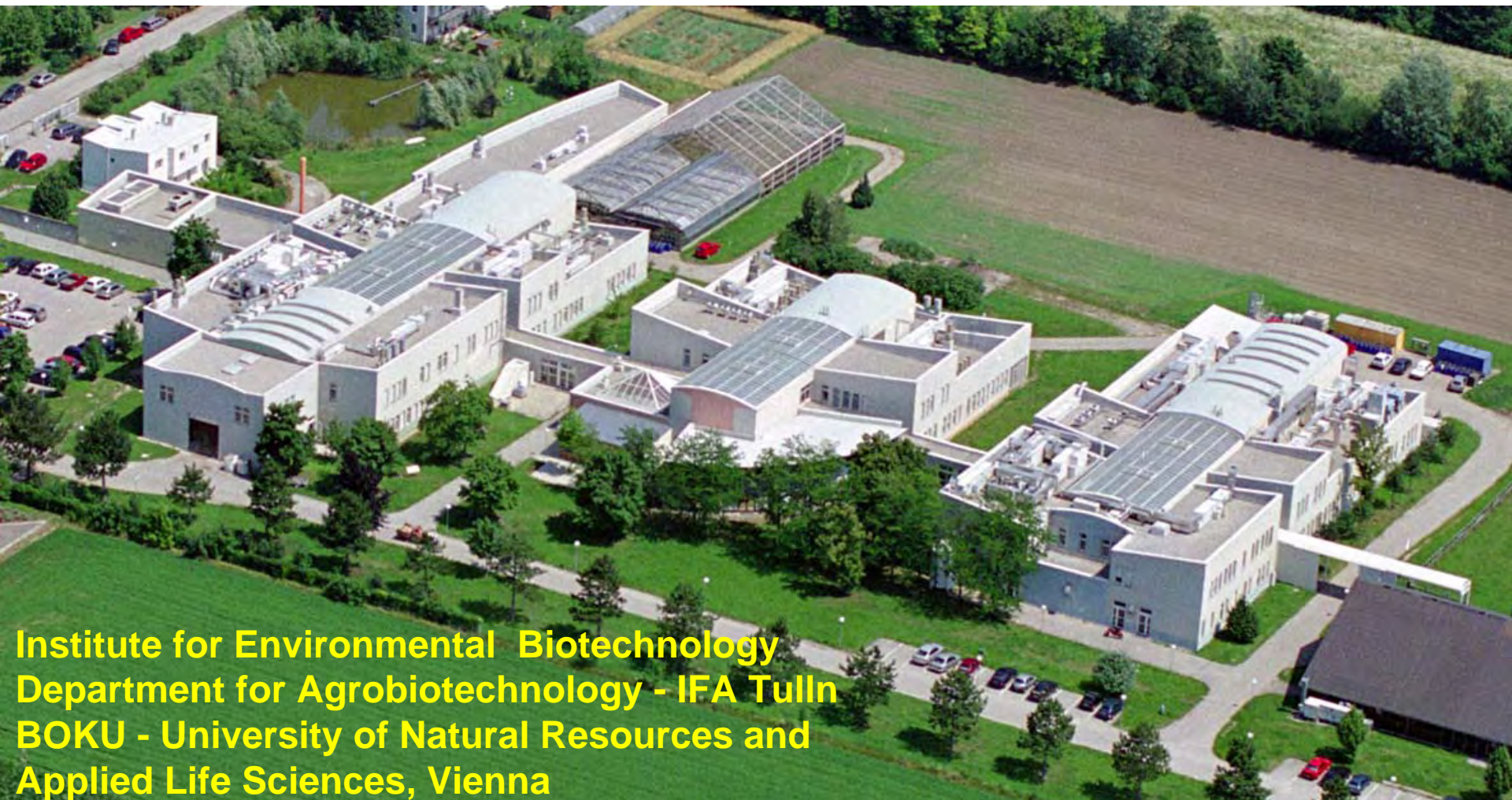


Short Report - Status Austria - 2009

R. Braun

Jyväskylä, 27. 4. 2009



**Institute for Environmental Biotechnology
Department for Agrobiotechnology - IFA Tulln
BOKU - University of Natural Resources and
Applied Life Sciences, Vienna**

Renewable Energy Sources in Austria

(Statistics Austria, 2001)

Hydropower	151 PJ \approx 11.6 % of PED ¹⁾
Others	142 PJ \approx 11 % of PED
Total PED in Austria	1,290 PJ
OTHERS	
Firewood	69.2 %
Industrial residual waste liquors	15.6 %
Combustible waste	7.3 %
Heat pump	4.9 %
Biogas, sewage gas, landfill gas	1.6 %
Straw	1.0 %
Wind- & solar energy	0.4 %
100,0 %	

¹⁾ Primary energy demand

Biogas Plants in Austria

Source	Number of Plants	Mio m ³ Biogas per Year	% of Total Biogas
Landfills	62 Grey Waste - Landfill Gas Recov. Pl.	45-100	21.3
Sewage sludge	134 Sewage sludge digesters	75 - 100	25.8
Agriculture ¹	~350 Biogas- u. Co-Fermentation Plants	121 - 182	44.6
Industry ¹	25 Anaerobic Wastewater Treatment Pl.	9 - 14	3.4
Municipalities ¹	~15 Biowaste Digestion Plants	15 - 18	4.9
TOTAL		265 - 414	100

1) Estimation

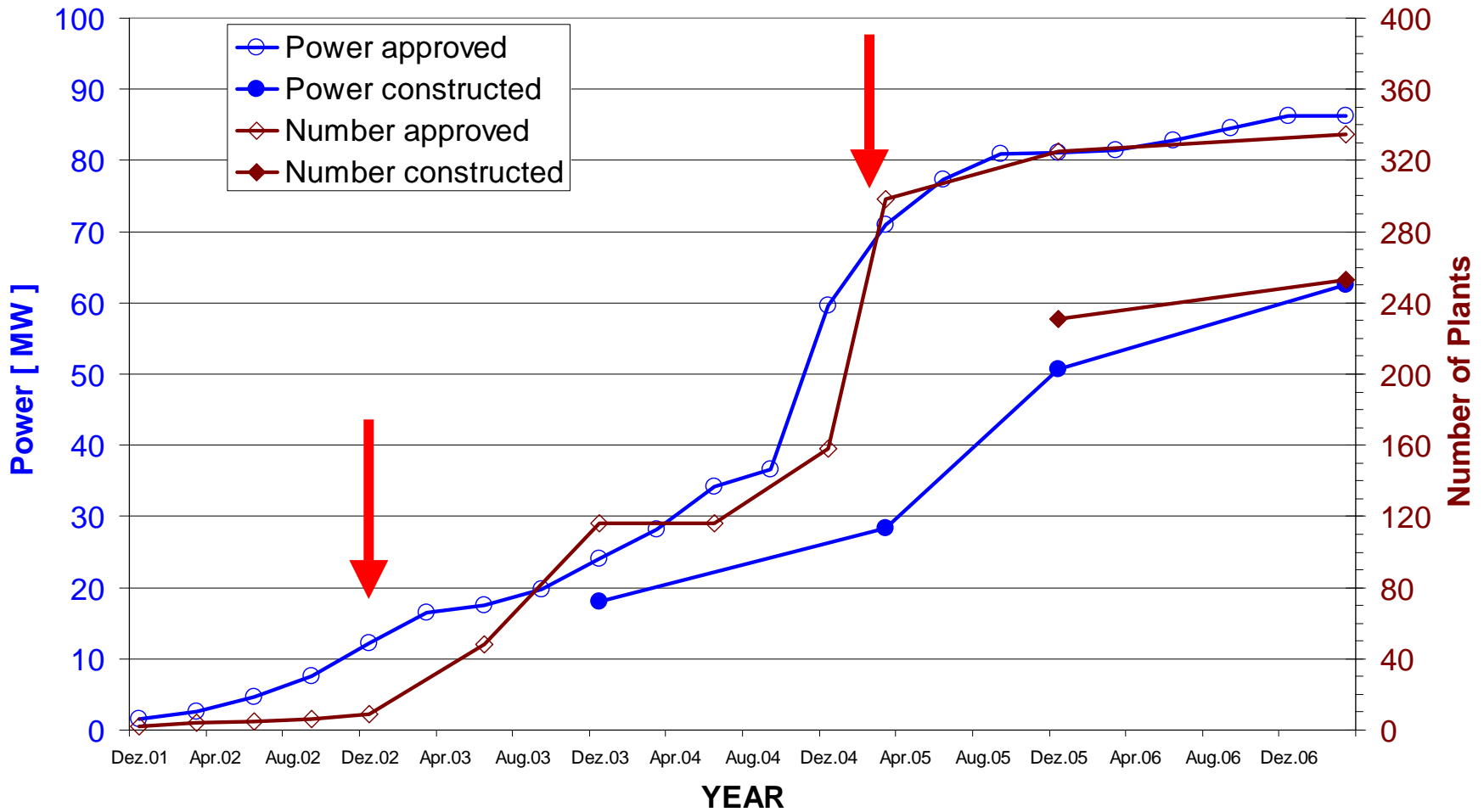
Country	Location	Feedstock	System	Scale [tpa]	Date	Country total	Type
Austria	Böheimkirchen	Biowaste, manure	Ing. Bauer GmbH	7.000	1996		wet
Austria	Lustenau	Biowaste	Kompogas	10.000	1996		dry
Austria	Roppen	Biowaste	Kompogas	10.000	2001		dry
Austria	Siggerwiesen	Biowaste	Dranco	20.000	1993		dry
Austria	Wels	Biowaste	Linde BRV	15.000	1997		wet
Austria	Amstetten	Biowaste, Catering Waste	BST	10.000	2005		wet
Austria	Antiesenhofen	Biowaste, Catering Waste	BST	2.000	2002		wet
Austria	Bruck a. d Leitha	Catering Waste, EC	Eigenbau	20.000	2004		wet
Austria	Habersdorf	Biowaste, Catering Waste	BST	5.000	2005		wet
Austria	Hagenbrunn	Catering Waste	Entec	20.000	2004		wet
Austria	Heiligenkreuz am Wasen	Catering Waste, EC	Nahtec / Koller	12.000	2002		wet
Austria	Herzogdorf	Biowaste, Catering Waste	BST	10.000	2005		wet
Austria	Immendorf	Vegetables, Manure, EC	Führer, Schweitzer	4.000	2003		wet
Austria	Markgrafneusiedel	Biowaste, Catering Waste	Komptech	15.000	2005		wet
Austria	Michaelbeuern	Catering Waste, Manure, EC	Wolf	3.800	2002		wet
Austria	Nußbach	Catering Waste, Manure, EC	Scheitzer	6.600	2001		wet
Austria	Ottngang	Biowaste, Manure, EC*	Bioenergetica	5.000	2003		wet
Austria	Penz	Slaughterhouse Waste, Manur	AAT, Wolf	20.000	2005		wet
Austria	Pettenbach	Slaughterhouse Waste, Manur	Führer	5.700	2003		wet
Austria	Rankweil	Catering Waste, Manure, EC	Entec	2.500	2004		wet
Austria	Rechnitz	Biowaste, Catering Waste	BST	15.000	2004		wet
Austria	Ruprechtshofen	Biowaste, Catering Waste	BST	2.000	2002		wet
Austria	St. Martin/I	Slaughterhouse Waste	Scheitzer	10.000	2002		wet
Austria	St. Pankraz	Catering Waste	Waltenberger	10.000	2003		wet
Austria	St. Stefan i.R	Slaughterhouse Waste, Manur	AAT	13.000	2003		wet
Austria	Wels	Whey	AAT	45.000	2006		UASB

Austrian Tariff for Green Electricity from Biogas

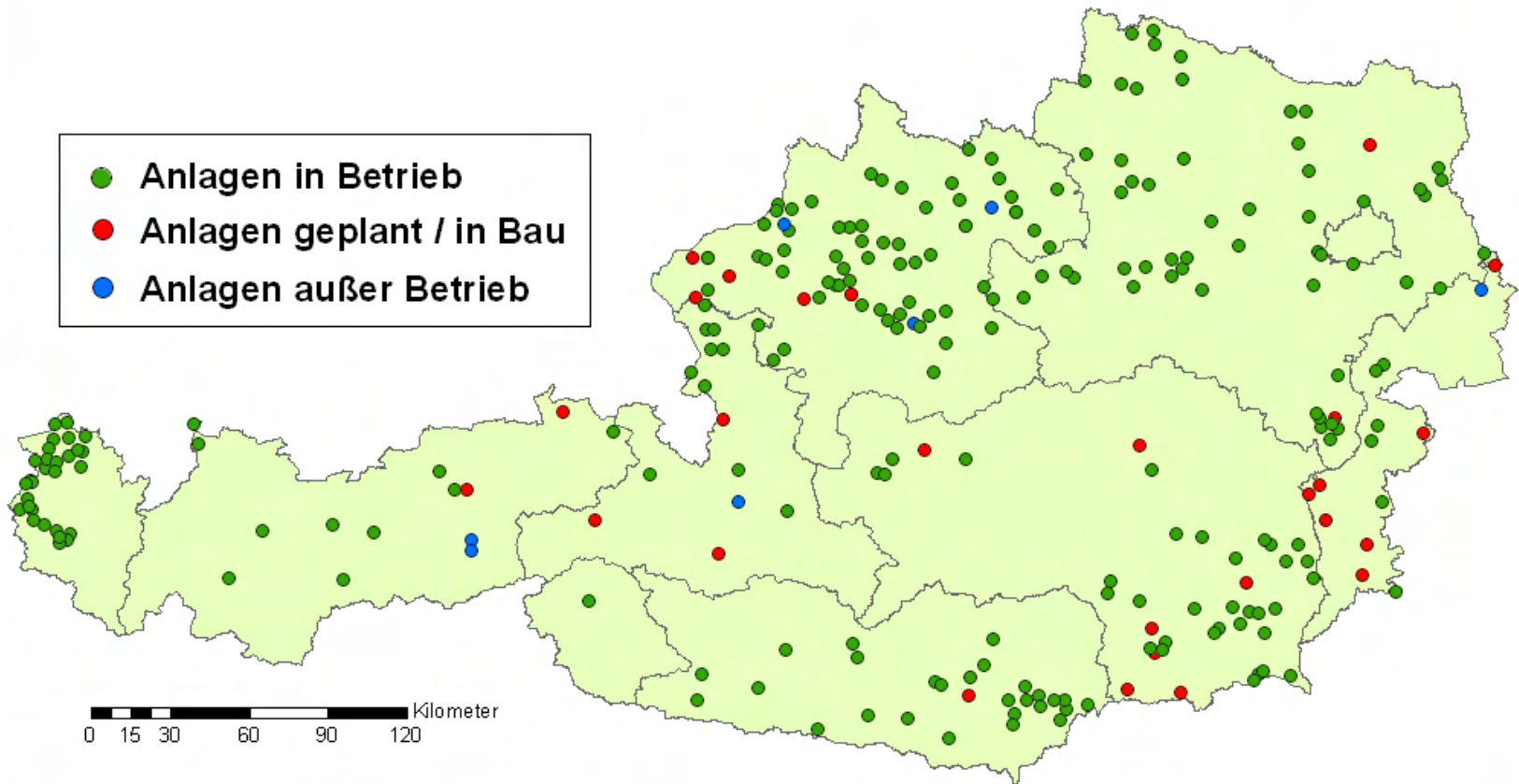


	BGBL II 508/2002	BGBI II 401/2006	BGBI II 401/2007	BGBI II 59/2008	BGBI I 114/2008
	2002-2004	2006	2007	2008	2008
	[Cent/kWh]	[Cent/kWh]	[Cent/kWh]	[Cent/kWh]	[Cent/kWh]
≤100 kW	16,50	17,00	16,95	16,94	+ 4,00
>100 - 250 kW	14,50	15,20	15,15	15,14	+ 4,00
>250 - 500 kW	12,50	14,10	14,00	13,99	+ 4,00
>500 kW - 1MW	12,50	12,60	12,40	12,39	+ 4,00
>1 MW	10,30	11,50	11,30	11,29	+ 4,00
Landfill Gas	6,00	4,10	4,05	4,04	
Gas WWTP	3,00	6,00	5,95	5,94	
min. Utilization		60%	60%	60%	
Co-Substrates	-25%	-30%	-30%	-30%	
Limit		30% of € 17 Mio/a			
Guarantee	13 Year	10 Year Year 11: 75% Year 12: 50% Year 13-24: Market Price	10 Year Year 11: 75% Year 12: 50% Year 13-24: Market Price	15 Year	2008 only

Biogas Plants in Austria Data: e-control Austria



- Anlagen in Betrieb
- Anlagen geplant / in Bau
- Anlagen außer Betrieb



USE OF BIOGAS IN AUSTRIA

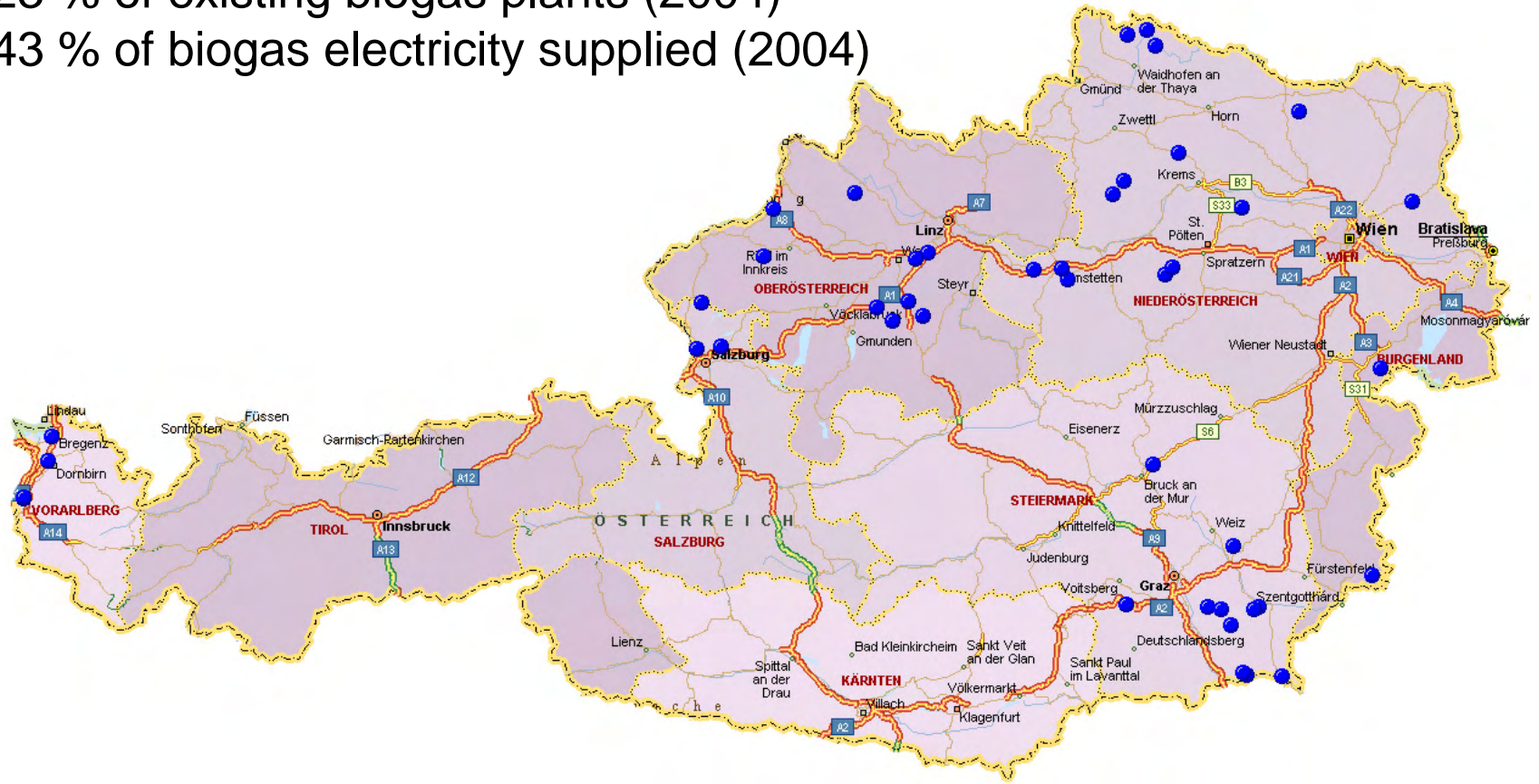
- Biogas is mostly used for power production
Approx. 350 plants in operation
Heat from CHPs cannot be used efficiently
- Upgrading to bio-methane and / or fuel is starting

Plant / Location	In operation	Technique	Capacity (raw biogas)	Remarks
Bruck / Leitha	Since 2007	Gas permeation	180 Nm ³ / hr	Grid injection
Pucking	Since 2005	PSA	10 Nm ³ / hr	Grid injection
Leoben	planning		140 Nm ³ / hr	Grid injection
Linz	planning			Grid injection
St. Margarethen	Since 2007	Membrane		Gas fuelling
Eugendorf	Since 2008	Blend of Methane (80 %) and biogas (20%)		Gas fuelling

Investigation of “Energy Crop” - Digestion Status in Austria by means of monitoring of a representative sample of 41 biogas plants

23 % of existing biogas plants (2004)

43 % of biogas electricity supplied (2004)



Performance figures of the technical monitoring

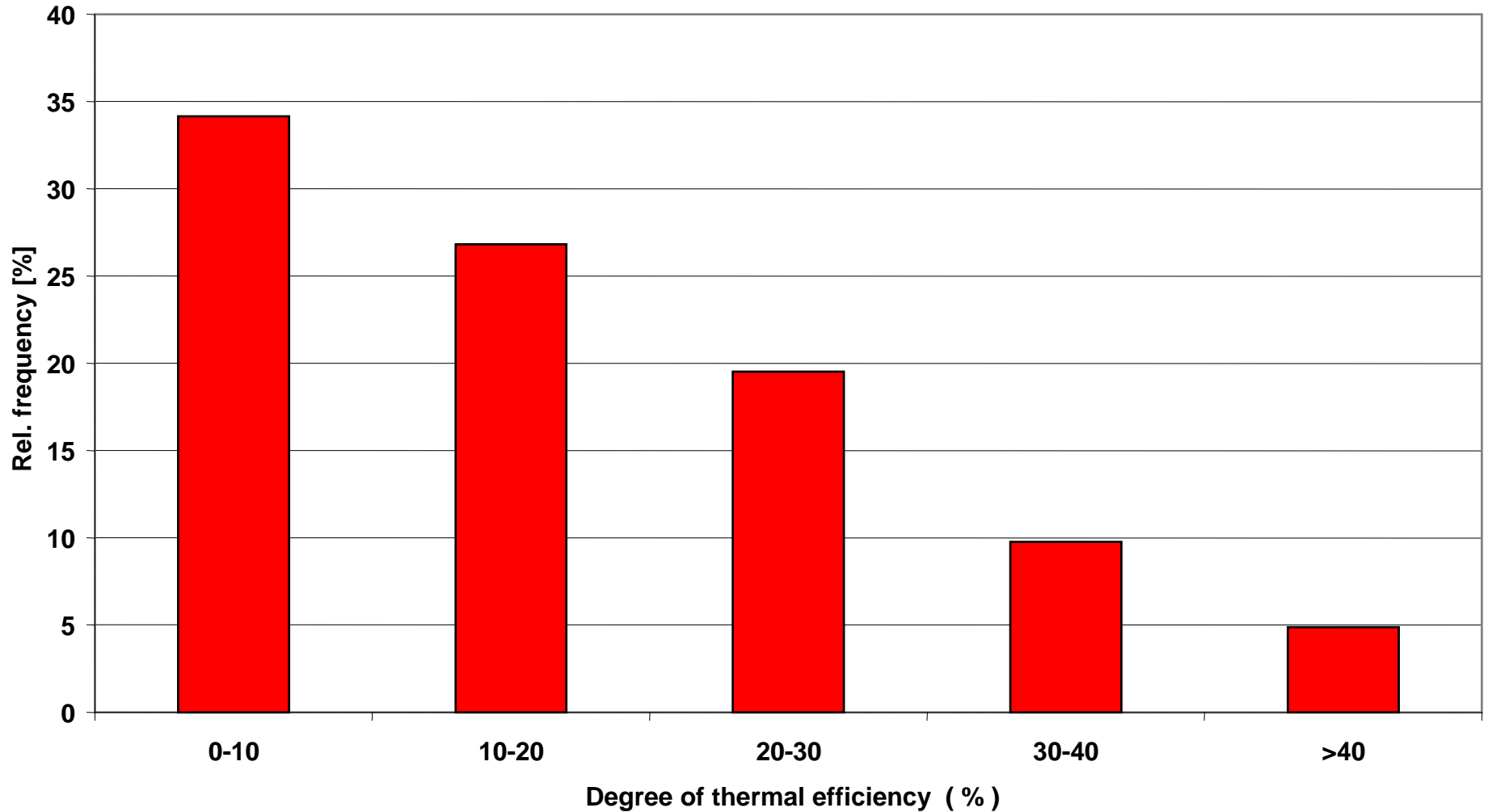
Parameter	Unit	Median ¹	Reidling 500 kW	Reidling 1000 kW	Strem
				F1/F2 ²	
Amount of processed substrate	$t_{\text{Substrate}}/\text{d}$	12.5	29.2	25.9/24.4	27,3
Hydraulic retention time	$\text{m}^3_{\text{RV}}/(t_{\text{Substrate}}/\text{d})$	139	131	187/80	90
Organic load (dry substance)	$\text{kg}_{\text{VSS}}/(\text{m}^3_{\text{RV}}\cdot\text{d})$	3.39	3.99	2.55/5.87	5,78
COD load	$\text{kg}_{\text{COD}}/(\text{m}^3_{\text{RV}}\cdot\text{d})$	5.09	5.85	3.58/7.12	8,56
Amount of VSS	t_{VSS}/d	2.33	8.02	5.14/9.97	7,66
Biogas generation	$\text{Nm}^3_{\text{biogas}}/\text{d}$	1461	5469	9834	5527
Biogas productivity	$\text{Nm}^3_{\text{biogas}}/(\text{m}^3_{\text{RV}}\cdot\text{d})$	0.89	1.42	1.66	2.09
Degradation of VSS	%	81.3	88.7	81.17	87.6
Average biogas yield	$\text{Nm}^3_{\text{biogas}}/\text{kg}_{\text{VSS}}$	0.67	0.68	0.65	0.68
Methane content in biogas	%	53.01	55.3	53.0	53.0
Electrical efficiency	%	31.8	35.5	35.3	37.9
Degree of heat utilisation (end use)	% (rel. to total output)	14.7	18.2	10.6	15.1
Degree of utilisation of the energy contained in biogas (H_u)	%	46.9	53.7	45.9	53.0
Plant utilization	%	78.5	95.3	81.6	93.4

RV: Reactor volume; H_u : Net calorific value; VSS: Organic dry substance

¹⁾ Instead of average values the median was calculated

²⁾ In Reidling one part of the substrate is fed into digester 1 (F1), which runs over into digester 2 (F2). F2 is additionally fed with substrate, which is expressed by two values for some performance figures. The effluent of F2 flows into a closed storage tank.

Degree of thermal efficiency



Ongoing activities in Austria

- Platform Bio-CNG for the advanced implementation of gas vehicles (Goal: 200 Bio-CNG fuelling stations in 2010)
- Continued activities in biogas upgrading and grid feed in; First biogas fuelling station in Eugendorf-Reitbach, Salzburg
- New membrane biogas upgrading (CO₂ – removal) technique in operation (Bruck / Leitha); Techn. Univ. Vienna (M. Harasek)
- Efforts for the amendment of the ÖVGW guidelines G 31 & G 33, currently excluding sewage gas and landfill gas from grid injection
- Austrian Biofuel Center in Güssing - K1 center, Comet programme in operation
- First dual fuel – biogas & diesel – tractor developed by Steyr (Steyr CVT 6195, 143 kW)
- Biorefinery Utzenaich – Official opening May 27, 2009 (Lactic acid, Amino acids from grass sap, Biogas from residues)

BIOREFINERY UTZENAICH, Upper Austria



Grass silage (1 t / h) processed to lactic acid and amino acids.

Residues used in a combined biogas plant.



OÖ Forschungs- u. Entwicklungs GmbH

Joanneum Research GmbH

BioRefSys

Funding: Factory of Tomorrow, BMVIT

Austrian biogas trade monitor

- 50 % of all Austrian biogas plants suffered on economic losses in 2008
- Most plants depend on external substrates (crops)
- Every third owner considered a shutdown of the plant in 2008
- 60 % of all owners would not invest again in biogas plants
- Most plants have just a poor or even missing concept for heat use
- Only a small minority of the plants considers biogas upgrading
- 40 % of the plants use uncovered digestate storage tanks / lagoons
- 20 % of all plants use open substrate storage

1st Announcement

Task 37 Energy from Biogas

Research Exchange WORKSHOP

October 8, 2009

Institute for Agrobiotechnology A 3430 Tulln

BIOGAS UPGRADING

- 14:00** **Welcome & Introduction to Topic**
Dr. Arthur Wellinger (Novaenergie, Ch)
- 14:30** **New Developments in Biogas Upgrading**
Prof. Michael Harasek (Vienna Univ. of Technology)
- 15:00** **Long Term Experience with Biogas Upgrading**
Dr. Anneli Petersson (Swedish Gas Center AB, Malmö)
- 15:30** **Trends in Biogas Upgrading**
Prof. Peter Weiland (Johann Heinrich von Thünen-Institut, vTI;
Braunschweig)
- 16:00** **Coffee Break**
- 16:30** **Gas Upgrading from Thermal Gasification**
Dr. Reinhard Rauch (Vienna Univ. of Technology)
- 17:00** **Sources and Potential of Biogas**
Roland Kirchmayr (Univ. Nat. Res. & Applied Life Sciences, Vienna)
- 17:30** **Advances in Grid Injection**
Paul Schöberl, (Wien Energie Gasnetz)
- 18:00** **Final Discussion / Closing**