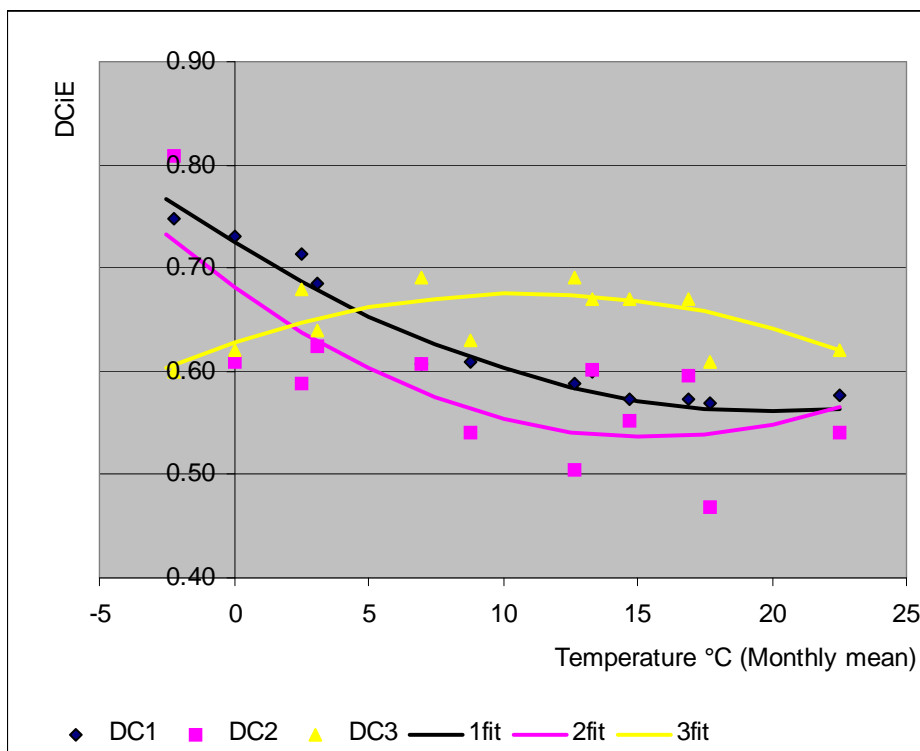
... but a good enough **measurement concept** – with **energy and not power to be measured** - is essential



DCiE in 1994 and 1995 in 14 computer centres in Switzerland

Source: Bänninger (1996) in Aebischer (1996)

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

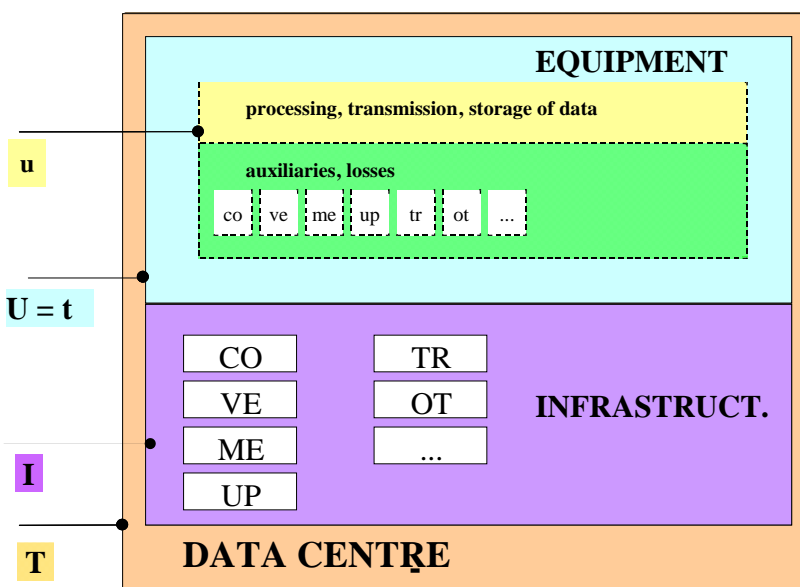
- Geneva: +(10-20)% of total electricity demand.
Study: indicators and target values for energy efficiency in data centres → voluntary agreements or legal requirements (Aebischer et al. 2003)

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

Dotcom bubble bursts after 2000

- Geneva: very little built → other priorities!

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



Indicator for over-all energy efficiency:

$$CEE = u/T$$

$$= U/T * u/t$$

$$= C1 * c2$$

- C1 = indicator for energy efficiency of central infrastr. = **DCiE**

- c2 = indicator for energy efficiency of infrastructure of ICT-equipment : **nok**

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

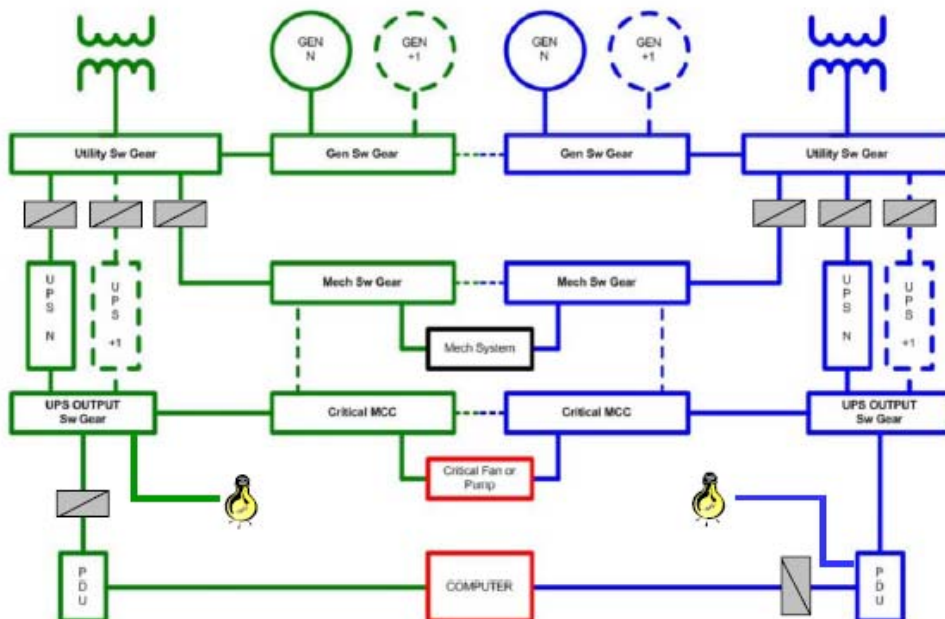
Following two characteristics of data centres:

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

http://www.biblioite.ethz.ch/downloads/Measurement-concept_DCiE_10-2-09.pdf

Measurement concept for Tier IV with dedicated cooling



Source:
Uptime Institute,
2006
and
Maucoronel et al.,
2008

Figure 4 : principe de mesure avec production de froid dédiée et 2 variantes éclairage

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:

- Grossverbrauchermodell (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.

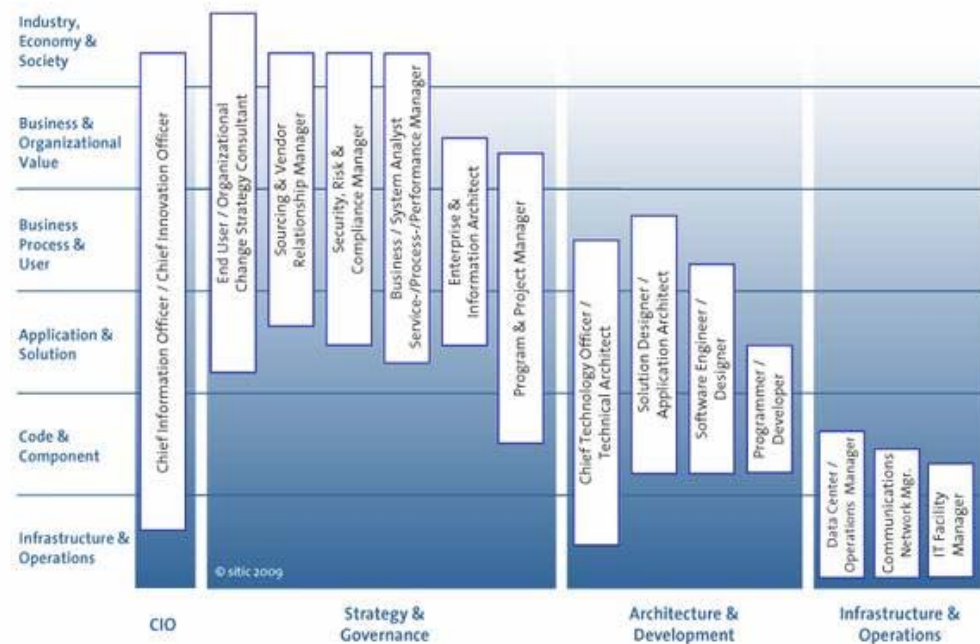
- For large companies: targets in % per year reduction of specific variable;
- For data centres: planned/realised savings/reductions in absolute terms.

User groups (in preparation)

Sitic (Swiss IT Intelligence Community) www.sitic.ch

- 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>



User groups (planned)

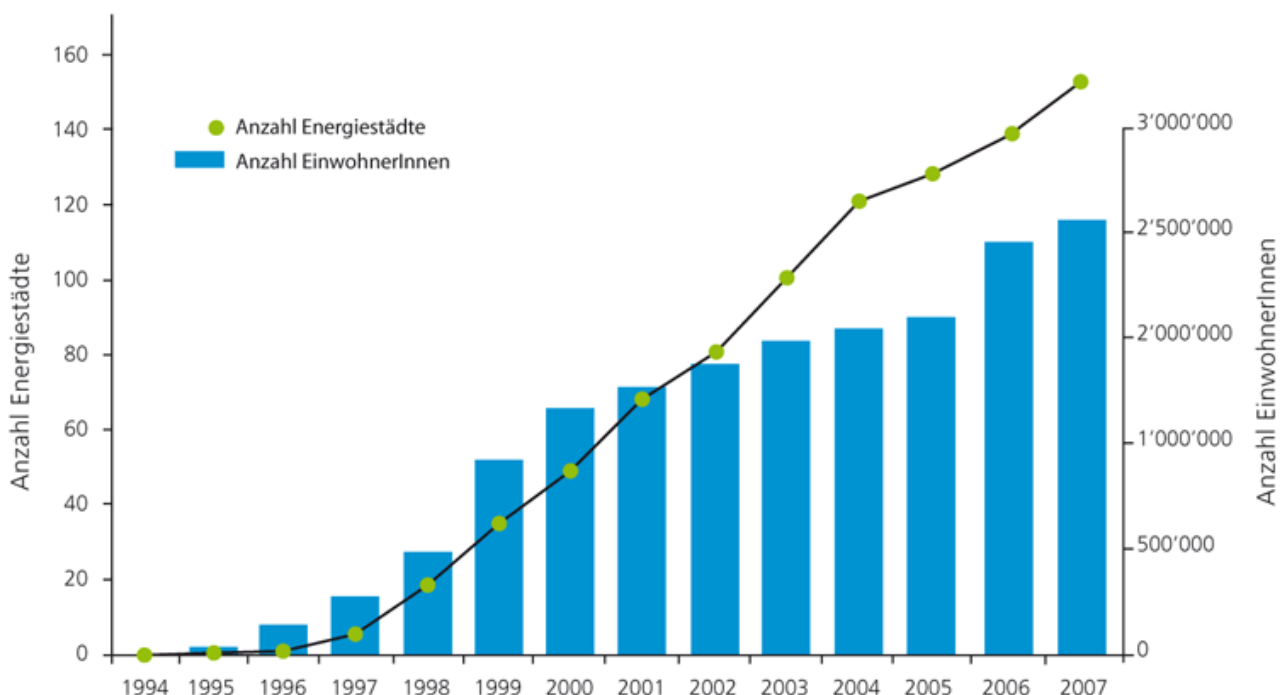
Integration of SME in “green data centres” movement

- 1st interested target group: data centres of cities/communities (Energienstadt / 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

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

Grossverbrauchermodell (Canton of Zürich)

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