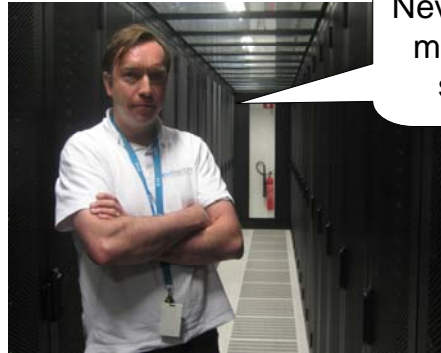


# Energy-Efficient Data Centres

## Best Practice Examples from Europe, the USA and Asia

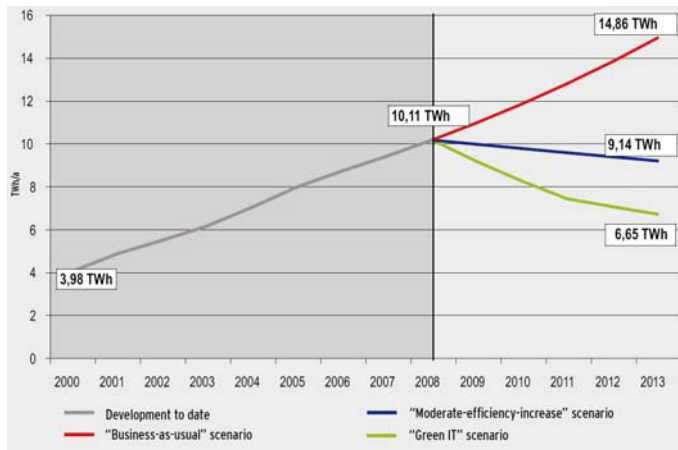


Never change  
my running  
system!

**Dr. Jens Clausen**  
**PD Dr. Klaus Fichter**  
Borderstep Institute for Innovation and Sustainability, Berlin, [www.borderstep.de](http://www.borderstep.de)

# The Problem

## The Electric Power Consumption of Servers and Data Centres in Germany



Diffusion of some best practices in half of the data centres

Diffusion of most best practices in nearly all data centres

## Low and High Hanging Fruits

### ■ Optimists say:

- Raising energy efficiency by 20% is often possible.
- Raising energy efficiency by 50% requires some effort.
- Raising energy efficiency by 90% is sometimes possible when employing Best Practice Solutions.

# The Task

## The Project

- Commissioned by the German Federal Ministry for the Environment
- Conducted by Borderstep Institute in 2008
- In cooperation with BITKOM e.V.
- Objectives of the project
  - Showcase best practice cases of energy-efficient data centres to raise awareness for best practice solutions
  - Present cases of server closets, server rooms, localized data centres, mid-tier data centres and enterprise class data centres
  - Present cases from Europe, the USA and Asia
  - Choose cases for which data on energy efficiency results is available

# The People

## Best Practices Come from Best Practice Entrepreneurs

- It is not enough to employ state of the art technology to become a best practice example.
- Best practice entrepreneurs employ innovative technology and create new combinations of technology to achieve more.
- The Best Practice Broshure presents
  - best practice technologies AND
  - the people behind them AND
  - the process of change.



# The Examples

## Consolidation and Virtualisation of the City of Copenhagen Data Centres



**Andreas Hare and a team of 8 colleagues** were in charge of the project. They replaced 15 old server rooms by one new data centre of 230 sq. m, reduced the number of servers from 700 to only 80 and are about to cut energy consumption by 75%.

**Reduction of energy consumption = 75%**

**Reduction of energy cost = 220.000 €/a**

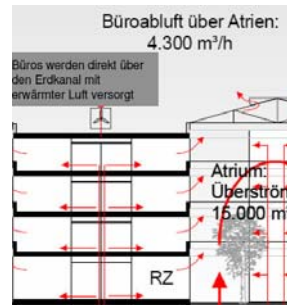
## Integrated Planning of IT and Building at Fraunhofer ITWM



**Franz Josef Pfreundt** was responsible for the integrated planning of a huge scientific building. As result

- all Desktop PCs were removed and replaced by a Thin Client System,
- computing power was concentrated in the data centre
- the centre is run at a waste heat temperature of 30°C and the hot air heats the building.
- On top, the Green500 Rank #1 supercomputer was installed.

**DCIE = 70%**  
**PUE = 1,43**



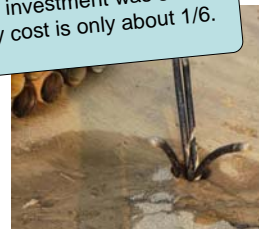
## An Unconventional Cold Source at Bechtle



**Bernhard Margos** recognized that a client did not buy a compression cooler but strived for geothermal cooling. He tried geothermal cooling himself and achieved a COP of 9 with the new cooling system. In combination with virtualization he reduced energy demand by over 60%.

In Austria, a shopping mall uses 2 MW geothermal cold. The investment was similar to compressors, but energy cost is only about 1/6.

**DCIE = 85%**  
**PUE = 1,17**



## Efficient IT-Hardware in a Secondary School in Hanover



**Claus-H. Schröder** expanded the capacity of the schools data centre to be able to switch to server based computing. The target was a more efficient administration.

He choose five extremely efficient servers based on notebook technology consuming only 35 Watt of electricity each. The low energy consumption enabled the school to skip server room cooling altogether.

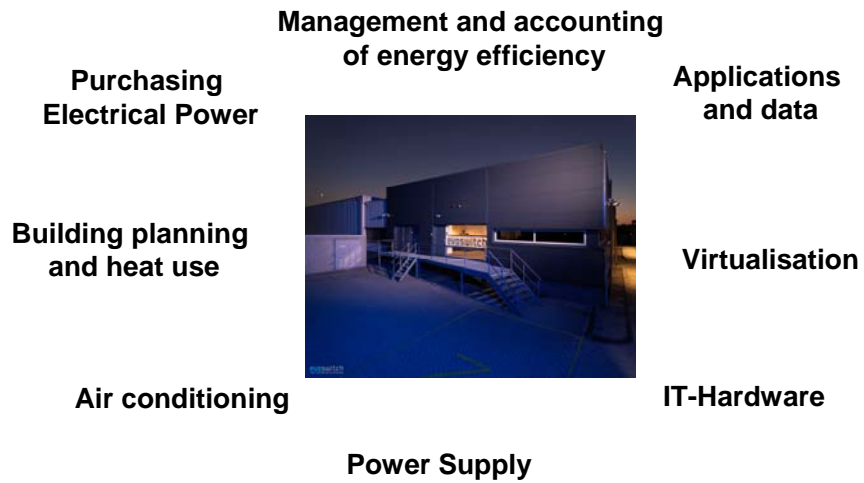
**DCIE = 86%**  
**PUE = 1,16**



The energy saving server  
consuming only 35 Watt

## The Eight Dimensions of Energy Efficiency

## The 8 Dimensions of Energy Efficiency



## The Brochure

# Energy-Efficient Data Centres

## Best Practice Examples from Europe, the USA and Asia

- Funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Published January 2009
- 11 Best – Practice – Examples from Europe, the USA and Asia

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