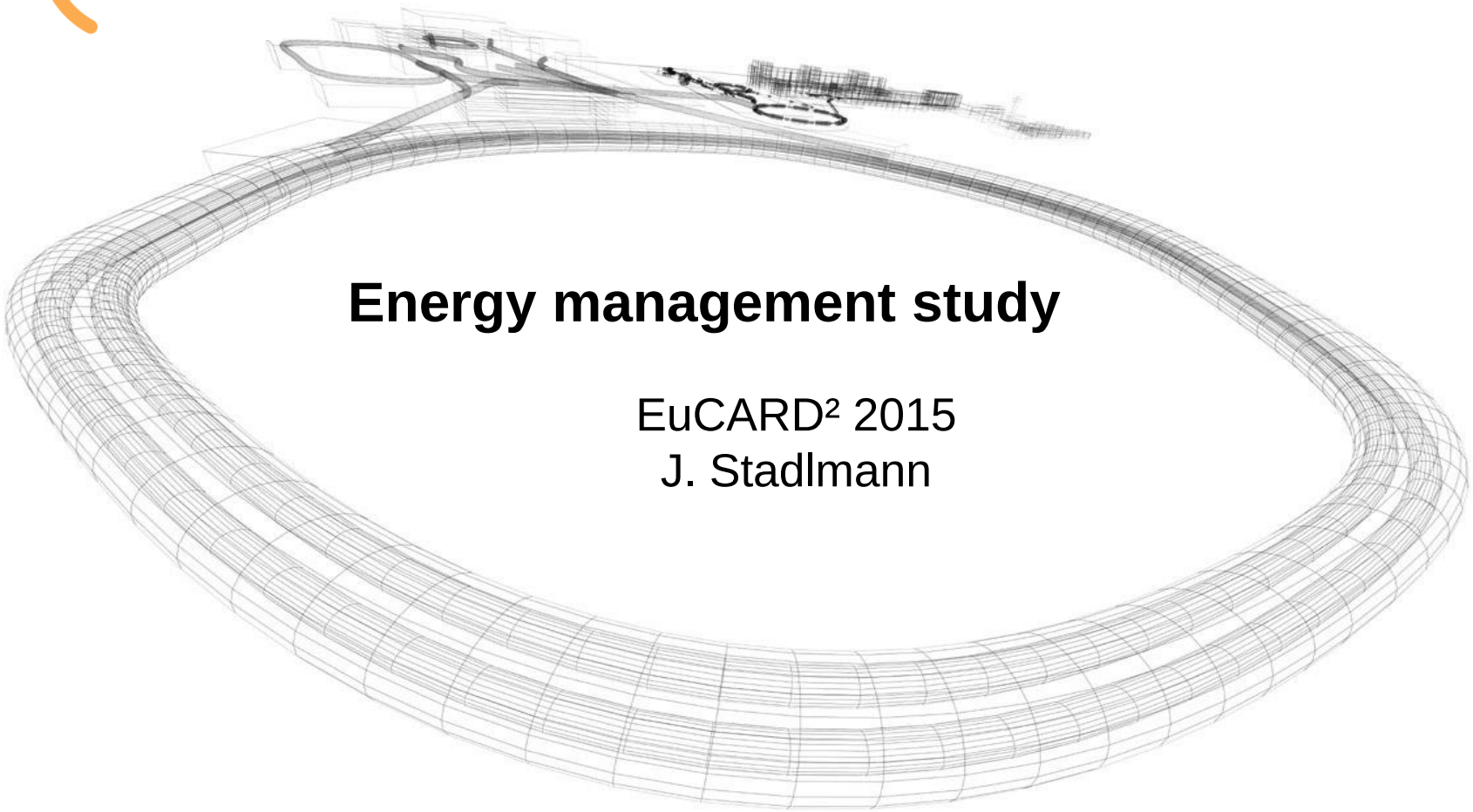

Energy management study

EuCARD² 2015

J. Stadlmann

Motivation

- Start was a detailed energy survey at GSI within a thesis (C. Ripp) with interesting results
- GSI had basically „one big power bill“ and we managed to cut that into pieces which is the start of every energy management effort
- We did predictions for the FAIR project in another study and could help our management.
- NOW -> how do other institutes do?

Collaboration with Institute „Electrical Power Systems“ of TUD

TECHNISCHE UNIVERSITÄT DARMSTADT

Elektrische Energieversorgung unter Einsatz Erneuerbarer Energien

Collaboration in projects with focus on energy efficiency

FAIR@GSI

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Control Strategies for Power Systems

Analyses of energy consumption
for accelerators
to determine energy efficiency
and associated potential

Analyses of power quality problems
in the electrical network

Survey 1

Questionnaire

on Accelerator Electric Power Consumption and Efficiency

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Part 1: Description of the nature of your facility

We tested with GSI!

		A	B
1.	Description of facility		
1.1	General	Name GSI	First operational year 1975
1.2a	Particles and type of accelerator (e.g. e/synchrotron)	1. (major) Heavy Ion Synchrotron (SIS18)	
1.2b		2. Universal Linear Accelerator (UNILAC)	
1.2c		3. Experimental Storage Ring (ESR), Fragment Separator (FRS)	
1.3	Type of research (e.g. matter and material, human health)	Main task Nuclear Physics	Secondary task Atomic Physic., Life Sc., Material Sc., Plasma Phy.

Survey II

- You got the survey and the TUD students are willing to help completing it
- In our test the survey was filled quite fast in a kind of interview mode with the “energy guy”
- Please help us to distribute the survey to interesting labs

What is in?

		A	B	C	D
2.	**Basic parameters on operation** re 2.3: Normal operating time means sum of preparation, operation and experiment time, the accelerators are turned on re 2.2: Standby operation time means the accelerators are turned off				
2.1	■ Reference year 2012 or □ Typical Value/ Average Value				
	Operating hours per year [h]	Accelerator 1	Accelerator 2	Accelerator 3	Comments
2.2	Standby operation time	4260	2860	6760	
2.3	Normal operating time	4000	5300	1500	
2.4a	Preparation time	300	k.a.	k.a.	
2.4b	Operating time (Accelerating time)	4000	k.a.	k.a.	
2.4c	Experiment time	200	k.a.	k.a.	
2.4d					
2.5					
2.6					
		A	B	C	D
	Average energy consumption in normal operation time [GWh]	Accelerator 1	Accelerator 2	Accelerator 3	Sum per year
2.7	Total	5	30	2	63
2.8	Personal and Buildings	14			
2.9	Experiments and Laboratories	14			
2.10	Accelerator (operating time)	37			
2.11	cooling plants e.g. cooling system	12			
2.12					
2.13	Comments				

Fluctuations might be intersting

Recording time [min]	t_{rec} = 15		(eg. 15 min)			
	Base load [MW]		Average power [MW]		Peak power [MW]	
age load curve value of rding time t_{rec} or of day	t_{rec}	day	t_{rec}	day	t_{rec}	day
operation time (re 2.3)	6		9		12	
operation time (re 2.2)	2,5		3,5		6	
erienced any unique or value (above or below						

3 to 6 MW to „play“ with

6.2	▣ Holiday related (e.g. summer break, Christmas time)				
6.2a	Christmas time	2,5	2,5	2,5	deep shutdown
6.2b					

Even more potential in here!

Conclusion and Outlook

- The survey might produce interesting data for all labs
- It already helped at GSI in argumentation with management about modernization

- Please help Christina and Damian!

Potential Fields of Cooperation

Elektrische Energieversorgung unter Einsatz Erneuerbarer Energien

TECHNISCHE UNIVERSITÄT DARMSTADT

Motivation : Increase share of renewable energies and shut-down of nuclear power plants requires new approaches to ensure reliable and safe operation of the German transmission system

Accelerator Conditions and Innovations

- Increased energy efficiency and high power factor at network connection point
- Increased supply from renewable energies (e.g. self-generation)
- Independent and innovative supply, development of UPS, high reliability
- Require/exchange huge amount of reactive power from/with public grid

Innovative Research Activities

- Analyses of innovative facilities for reactive power compensation and reduction of harmonics
- Optimization of control strategies to increase efficiency and robustness
- Optimization of reactive power supply in transmission systems
- Network design and analyses
- Analyses of power quality problems
- Network modelling with high proportion of renewable energies

Potential Synergies between TUD and Research Accelerator Facilities

Elektrische Energieversorgung unter Einsatz Erneuerbarer Energien