Deutsches BiomasseForschungsZentrum
German Biomass Research Centre

DBFZ

3rd International Scientific Conference
Energy and Climate Change

Contribution of biomass to decentralised energy supply with the objective of public services and supply security for peripheral regions in Germany

a project financed by the German Federal Government, 2009

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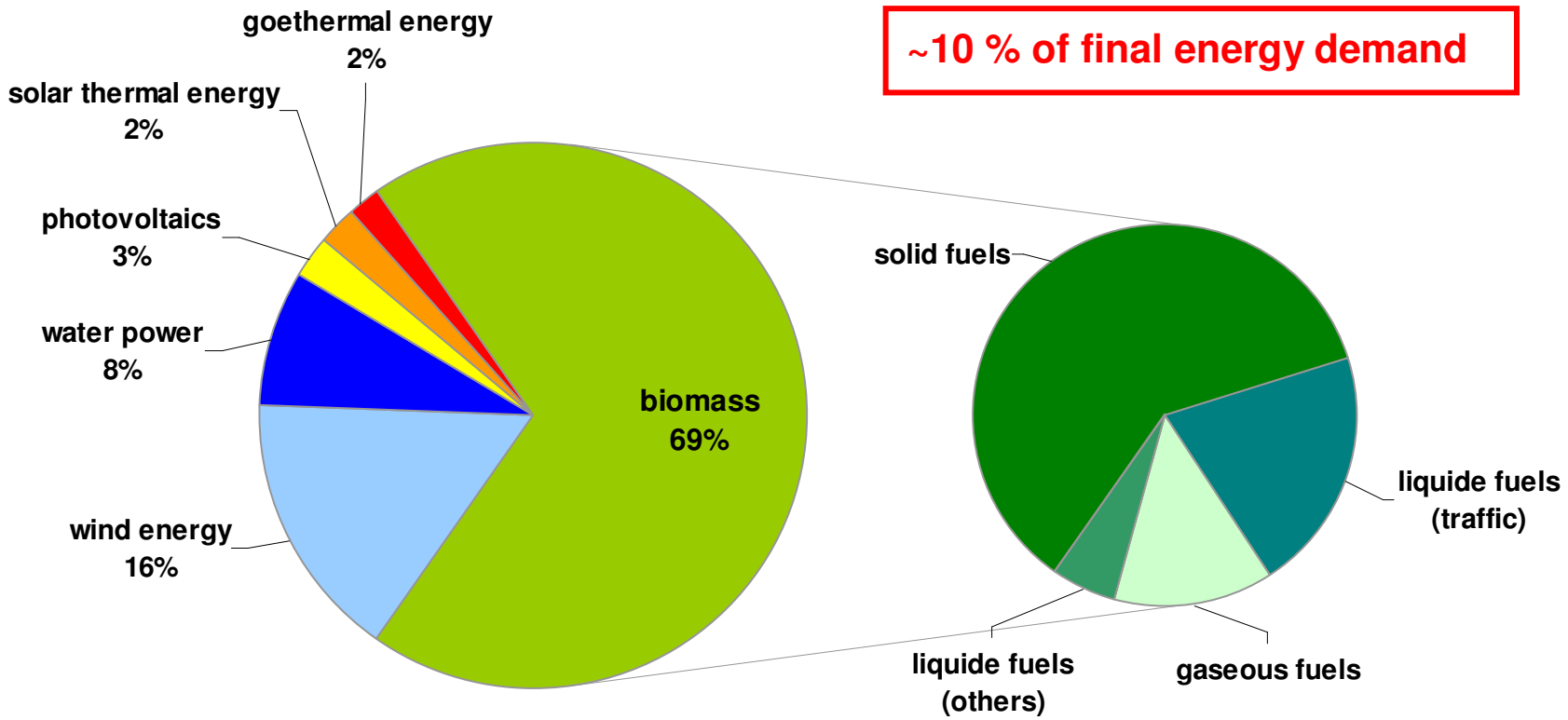
Agenda

1. Introduction – relevance of bioenergy for Germany
2. Introduction – main questions of the presented topic
3. Project structure
4. Peripheral regions in Germany
5. Energy demand of reference regions
6. Used renewable energy technologies
7. Scenarios of self supply
8. Summary and discussion

9. Further activities of DBFZ in projects with regional context

Introduction
Relevance of bioenergy in Germany

Final energy production of renewable energy in Germany in 2009



source: BMU, Erneuerbare Energien in Zahlen

Introduction in the topic

Subject

- Use of renewable energy for peripheral regions with target of self-supply. Focus: Use of bioenergy from regional sources.

Main questions

- Which german regions (counties) are “peripheral” and can be used as reference regions?
- What is the energy demand of this regions?
- Which bioenergy techniques can be used?
- Which kind of scenarios shall be used to take a look in a possible future?
- For which kind of final energy (electricity, heat, liquid fuels) a self-supply can be achieved in the reference regions?

financed by:

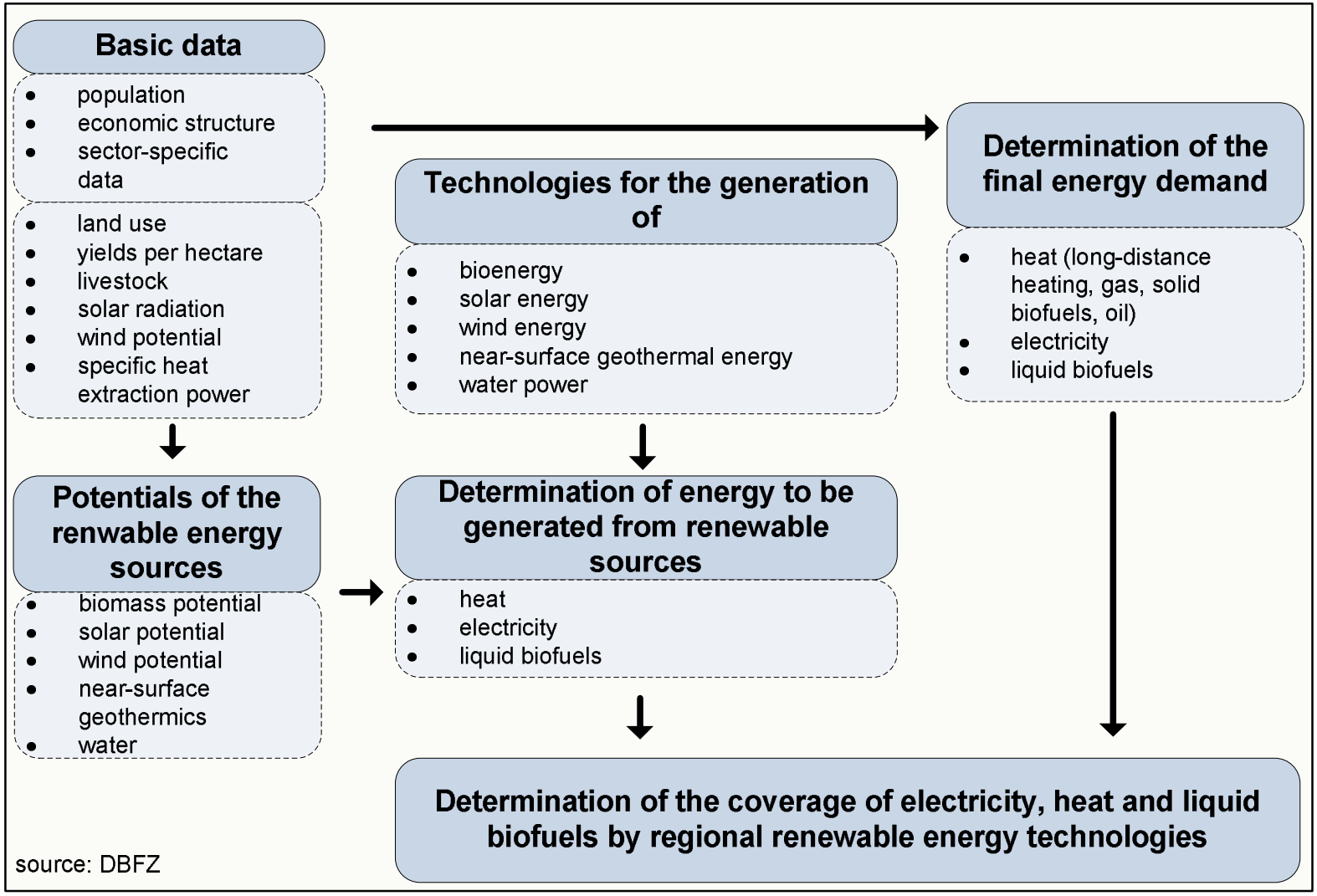
Federal Ministry of Transport, Building and Urban Development

advised by:

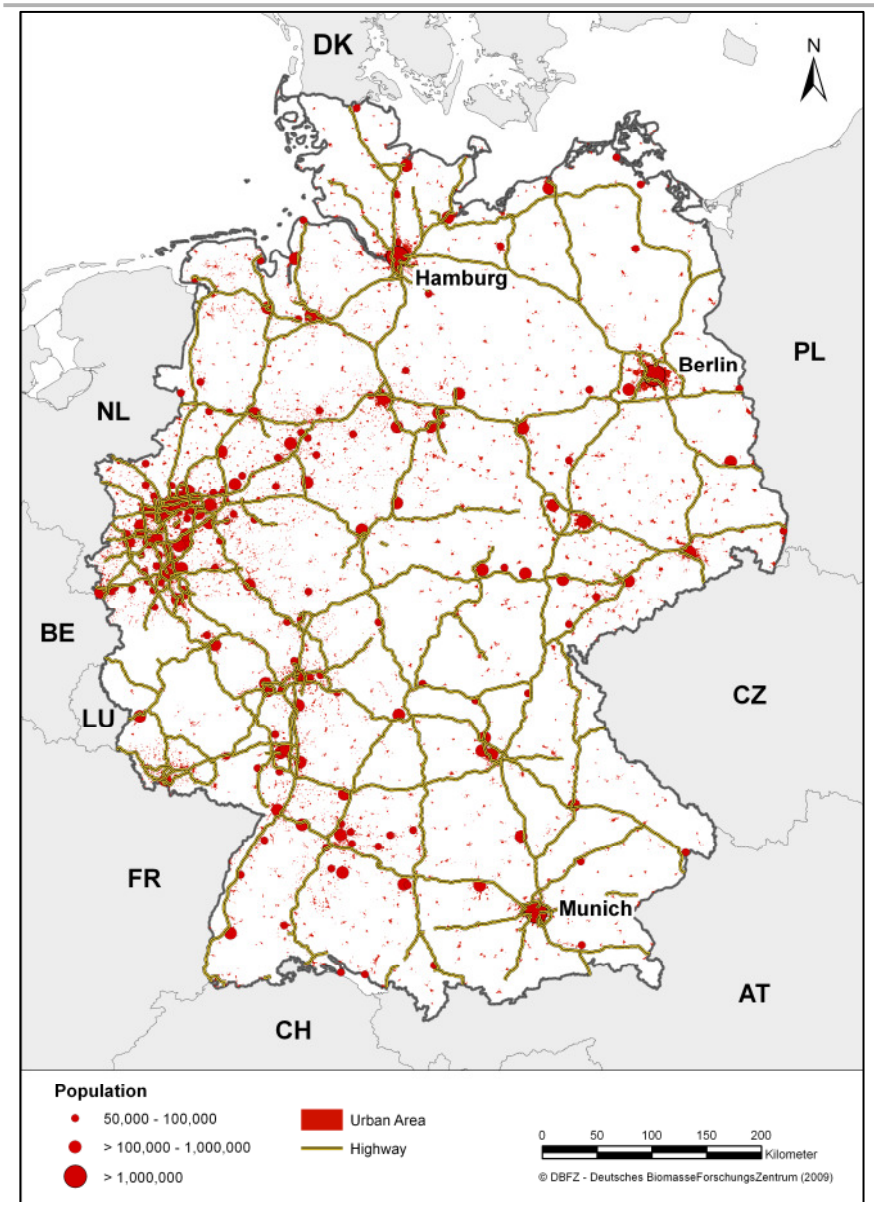
Bundesinstitut für Bau-, Stadt- und Raumforschung im Bundesamt für Bauwesen und Raumordnung

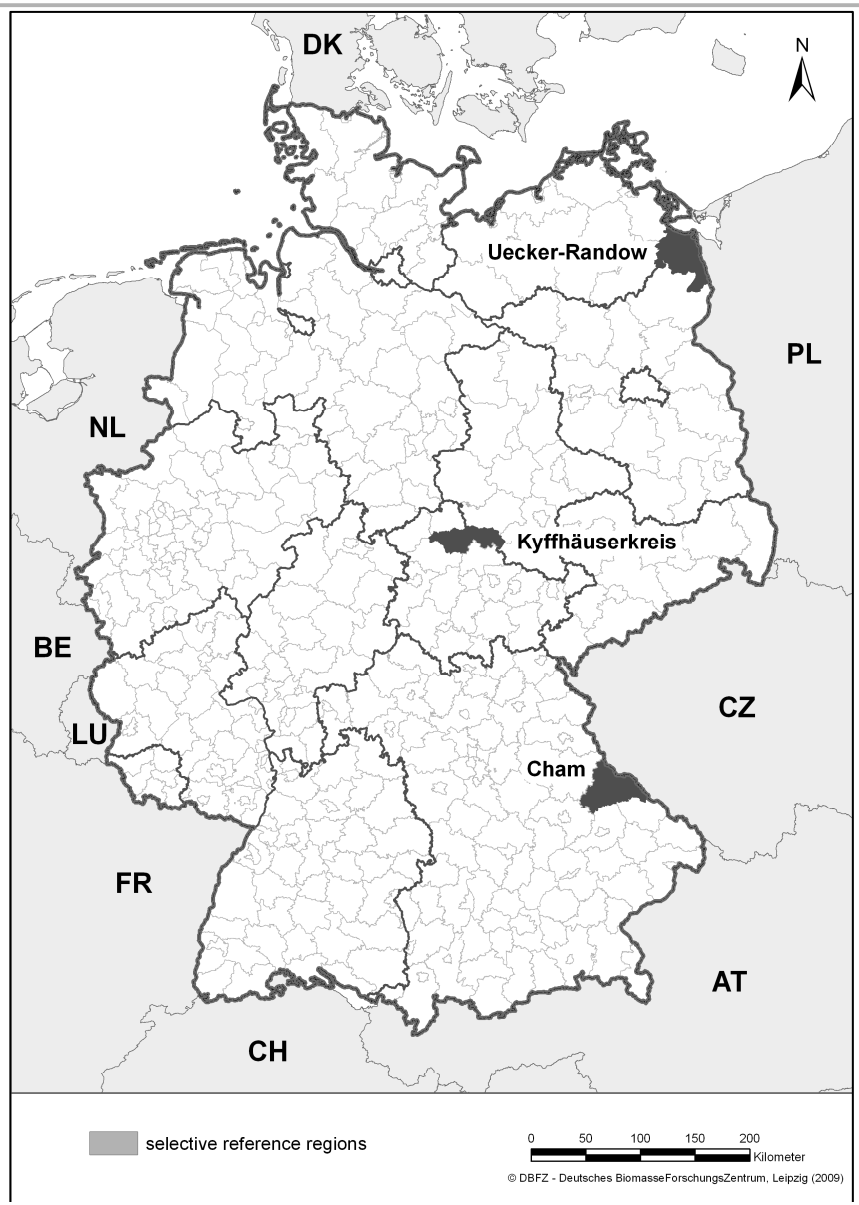
Project structure
- overview -

Project parts to calculate the self-supply with renewable energy.



Peripheral regions in Germany; the 3 reference regions



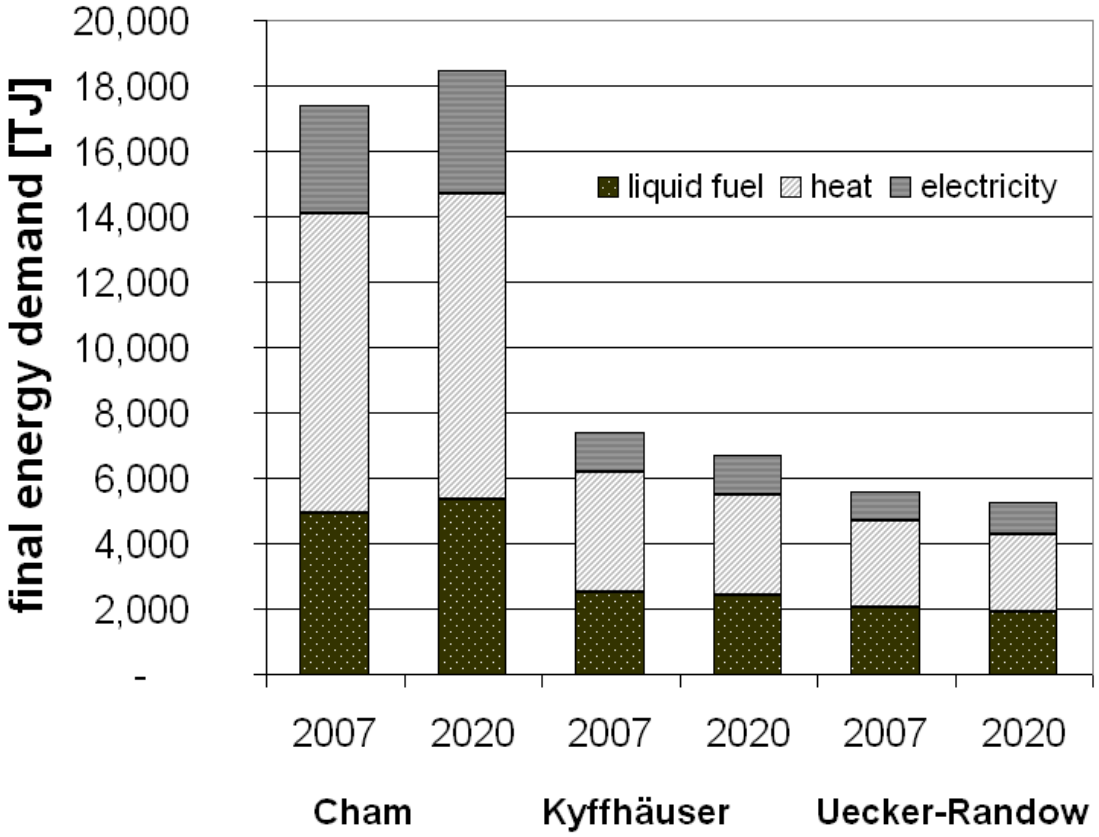


3 reference regions - characterization -

parameter	Cham	Kyffhäuser	Uecker-Randow
Spatial aspects			
- Area	151,187 ha	103,514 ha	162,428 ha
- Population density	0.86 inh./km²	0.83 inh./km²	0.47 inh./km²
Bioenergy aspects			
- Share of arable land	21%	59%	35%
- Share of forest area	43%	23%	32%
- livestock	0.6 LUs/ha	0.8 LUs/ha	0.3 LUs/ha
Socio-economic aspects			
- Population 2007	129,817	85,882	75,842
- Population 2020	128,537	72,486	68,379
- Gross value added	23,092 €/inh.	13,886 €/inh.	13,468 €/inh.
- Energy demand 2007	17.4 PJ	7.4 PJ	5.6PJ
- Energy demand 2020	18.5 PJ	6.7 PJ	5.2 PJ
- Energy demand per capita 2007	134 GJ/inh.	86 GJ/inh.	73 GJ/inh.
- Energy demand per capita 2020	144 GJ/inh.	79 GJ/inh.	77 GJ/inh.

3 reference regions
- energy demand -

- Definition of sector-specific indicators to calculate the energy demand. (kWh_{el} per person, kWh_{th} per household etc.)
- With these indicators, the region specific data and a trend projection to 2020 the final energy demand is calculated for each region.



Source: DBFZ

Results:

Cham have the highest final energy demand because of
→ highest number of inhabitants (130,000 to 87,000 and 76,000) and
→ more industry than the other two regions

Used renewable energy technologies

Following renewable energy technologies were selected for scenario analysis

Technology chains	Electricity		Heat		Liquid biofuels	
	Installed capacity [kW_{el}]	Final energy [MWh_{el}/a]	Installed capacity [kW_{th}]	Final energy [MWh_{th}/a]	Installed capacity [kW_{th}]	Final energy [MWh_{th}/a]
Small scale heating + local heating grid	-	-	100	430	-	-
Agricultural biogas plant	500	3,900	448	3,494	-	-
Biomass CHP + ORC	1,000	7,800	7,500	33,000	-	-
Biomass gasification + CHP	500	3,750	1,020	4,080	-	-
Biogas plant (treatment) + fuel cell	1,300	10,000	-		-	-
Biodiesel	-	-	-	-	3,750	34,280
Bioethanol facility + biogas plant	2,700	22,880			5,850	57,600
Biomethane (from the bio-chemical route)	-	-	-	-	11,530	83,000
Biomethane (from the thermo-chemical route)	-	-	1,900	15,600	83,300	600,000
Heat pump	-	-	15	14	-	-
Solar collector (6 m^2)	-	-	1.4	2	-	-
Photovoltaic module (20 m^2)	2	2	-	-	-	-
Onshore wind energy plant	2,000	4,200	-	-	-	-
Hydroelectric power plant	500	3,250	-	-	-	-

Scenarios
- Status quo -

First step

As basis, the **„status quo“** of the 3 regions is generated for the year **2007**.

→ The biomass potential is calculated.

→ Bioenergy technologies are selected.

Heating plant
Biogas plant + CHP
Biomass heating and power station
Liquide biofuels

→ Other renewable energy techniques are selected

Wind energy
Solar heating and photovoltaics
Water power
Geothermal heating

Scenarios
- Reference and objective scenario -

Second step

Two scenarios are generated for the year **2020**.

→ The **reference scenario**, i.e. moderate increase of renewables.
→ The **objective scenario**, i.e. increase of renwables with target of a complete self supply.

All renewable energy technologies of the status quo are used, additionally

biomass gasification + CHP
biogas + fuel cell
bioethanol production + biogas plant
biomethan

Restrictions for all scenarios:

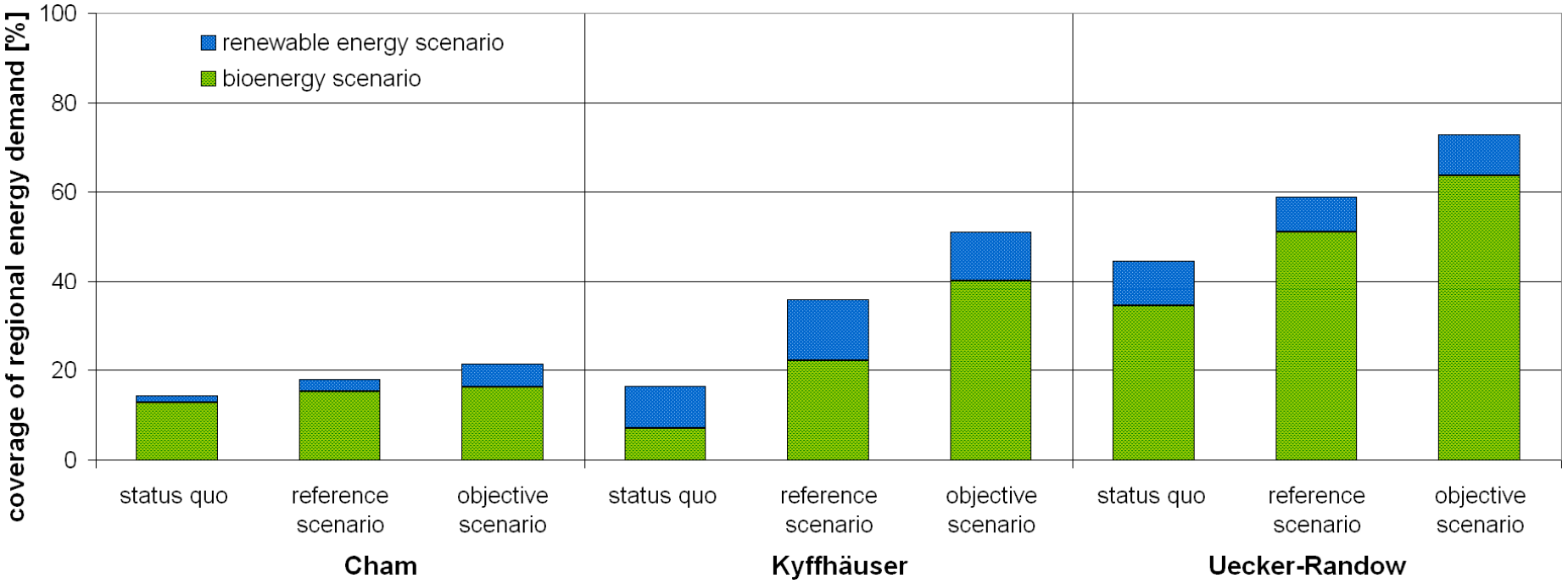
→ Only raw material of the region is used.
→ Self supply by food is given, e.g. no competions between bioenergy and food takes place.
→ Priority is put on the more efficient stationary energy facilities.

Scenarios
- Reference and objective scenario -

The following development and differences between reference and objective scenarios are given for biomass production.

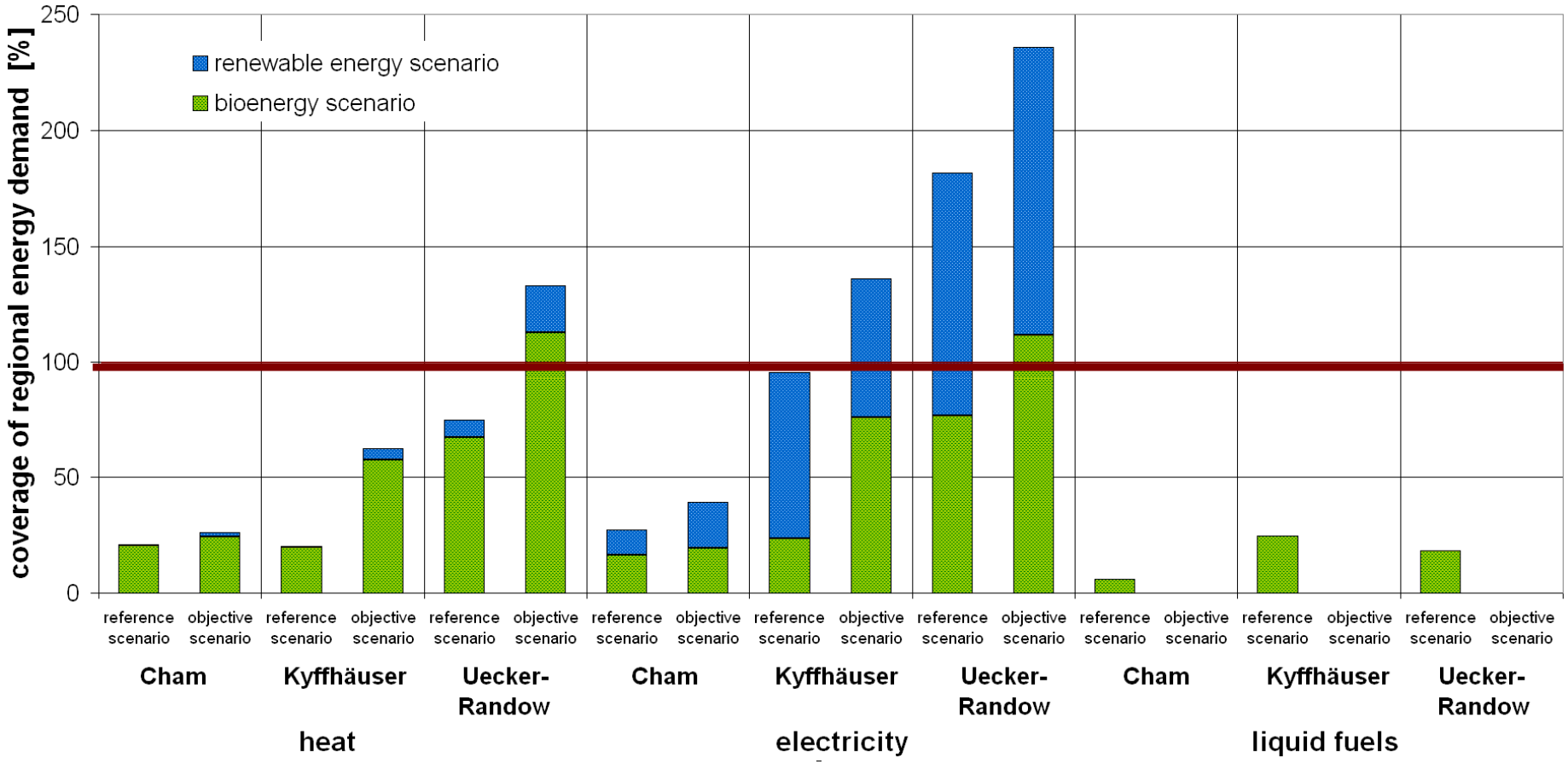
Land use	Reference scenario	Objective scenario
Fallow land	Recultivation of 50 % for cultivating energy crops	Recultivation of 100 % for cultivating energy crops
Forest increase	0.07 %/a	0.14 %/a
Arable land		
- for food production	Decrease as a result of declining population figures and increasing yields.	
- for energy crops	Increase of areas Distribution of crops: • 10 % of land for SRC • 20 % for rapeseed • remaining land: corn, grain	Increase of areas Distribution of crops: • 40 % of land for SRC • 40 % of land for corn • 20 % of land for grain
Yields per hectare		
Grain	0.5 %/a	1.0 %/a
Corn	1.0 %/a	1.5 %/a
Rapeseed	0.8 %/a	No energetic use because of little output
SCR	1.0 %/a	1.0 %/a

Scenarios
- Results, summerized -



Source: DBFZ

Scenarios
- Results, specific -



Source: DBFZ

Summary and discussion

- No region can realize a complete self-supply, **but** self-supply is possible (also exclusively with bioenergy) for heat and electricity.
- Significant differences between the regions are given.
  → as well on supply side as on demand side
- Different development in the scenarios between the regions are given:
  → main reasons are
    - differences in total area and land use (forest, acreage, grassland)
    - density of livestock
    - differences in economic situation and therefore energy demand
    - dimension of population decrease
- For a self-supply
  → great efforts are necessary (see assumptions in the objective scenario)
  → a detailed regional analysis is necessary
- Important:
  If renewable energies should be used considerable, all relevant regional stakeholders have to be include from the very beginning.

Funding program of the Federal Ministry of Environment in Germany

Climate protection pays off! GERMANY'S CLIMATE INITIATIVE

6 funding programs

- Biomass energy use
- Municipalities …
- Mini-CHP plants
- Commercial refrigeration plants
- Market incentive programm
- Further development Germany´s Climate initiative

Techn. / scientific coordination (PtJ)

Service- and Support Project (DBFZ)

Thematic areas

- Thematic area 1 - Utilisation of residues
- Thematic area 2 - International cooperation (focus on Non-EU Eastern Europe States)
- Thematic area 3 - Biomass gasification (Combined heat and power, CHP)
- Thematic area 4 - Biomethane strategy
- Thematic area 5 - Bioenergy strategy (biofuels)
- Thematic area 6 - Regional bioenergy (regional concepts, small-scale combustion plants)
- Thematic area 7 - Strategy development: biomass (strategic projects, service- and support project etc.)

Funding period: 2009 - 2012
Planed budget of the program: 30 Mio €
Phase I: ca. 15 Mio €
Phase II: ca. 15 Mio €

- supporting projects which aim to address the present unresolved questions relating to the production of electricity, heat and fuels from biomass
- provides funding for studies, pilots and demonstration projects in seven thematic areas (*see chart on the left side*)

ONE WORLD. ONE INTERNATIONAL CLIMATE INITIATIVE.

- Promoting a climate-friendly economy
- Promoting measures for adaptation to the impacts of climate change
- Promoting measures for preservation and sustainable use of natural carbon sinks/ reducing missions from deforestation and degradation (REDD)
- since 2008 funding worldwide of 181 projects with ca. 354 Mio €

www.energetische-biomassenutzung.de

Funding program of the Federal Ministry of Environment in Germany

Development of applicable concepts for environmentally sustainable energetic use of grass and reed (03KB035AB)

Funding period: 11/2009 – 03/2012
Project coordination:
German BiomassResearchCentre (DBFZ)
Project partners: Leibnitz-Institute for Agricultural Engineering Potsdam-Bornim(ATB)
Subcontractor: Bosch&Partner

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→ Project goals:
- Analysis of regional biomass potentials from landscape management (grass/hay and reed)
- Optimization of treatment processes and combustion of hay
- Information about the current status, acceptance and possible use of grass in biogas plants
- Development of applicable regional concepts for the energetic use of these residues

→ Relevance for Eastern Europe:
- Transfer of project results for potential analysis, hay treatment, combustion techniques and concept development to use grass and hay for energetic purposes

Thanks a lot

for your attention!

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