

Some contributions from BTU Cottbus to the grid integration of renewable energies

Prof. Dr.-Ing. Harald Schwarz

Managing Director of CEBra – Center for Energy Technology Brandenburg
Brandenburg University of Technology (BTU), Cottbus

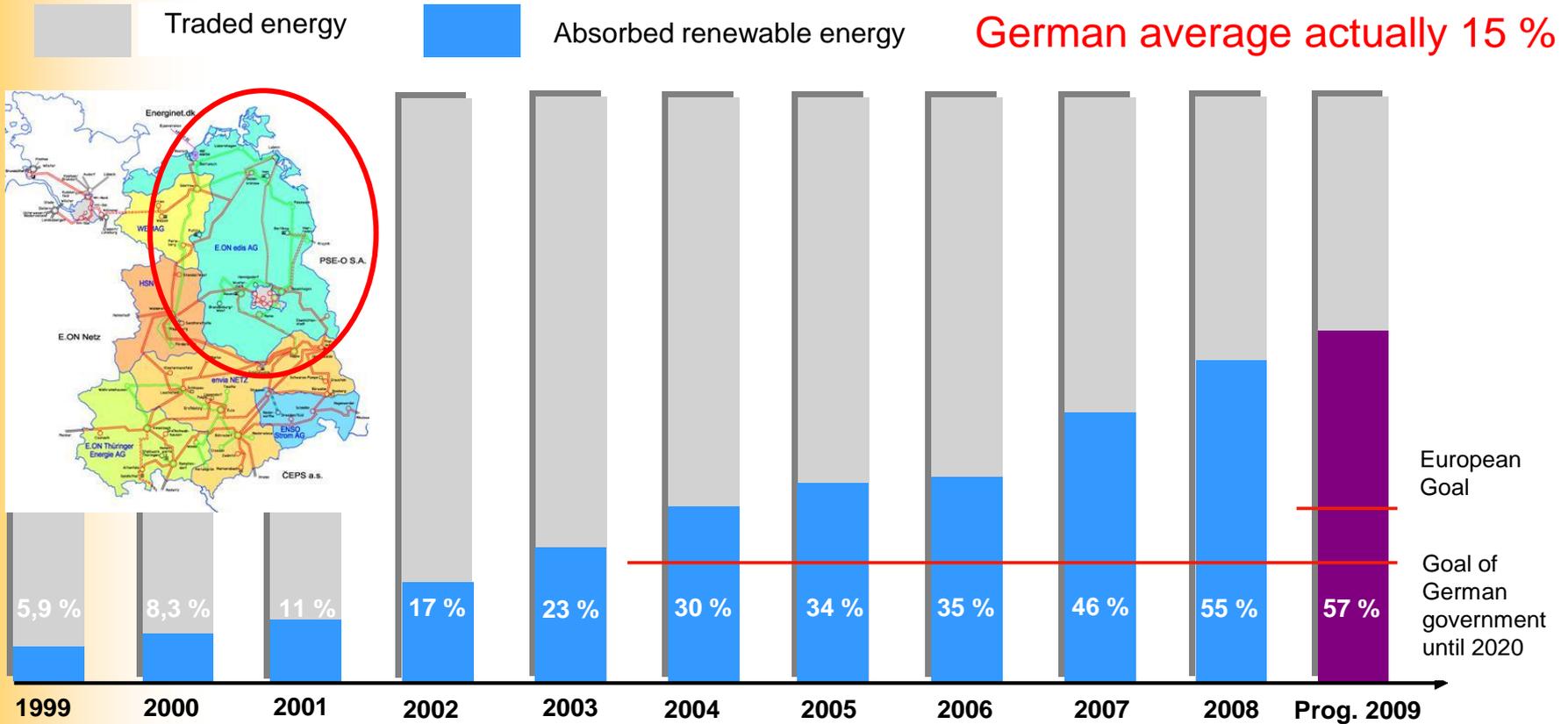
Member of Scientific Advisory Board of 50 Hertz Transmission Ltd, Berlin

2 Actual Status of Renewable Energies in Germany



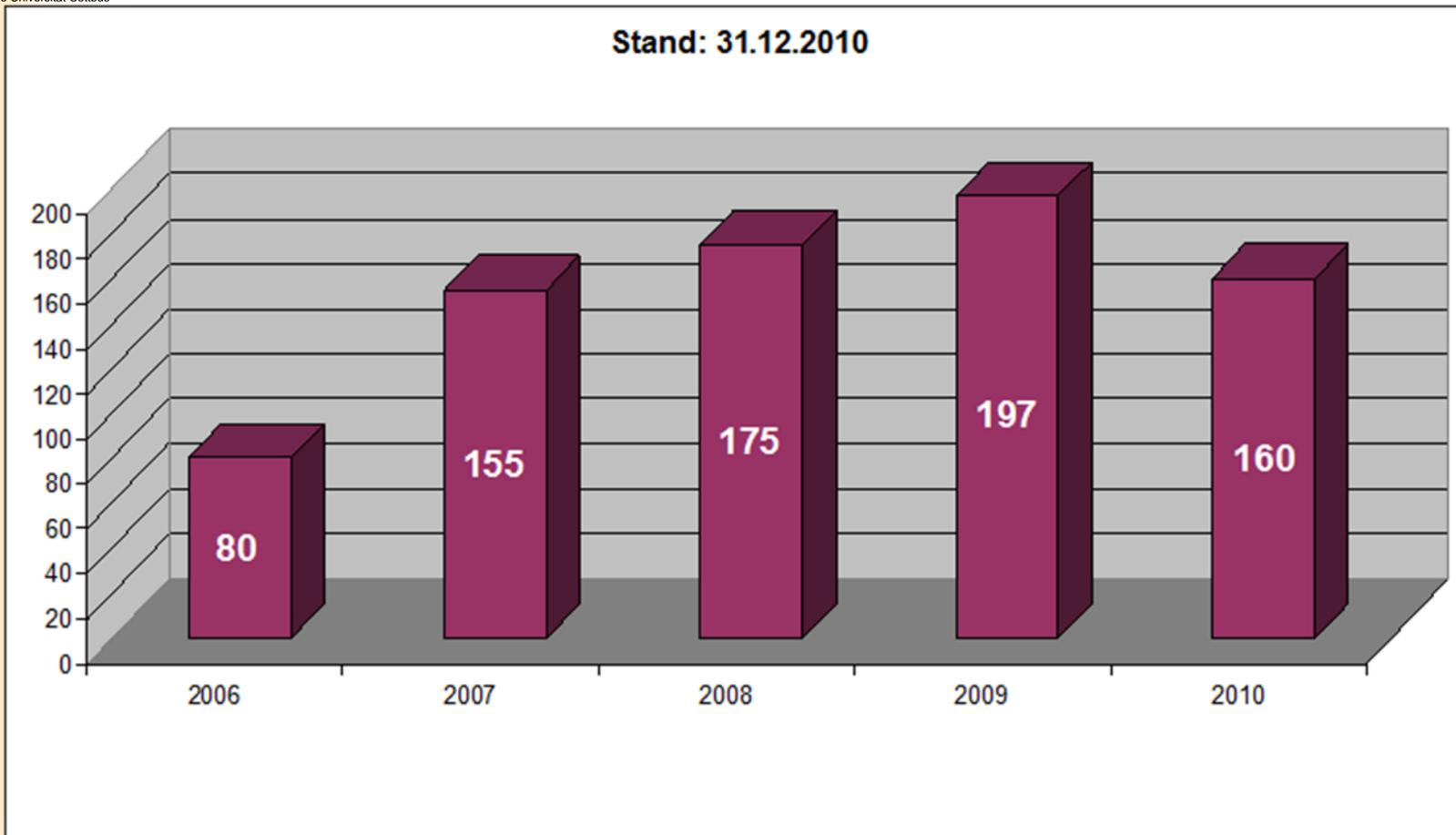
	1990	2010	2030
Total Load	4 – 11 GW	4 – 11 GW	4 – 11 GW
Generation Capacity	13 GW	35 GW	60 – 70 GW
Storage capacity	12 GWh	20 GWh	20 GWh ?

Share of electric power from renewable sources in the distribution grid of e-on edis



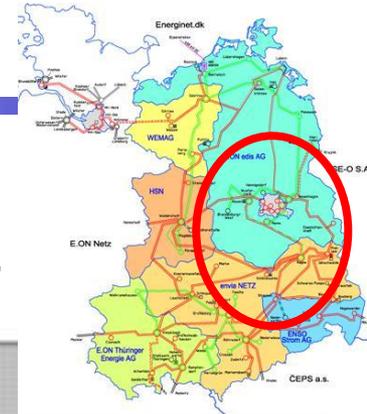
entnommen aus Vortrag Herr Dubberstein zur Weiterentwicklung der Energiestrategie Brandenburg

2 Actual Status of Renewable Energies in Germany

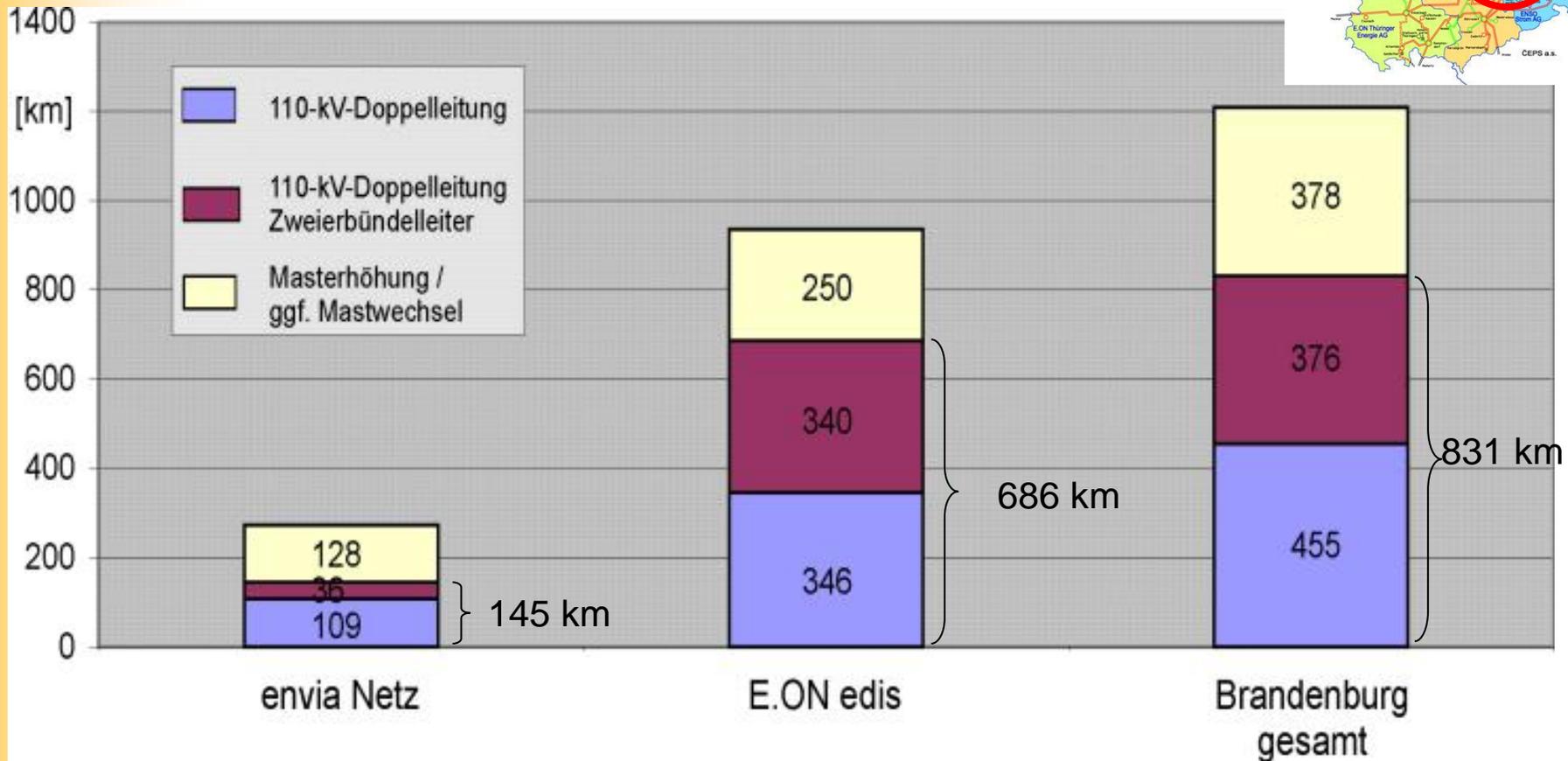


Days per year with counter measurements acc. to EnWG §13

Publication permitted by 50 Hertz-Transmission GmbH

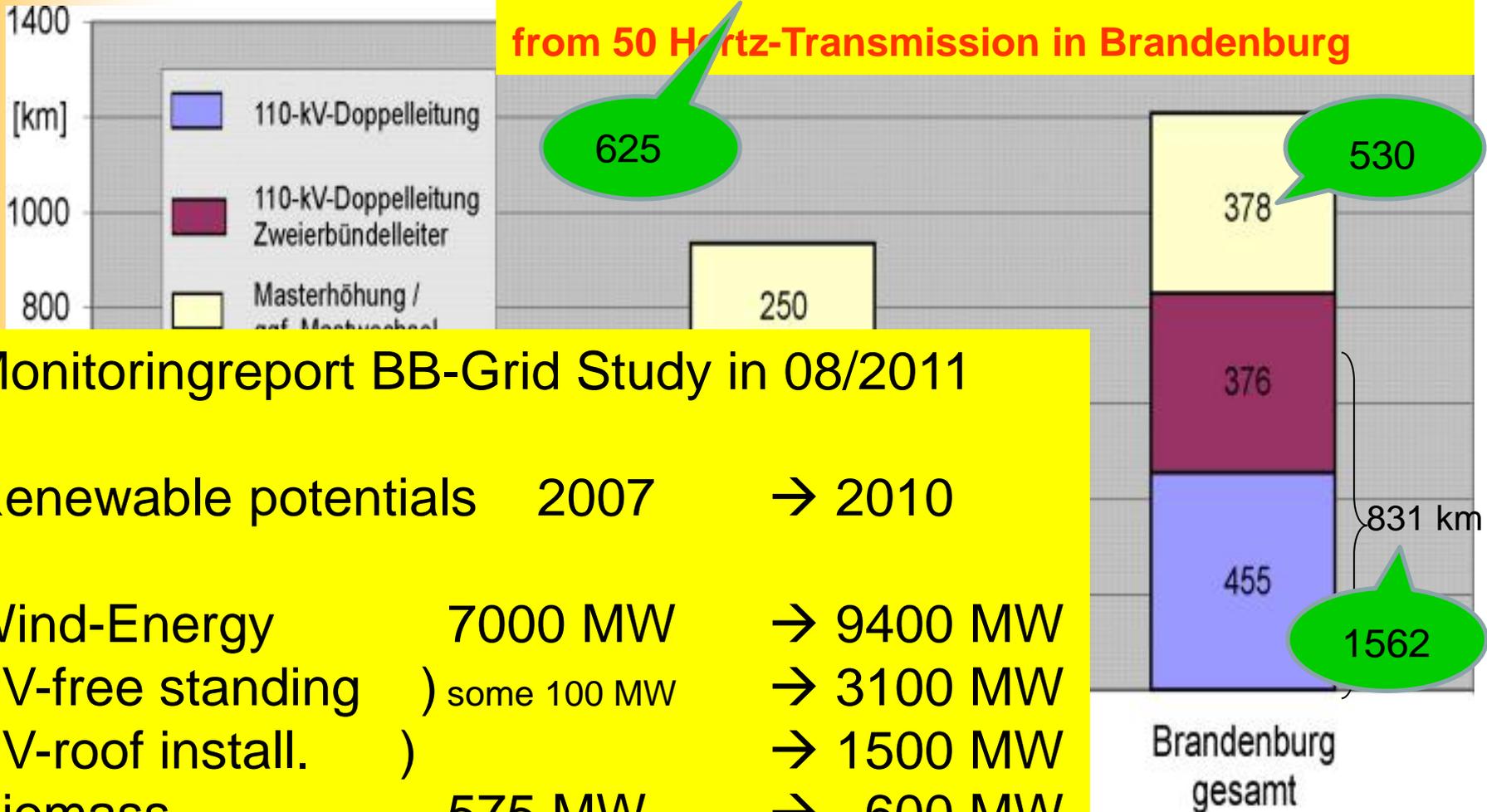


Necessary 110 kV Grid Extension in the State of Brandenburg



Plus another 300-600 km on 400 kV level

Plus 300- 600 km additional 400 kV lines from 50 Hertz-Transmission in Brandenburg

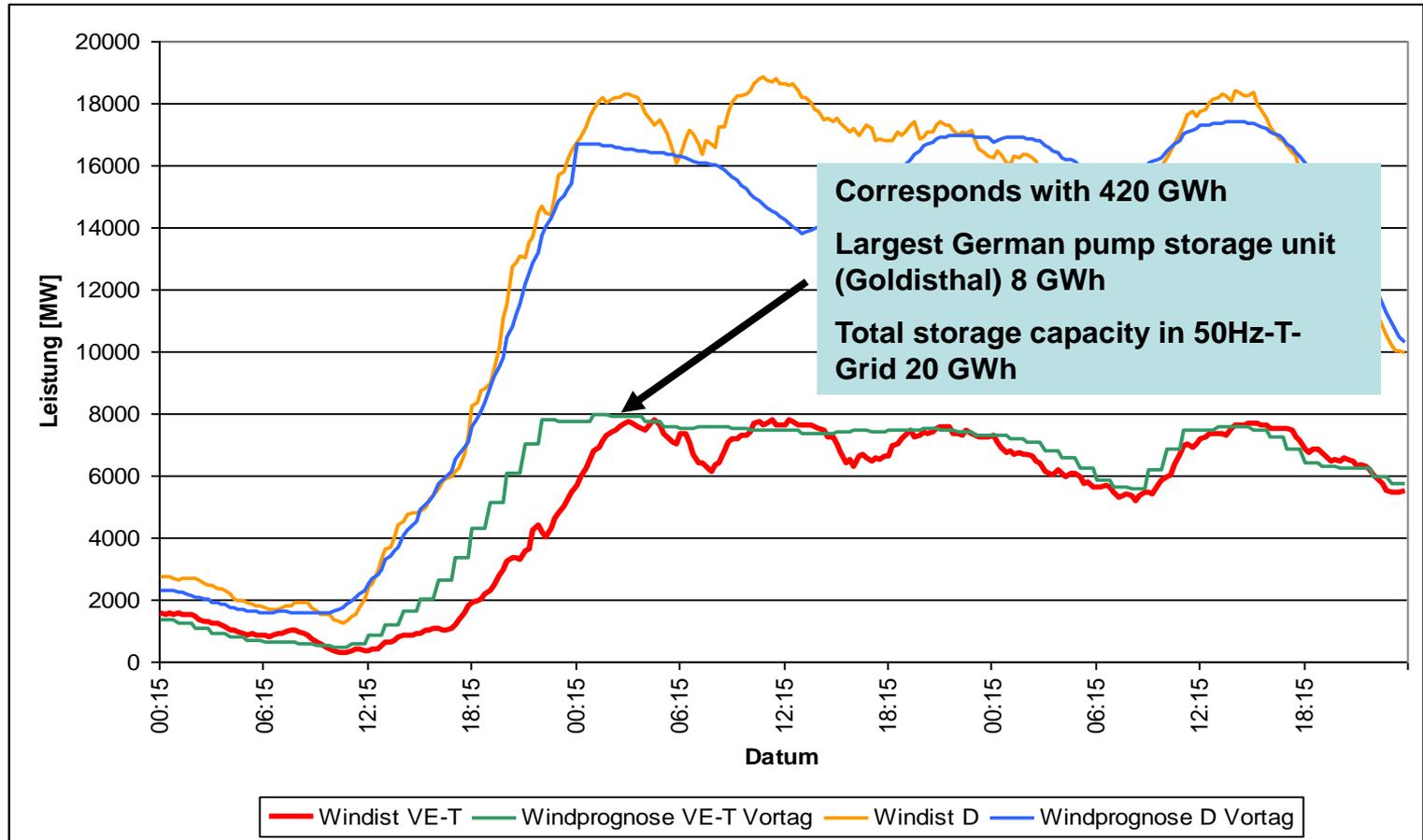


Monitoringreport BB-Grid Study in 08/2011

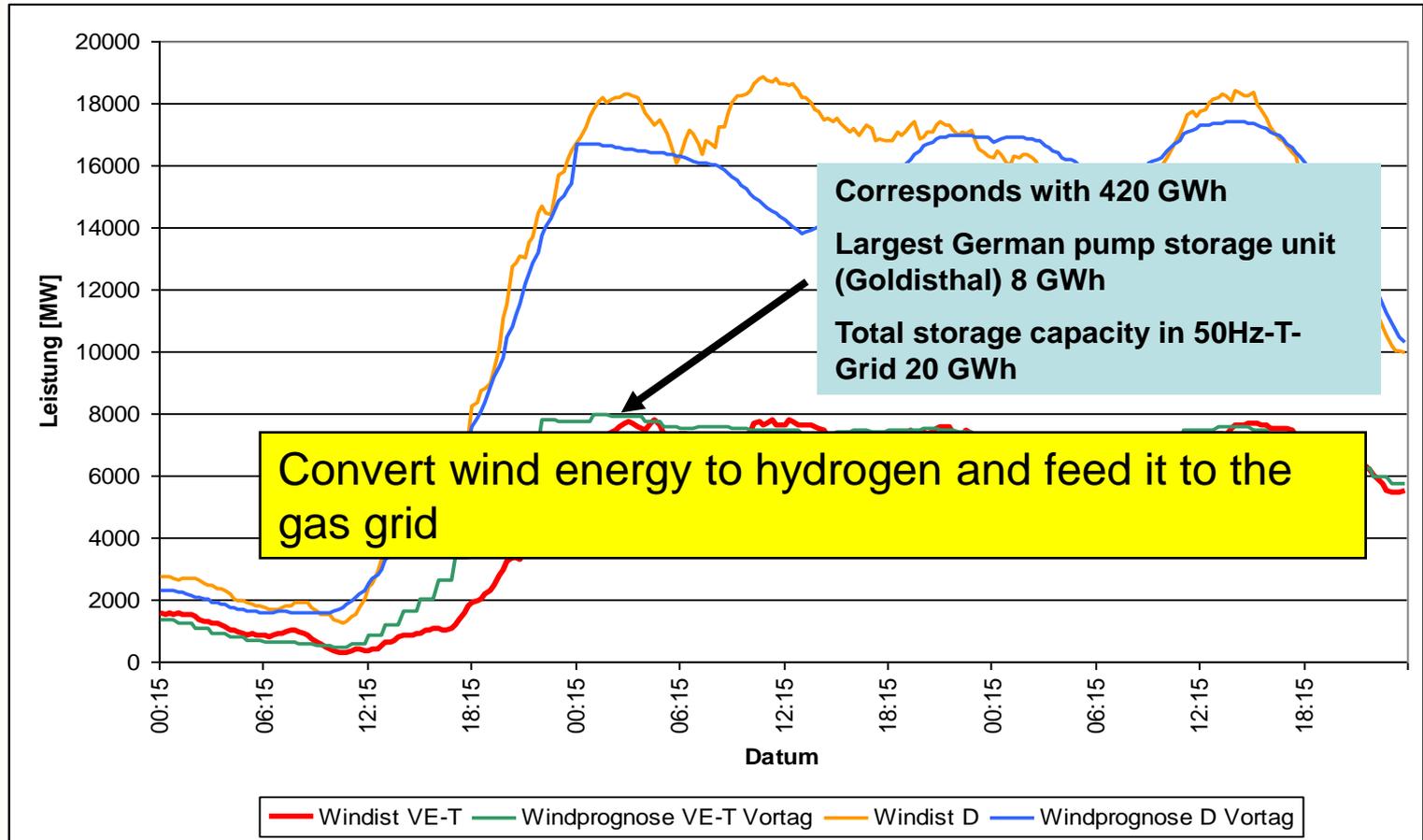
Renewable potentials 2007 → 2010

Wind-Energy	7000 MW	→ 9400 MW
PV-free standing) some 100 MW	→ 3100 MW
PV-roof install.)	→ 1500 MW
Biomass	575 MW	→ 600 MW

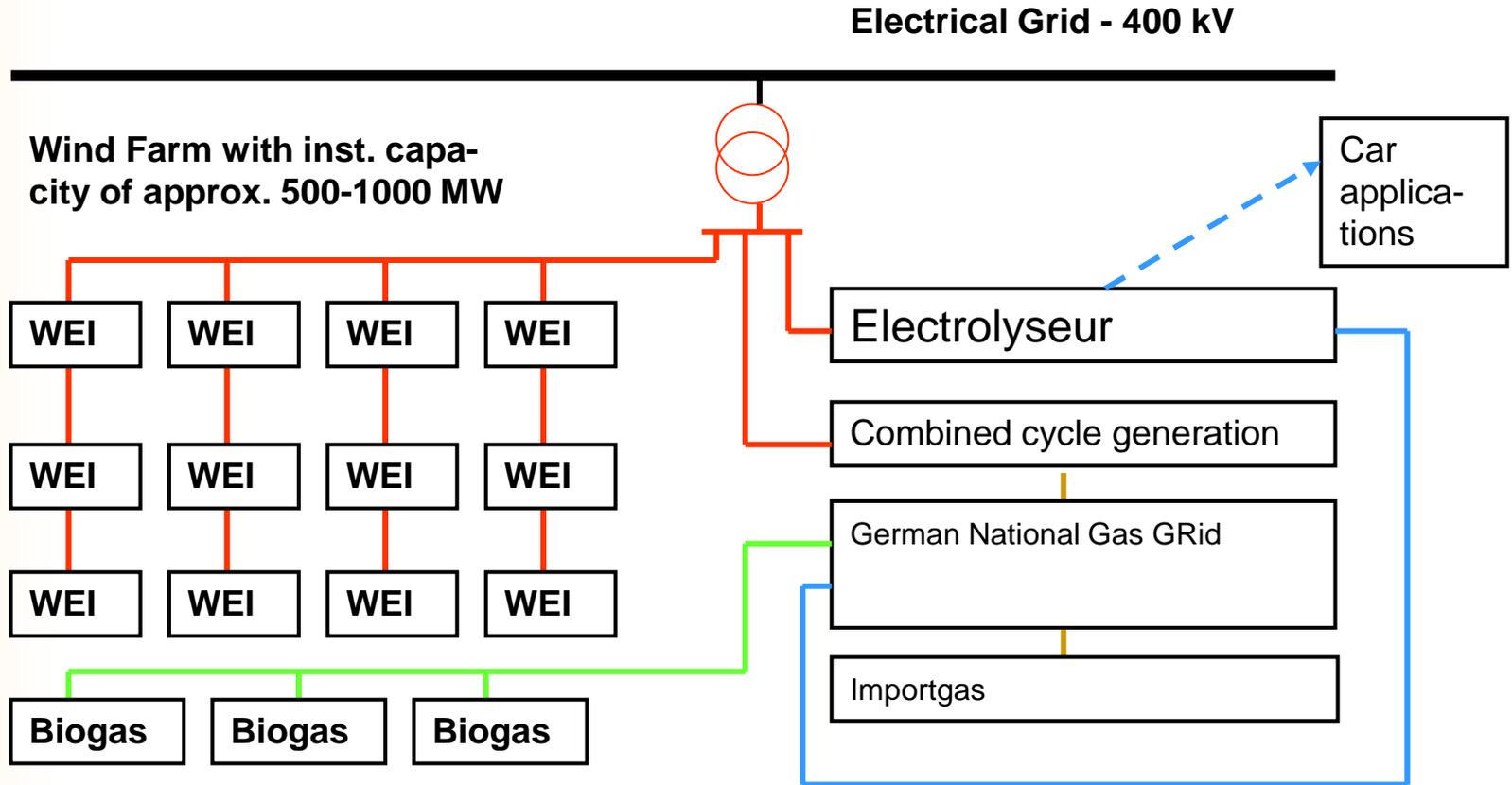
Storm „Emma“: Wind power generation in VE-G Grid 29.02. – 02.03.2008



Storm „Emma“: Wind power generation in VE-G Grid 29.02. – 02.03.2008



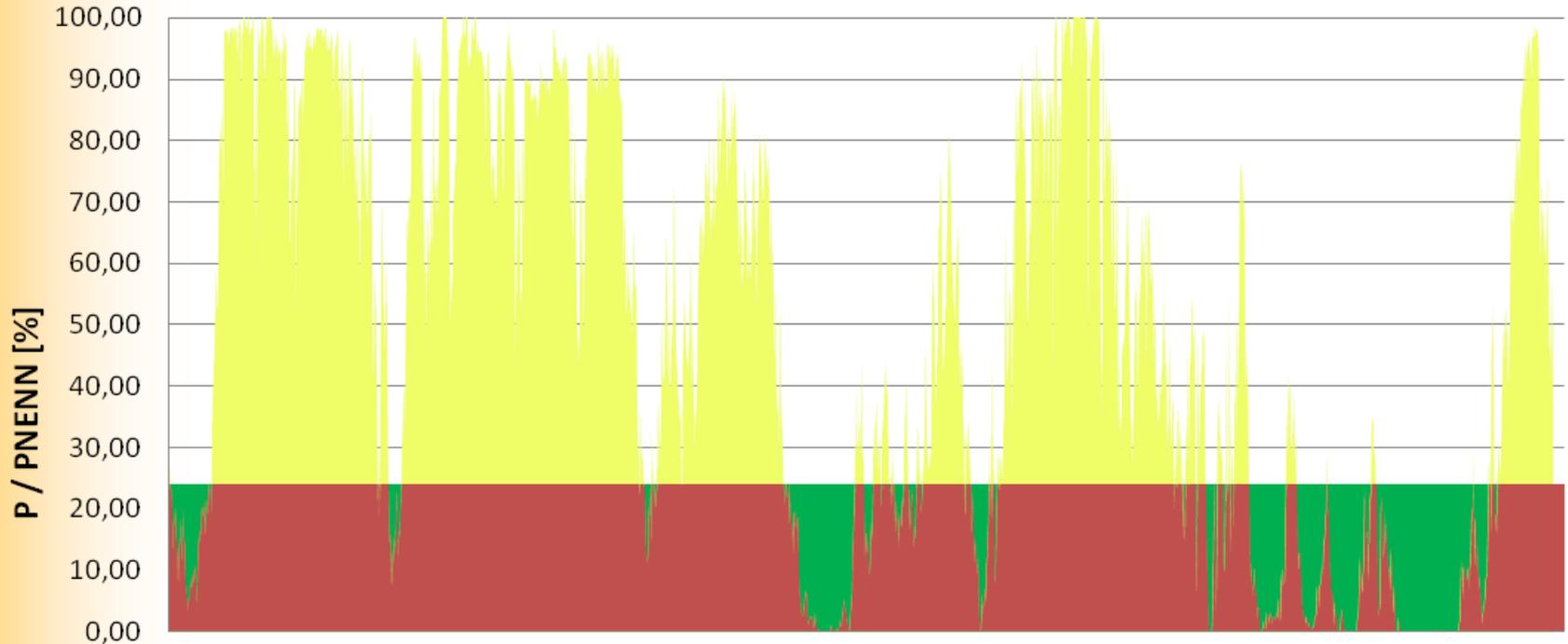
Development of Renewable Energy Hybrid Plants



Principle Design of a Renewable Energy Hybrid Plant

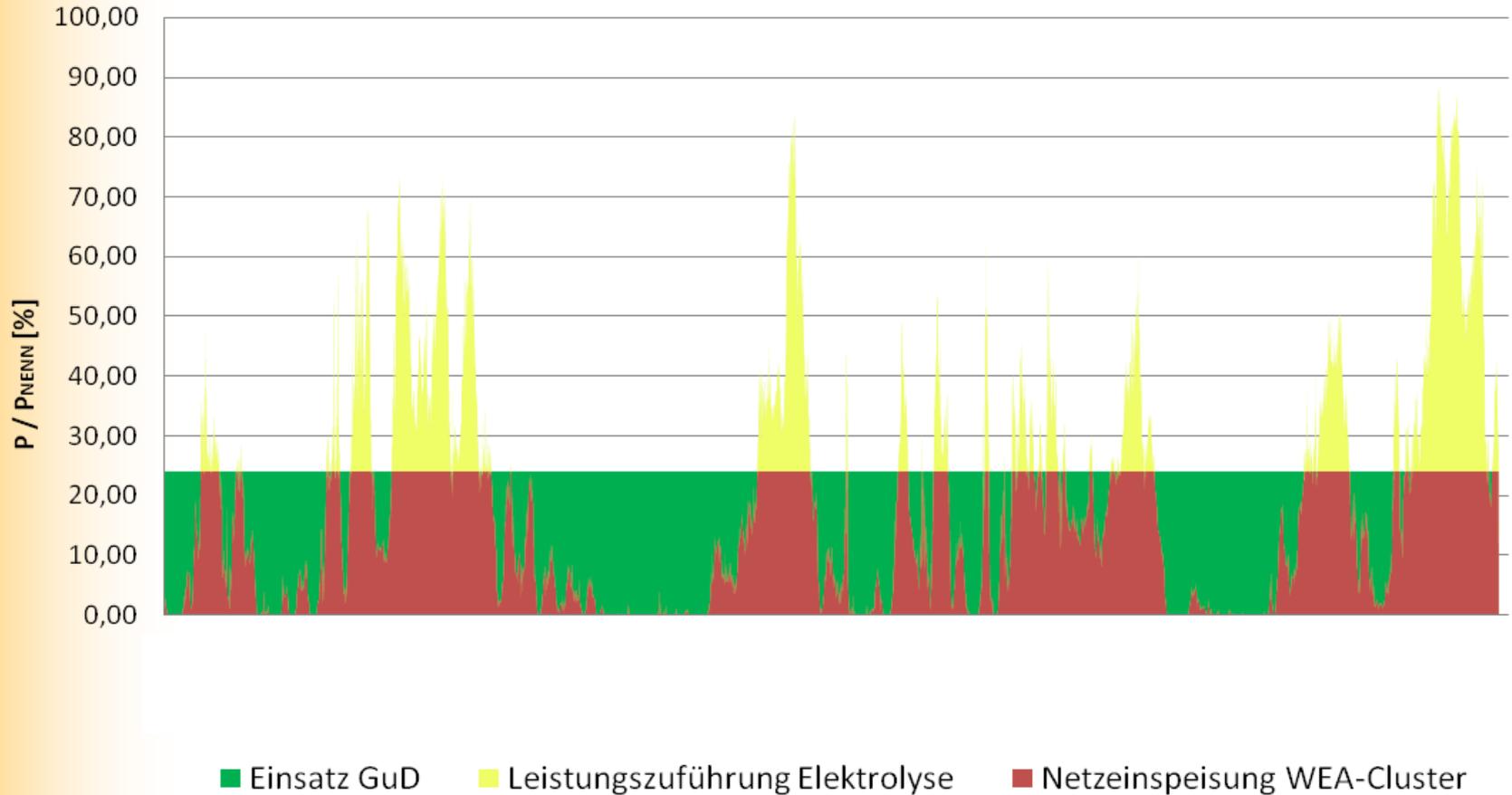
Electrolyseur test lab at BTU under construction

Wind power generation in a typical winter month

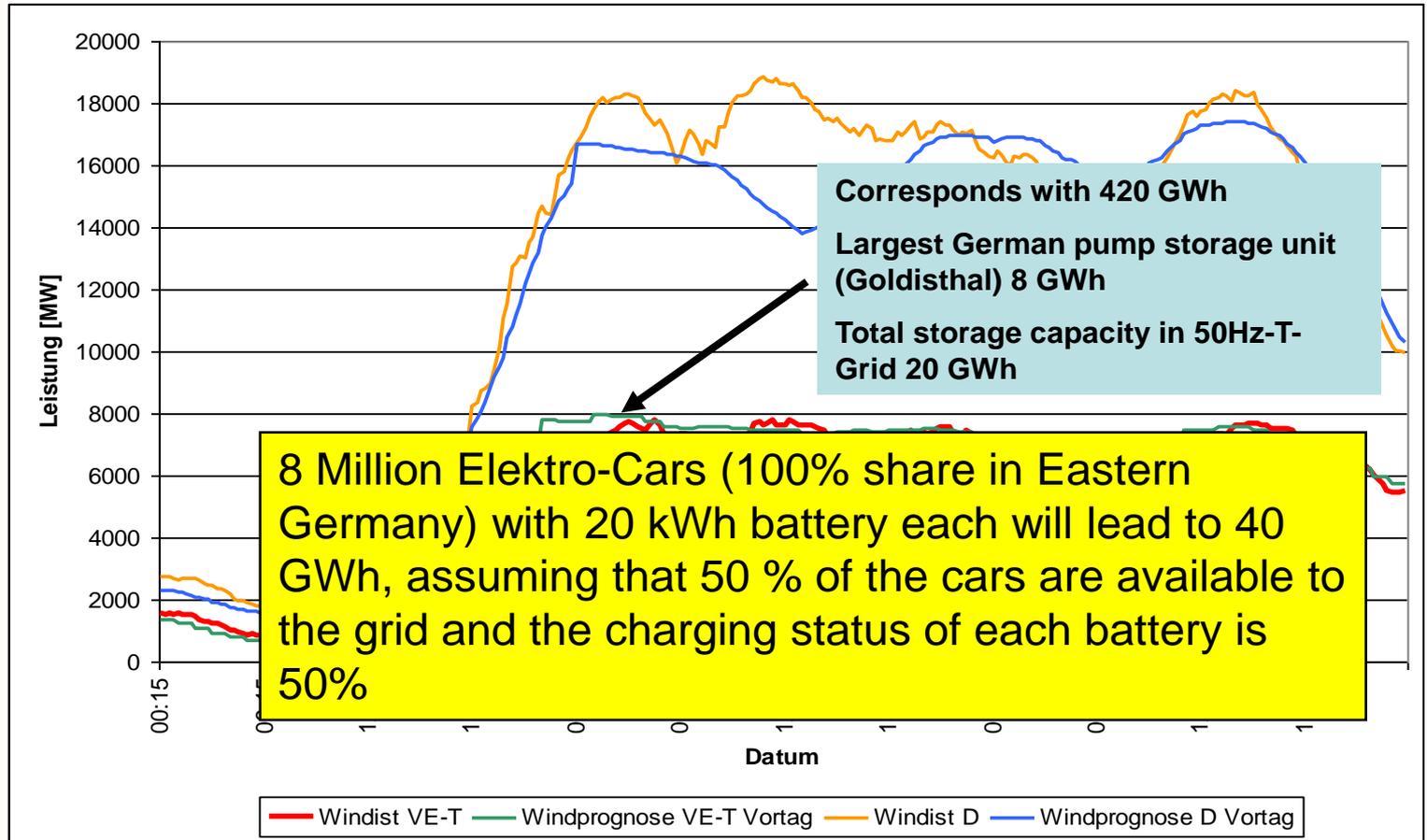


■ Einsatz GuD
 ■ Leistungszuführung Elektrolyse
 ■ Netzeinspeisung WEA-Cluster

Wind power generation in a typical summer month



Storm „Emma“: Wind power generation in VE-G Grid 29.02. – 02.03.2008



Impact of a e-cars based distributed storage to the grid

BTU Research Project together with

- Vattenfall Europe Generation
- Vattenfall Europe NetCom
- 50 Hertz Transmission
- German – e - Cars
- Mercedes
- Opel (GM sister company)

Supported by

- Ministry for Economics (State of Brandenburg)
- Ministry for Science and Research (State of Brandenburg)



30 Opel Corsa



17 Mercedes Sprinter



4 e-off road cars

Data connection
to Grid Control
Center

Charging Stations e-SolCar
at BTU Campus (20 units)

PV System
100kW peak

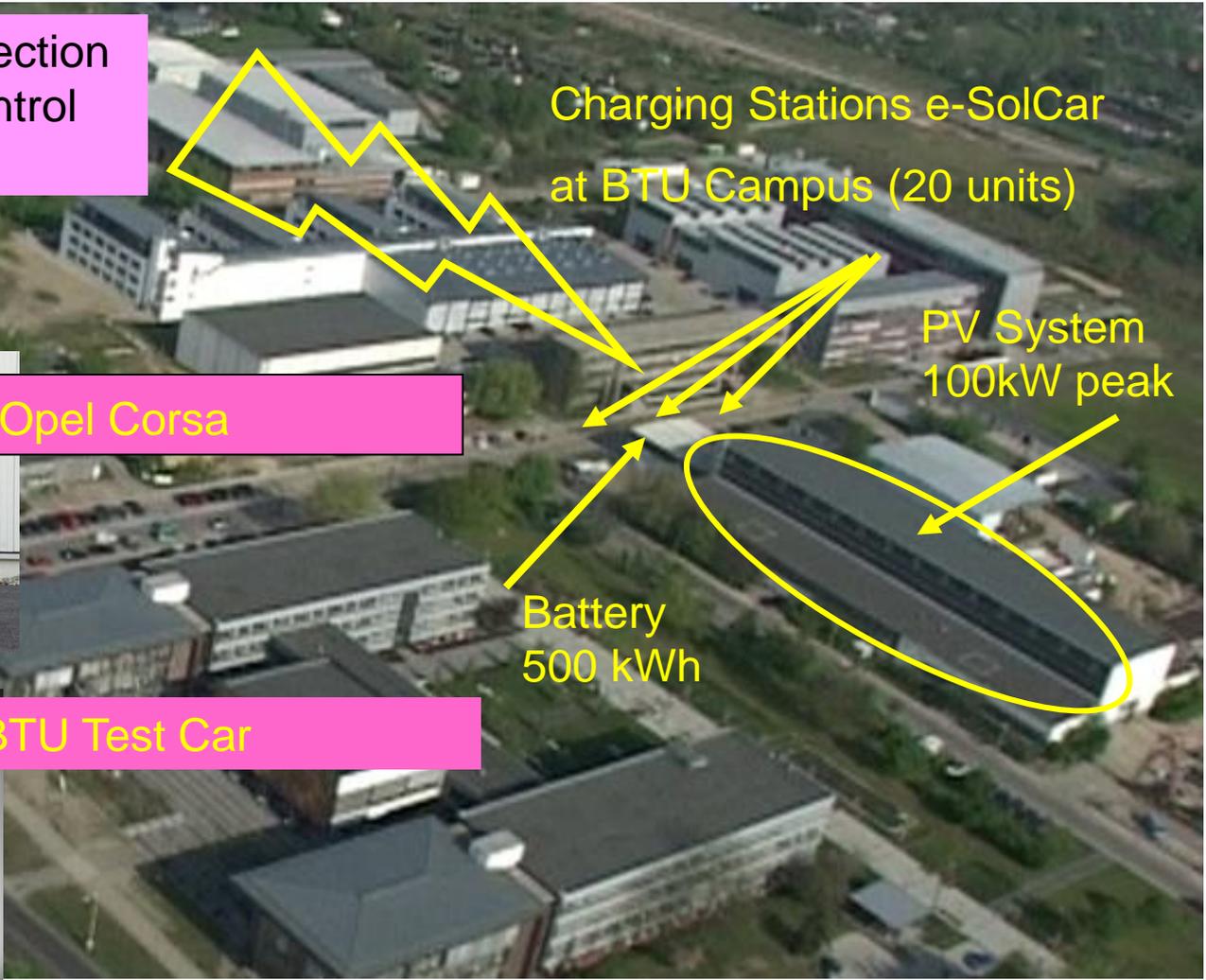
Battery
500 kWh



15 Opel Corsa



1 BTU Test Car





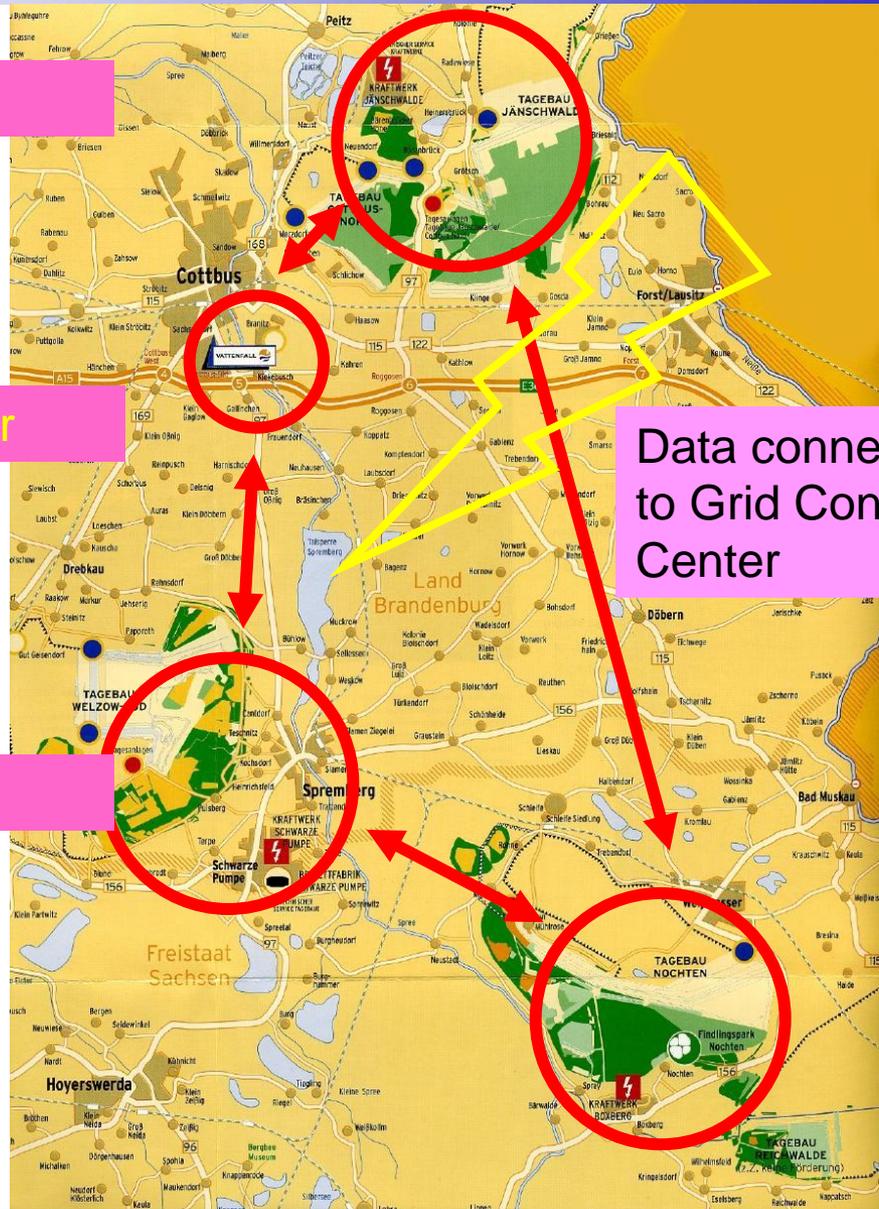
15 Opel Corsa



16 Mercedes Sprinter



4 e-Off-Road Cars



Data connection to Grid Control Center



3

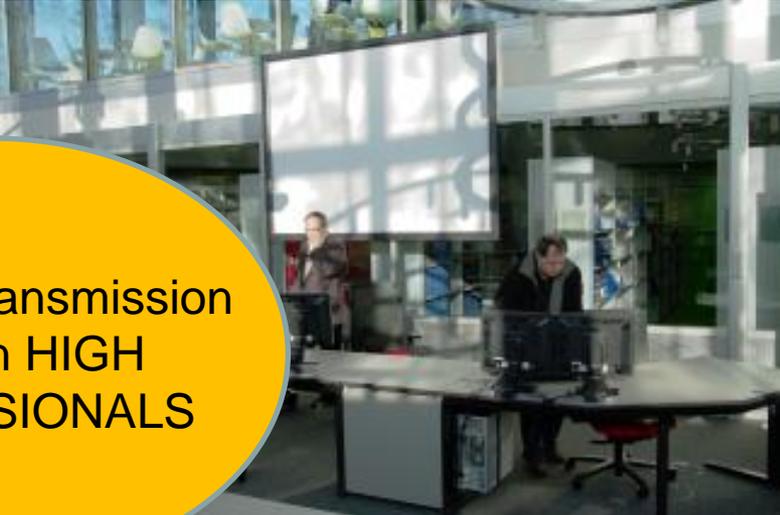
Ways to success – high professional training (Project Grid Training Center together with 50 Hz-T)



Cottbus, den 18.10.2011

Ways to success – high professional training (Project Grid Training Center together with 50 Hz-T)

50 Hertz-Transmission
will train HIGH
PROFESSIONALS



BTU Cottbus
will train HIGH
POTENTIALS

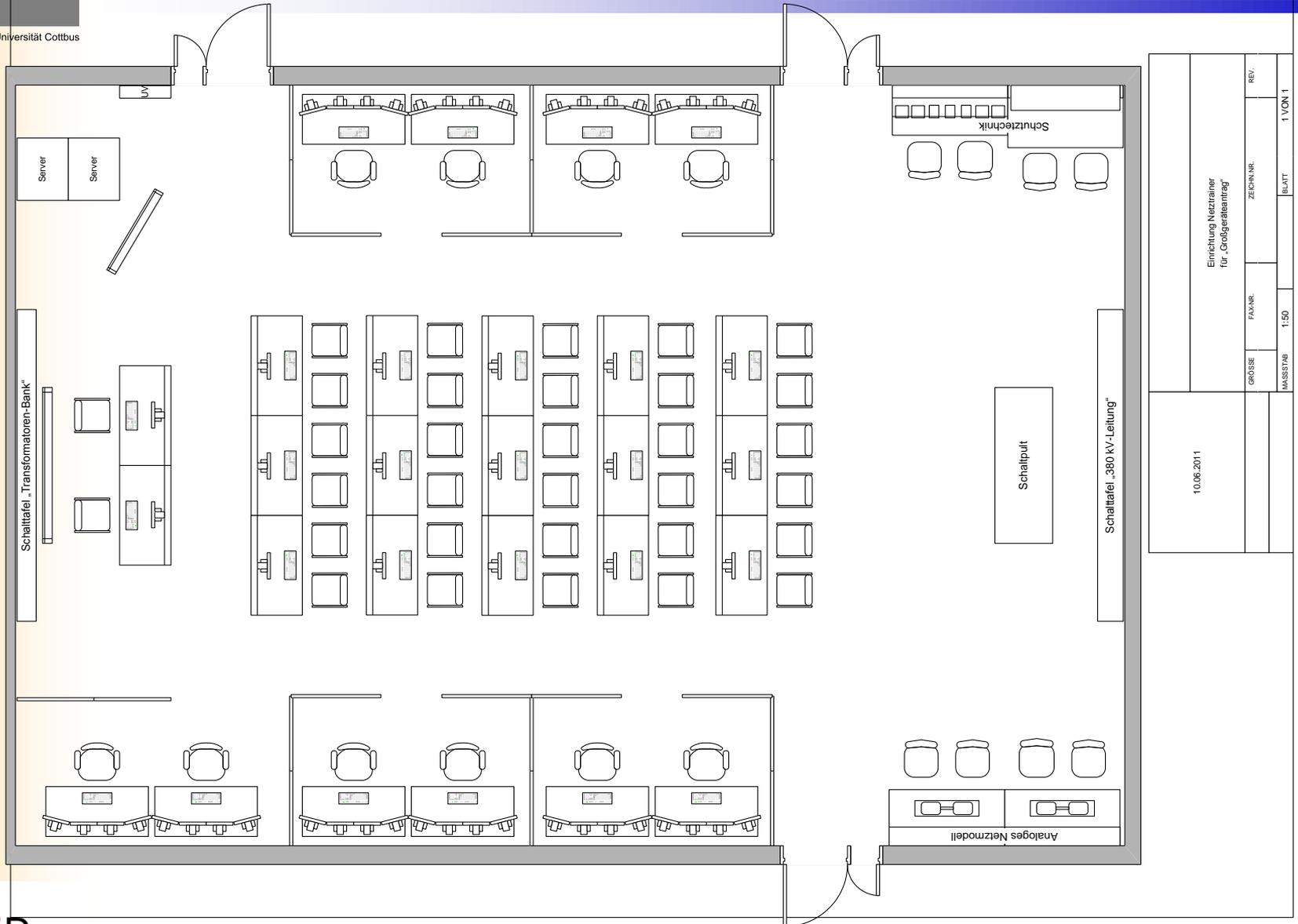


Discussion with State
Grid of China concerning
possible cooperation

Ways to success – high professional training (Project Grid Training Center together with 50 Hz-T)

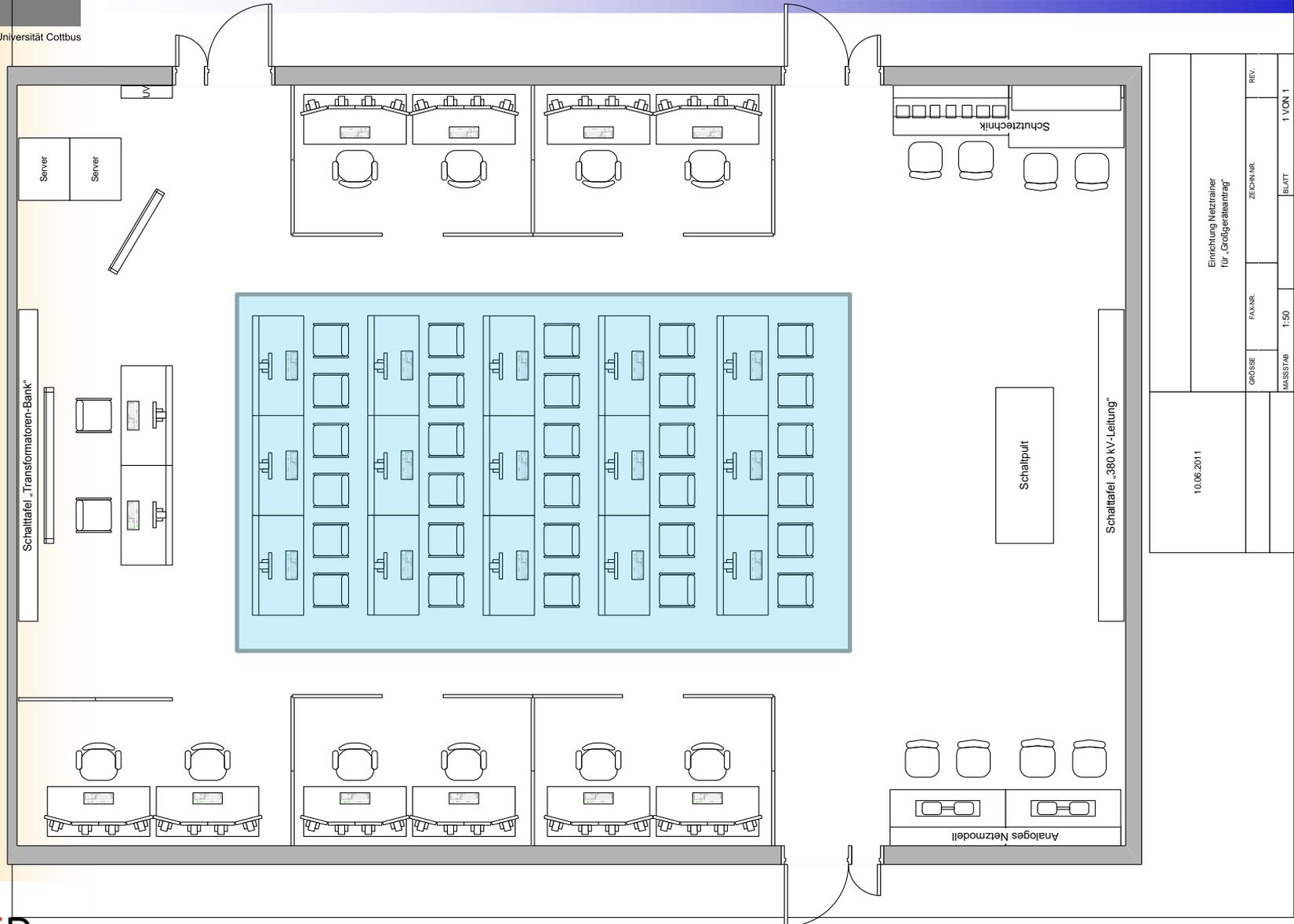


Grid-Research and Teaching Center



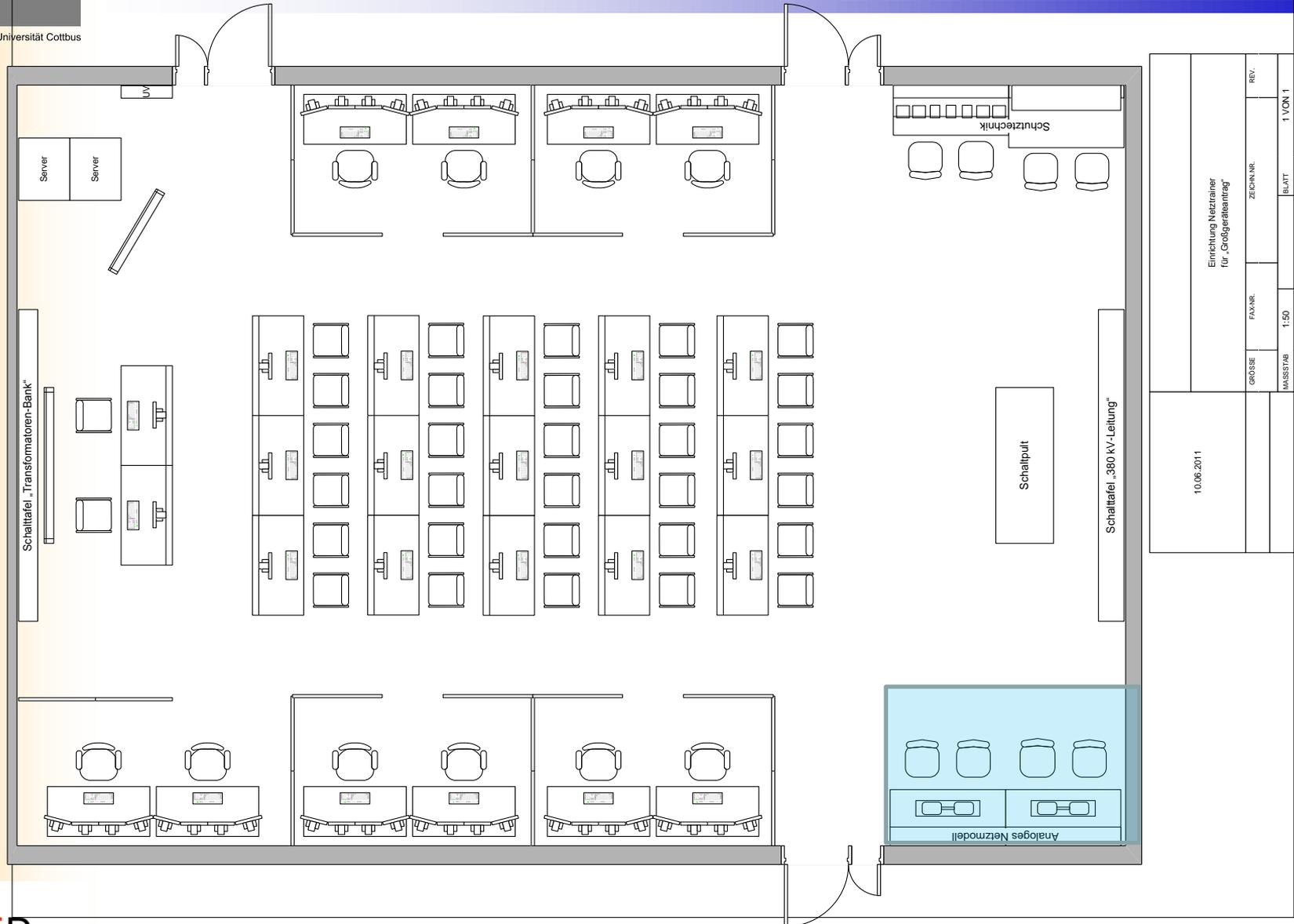
10.06.2011		Einrichtung Netztrainer für „Großgerätantrag“		BLATT	1 VON 1
GRÖSSE	FAX-NR.	ZEICHN-NR.	REV.		
MASSSTAB	1:50				

Grid-Calculation



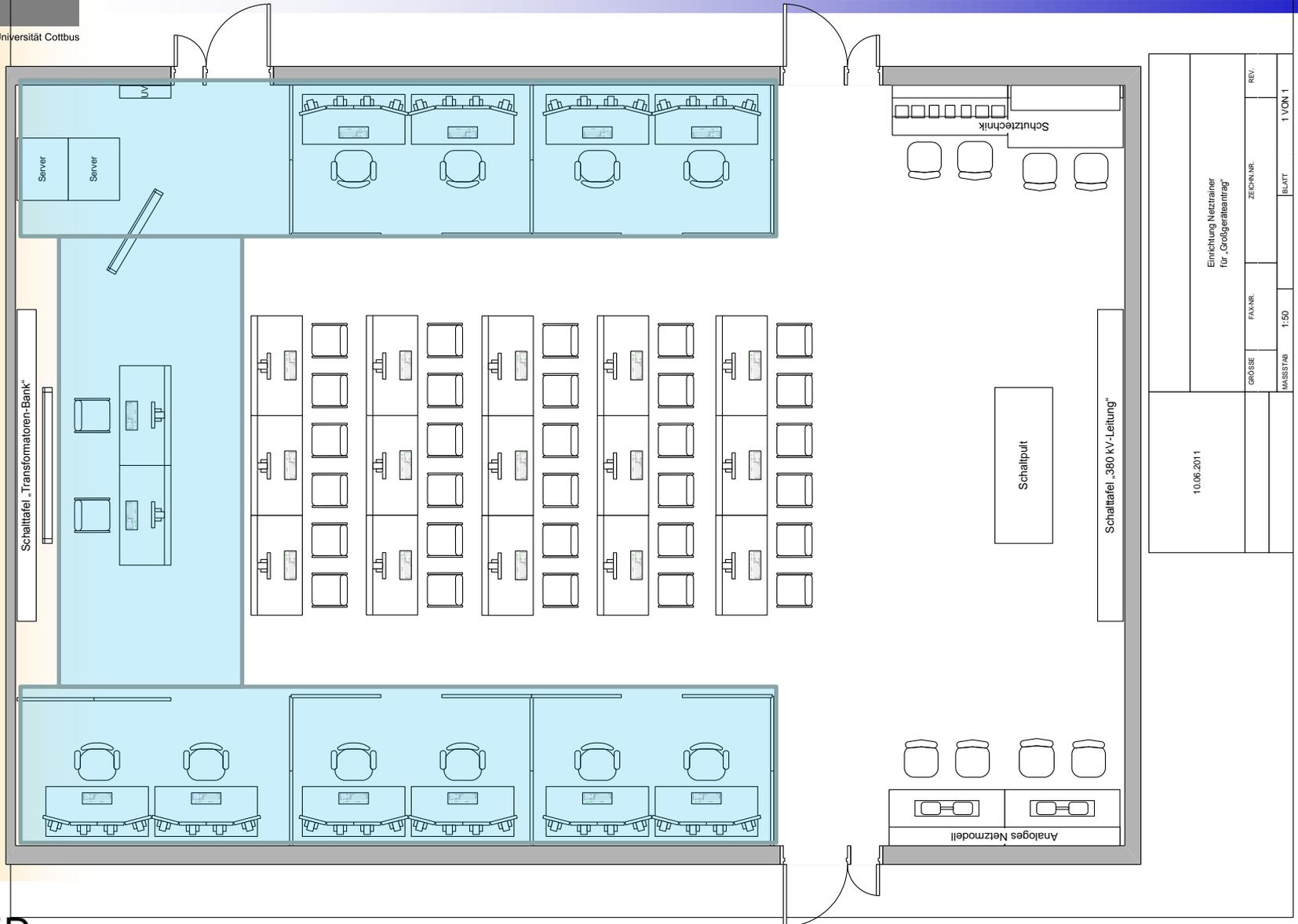
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Analogue Grid Model



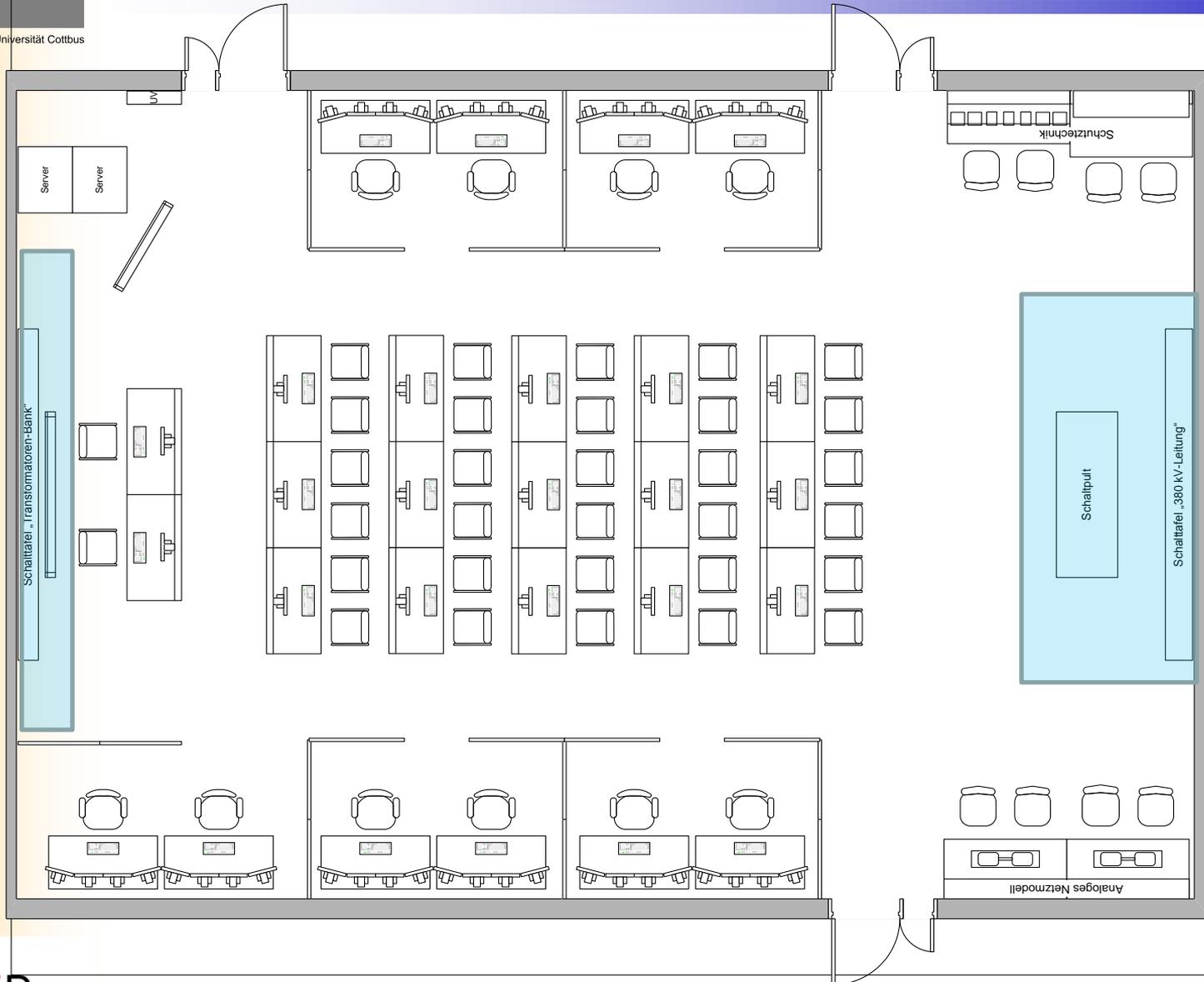
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MASSSTAB		1:50				

Power System Operation



10.06.2011		Einrichtung Netztrainer für „Großgeräteeintrag“		1 VON 1	
GRÖSSE	FAX-NR.	ZEICHN-NR.	REV.	BLATT	
MASSSTAB	1:50				

Showroom for former Control Center components



10.06.2011	Einrichtung Netztrainer für „Großgerätrtrag“	ZEICHNR.	REV.
		FAXNR.	
		MASSTAB 1:50	BLATT 1 VON 1

- Study programme fully taught in english language
- 3 branches of studies with 2 specializations each
 - Electric Power Engineering
 - Power Transmission and Distribution
 - Electric Grids and Drive Systems in Power Plants
 - Power Plant Technology
 - Fossil Power Plants
 - Nuclear Power Plants
 - Sustainable Energy Supply
 - Renewable Generation
 - Energy Supply of Large Buildings

Teaching Module „Power System Operation“ with 15 weeks /8 h or 2 weeks block seminar in Grid Training Center



- Approx. 35- 40 % of all lectures will be offered by experts from industry.
- The 4th semester (Internship and master thesis) can be fully organized abroad and/or in cooperation with industry
- Dual degrees with cooperating universities will be offered starting from October 2009
- German and international companies will offer different kind of support to students in this programme (internship, industrial supervised master theses, part or full scholarships)

Our cooperating universities are:

- * **Tsinghua University Beijing, China**
- * **Beijing Institute of Technology**
- * **Shanghai University for Science and Technology, China**
- * **Shanghai Electric Power University, China**
- * **Zhejiang University, Hangzhou, China**
- * **National Cheng Kung University, Tainan, Taiwan**
- * **(Moscow Power Engineering Institute / University of Technology)**
- * **St. Petersburg University of Technology**
- * **Obninsk State University for Nuclear Power Engineering**

Dual Degree
in discussion

Dual Degree
available

Dual Degree
in discussion

3 Ways to success – high qualified research and teaching **(Global Network of cooperating universities)**

Our cooperating universities are:

- * (University of Sao Paulo, Brasilien)
- * Paulista State University, Brasilien
- * University of Minas Gerais, Brasilien

- * (University of Stellenbosch, Südafrika)
- * (University of Witwatersrand, Johannesburg, Südafrika)

- * TU Wroclaw, Polen ←
- * TU Poznan, Polen
- * TU Ostrava, Tschechische Republik

- * University of Engineering and Technology Lahore, Pakistan

Dual Degree
available

Contacts to India are under preparation

Our cooperating universities are:

International Dual Degree MSc and PhD programmes will be supported by a newly established **Siemens PhD Research Group** in High Voltage Circuit Breakers with

- 1 PhD student from Beijing
- 1 PhD student from Shanghai

- 1 PhD student from Moscow
- 1 PhD student from St. Petersburg

- 1 PhD student from Mexico

- 2 PhD students from India

Many thanks for your kind attention

For more information please contact

www.tu-cottbus.de/cebra/