OPTIMAL DESIGN OF CHILLER UNITS AND COLD WATER STORAGES FOR DISTRICT COOLING SYSTEMS

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Source: http://szenarien.fgje.de/
2004-2005: Feasibility evaluation for empowerment of combined heat and cool and power cycle by means of Cool TES in large supplying systems

- Financial support
  - Federal Ministry of Economics and Labour (BMWA)
  - At the present:
    - Federal Ministry of Economics and Technology (BMWi)
  - Represented by Project Management Organisation Jülich (PTJ)

- Project partners
  - Utility Company Chemnitz Stock Corporation
  - University of Technology Chemnitz

- General goals
  - Better use of waste heat with Absorption Chillers ➔ heat surplus during summertime
  - Improvement of efficiency of Combined Heat and Cool and Power Cycle

Background
Combined heat and power plant in Chemnitz
465 MW_{therm}, 195 MW_{el}
- District cooling since 1973
- 1993 reconstruction
- Central cooling plant
  - Absorption chiller \(\Rightarrow\) *base load*
    - 2 x 1800 kW \(\text{H}_2\text{O-LiBr}\)
    - 500 kW \(\text{H}_2\text{O-LiBr}\)
    - Use of waste heat from CHP
  - Vapor compression chiller \(\Rightarrow\) *peak load*
    - 3000 kW centrifugal
    - 1242 kW screw
- Net
  - Temperatur: 5…7 °C / 13 °C
  - Length: 4.2 km
  - Total power of connections: 10.57 MW
  - Consumption
    - 93 % for air conditioning
    - 7 % for technological cooling

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District cooling in Chemnitz
The problem: Peak loads (forecast year 2006)
The solution: A Cool TES for the peak load operation ♦ Special goal ♦ TRNSYS-Simulation of district cooling in Chemnitz
The advantages of TES are well known, but the central question is: What are the ranges for an optimal system dimensioning?

Sensitive analysis
Example 1: Maximum of requested VCC power as function of $P_{F_{AbC}}$ and $V_{TES}$
Example 2: Maximum of requested TES discharge power as function of $\text{PF}_{\text{AbC}}$ and $V_{\text{TES}}$
Example 3: Annual overall costs as function of PF\textsubscript{AbC} and V\textsubscript{TES}
Conclusions
- The study shows the different effects in the field of dimensioning.
- The effects are analyzed in the article.
- An optimal design is therefore possible. 
- The advantages of the storage technology can be used optimally.

Outlook
- This year we will build the first large-scale short time storage in Germany. 
- We accomplish an extensive monitoring program in the next years (2006…2009).
- The optimization of the system and of the storage operation is an emphasis of the research program.
I look forward to the discussion at the poster.
Thank you for your attention.