



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN
Ufficio federale dell'energia UFE
Swiss Federal Office of Energy SFOE

Gasification of Biomass and Waste Country Report Switzerland



Martin Rügsegger, *ETECA GmbH*, CH-3617 Fahrni



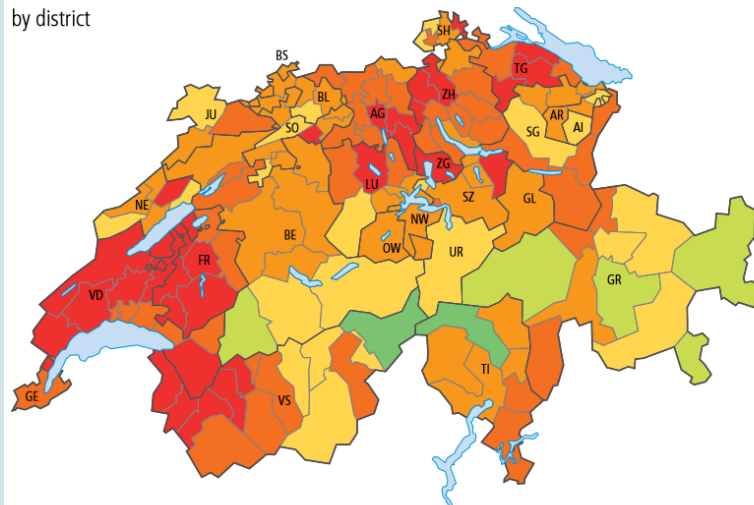
Switzerland 2015

Statistics

Permanent resident population		2015			
At year-end	Total in '000	Foreigners in %	Urban in %	Density km ²	Population growth 2010–2015 in %
Switzerland	8 327.1	24.6	84.5	208.2	5.8

Population growth, 2010–2015

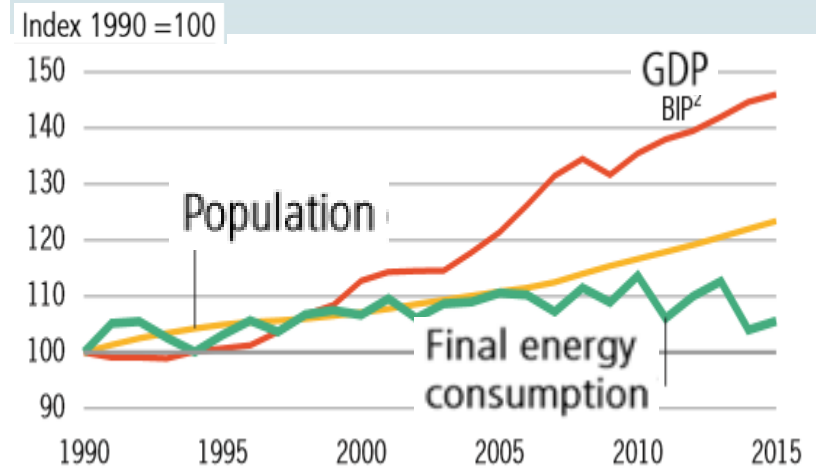
by district



Changes of the permanent resident population, in %

≤ -2.5	-2.4 - -0.9	0.0 - 2.4	2.5 - 4.9	5.0 - 7.4	≥ 7.5
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CH: +5.8

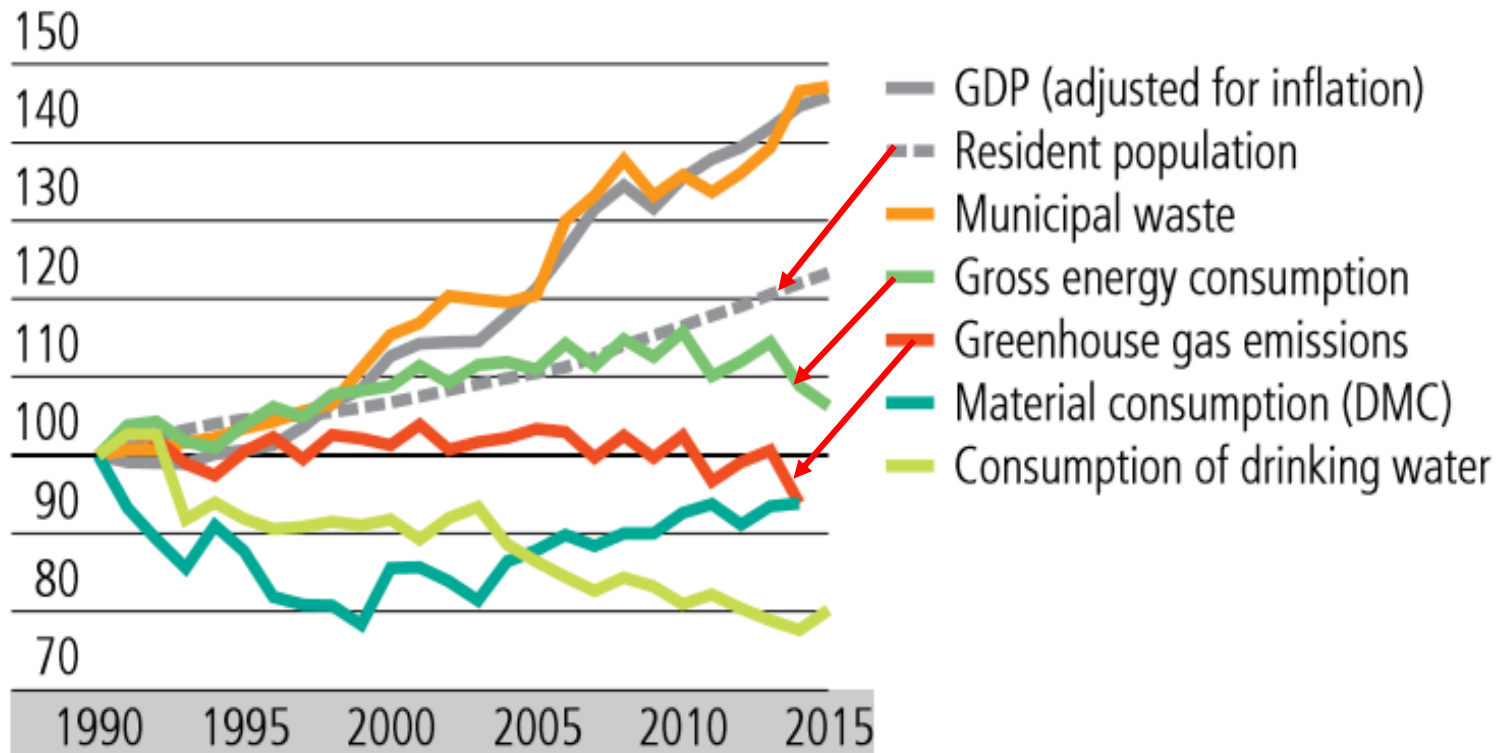


www.bfs.admin.ch/bfs/de/home/statistiken



Use of resources and emissions

Index 1990 = 100



www.bfs.admin.ch/bfs/de/home/statistiken

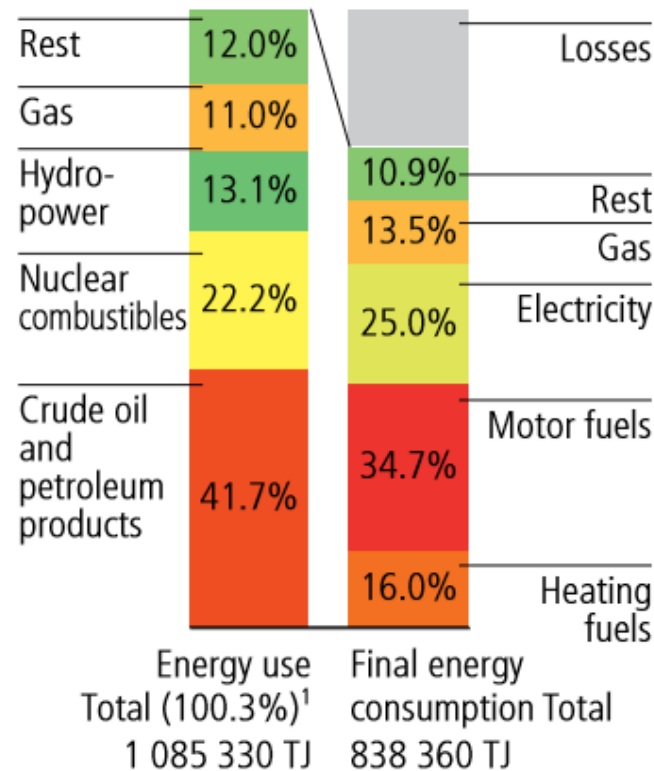


Switzerland 2015 Energy Statistics

1

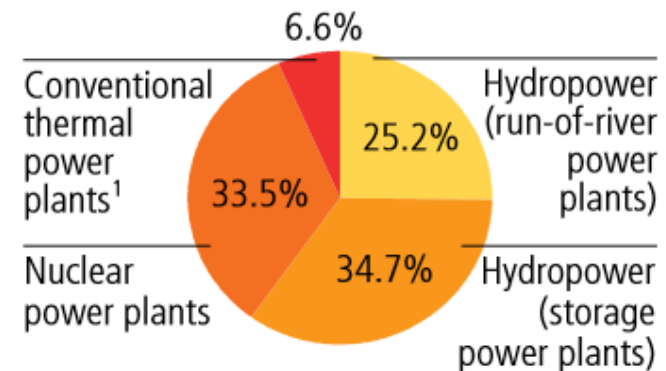
Energy

Total energy use and final consumption, 2015



¹ Incl. export surplus of electricity (0.3%)

Electricity generation by power plant type, 2015



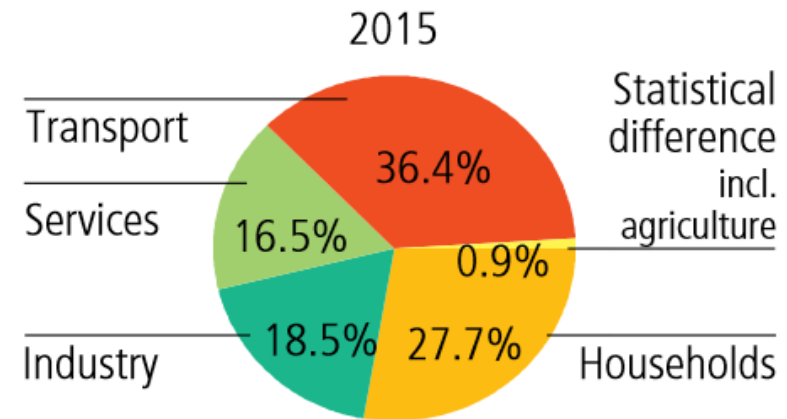
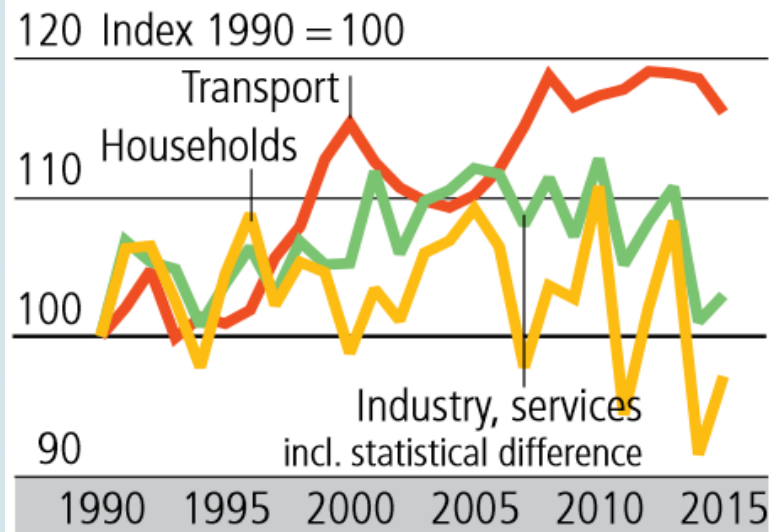
Total: 66.0 billion kWh

¹ Incl. district heating power stations and various renewable energies

www.bfs.admin.ch/bfs/de/home/statistiken



Final energy consumption by consumer groups 2015 ≈ 233 TWh Total



- ▶ www.statistics.admin.ch → Look for statistics → Energy
- ▶ www.bfe.admin.ch (Federal Office of Energy) → Topics → Energy Statistics

www.bfs.admin.ch/bfs/de/home/statistiken



Switzerland Renewable Energy Statistics

3

In 2 years + 10%

Renewable energy, 2013 ≈ 49 TWh	
Share of final consumption	in %
Total	21.12
Hydropower	12.74
Solar power	0.43
Ambient heat	1.52
Biomass (wood and biogas)	4.80
Wind power	0.03
Renewable energy from waste	1.28
Energy from sewage treatment plants	0.21
Biogenic fuels	0.10

Renewable energy, 2015 ≈ 54 TWh	
Share of final consumption	in %
Total	22.96
Hydropower	13.78
Solar power	0.73
Ambient heat	1.72
Biomass (wood and biogas)	4.71
Wind power	0.04
Renewable energy from waste	1.42
Energy from sewage treatment plants	0.21
Biogenic fuels	0.35

www.bfs.admin.ch/bfs/de/home/statistiken



Swiss Energy Strategy

→ Fukushima 2011 then Government decided for

→ Cleantech Masterplan end of 2011

<http://www.bfe.admin.ch/dokumentation/publikationen/index.html>

→ Cleantech Lighthouse projects

<http://www.bfe.admin.ch/cleantech/index.html?lang=en>

→ SCCER

(Swiss Competence Center Energy of Research)
formed in Institutes, University's and
University's of applied sciences

→ and proposed draft of
Energy Strategy 2050

→ Final Vote will be 21. Mai 2017



SCCER FEED&D - Future
Energy Efficient Buildings
& Districts

SCCER EIP - Efficiency of
Industrial Processes

SCCER FURIES - Future
Swiss Electrical
Infrastructure

SCCER HaE - Heat
Electricity Storage

SCCER SoE - Supply of
Electricity

SCCER CREST -
Competence Center for
Research in Energy,
Society and Transition

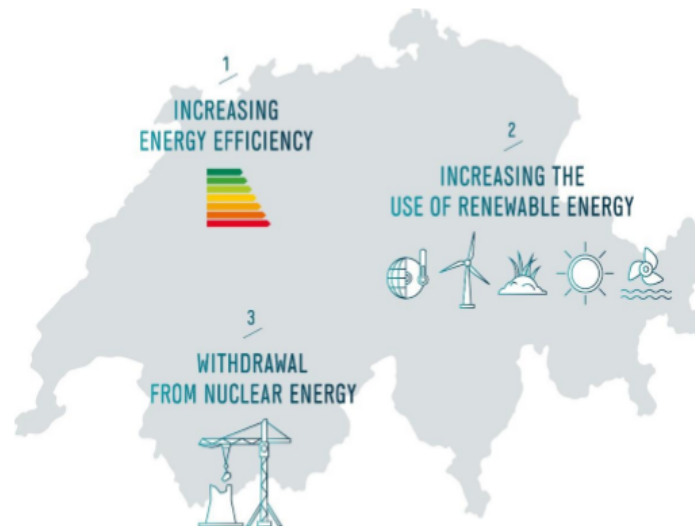
SCCER Mobility - Efficient
Technologies and Systems
for Mobility

SCCER BIOSWEET -
Biomass for Swiss Energy
Future



Energy Strategy 2050 of Switzerland,

THREE STRATEGIC OBJECTIVES



Measures to increase energy efficiency

- Buildings
- Mobility
- Industry
- Appliances

Measures to increase the use of renewable energy

- Promotion
- Improvement of legal framework

Withdrawal from nuclear energy

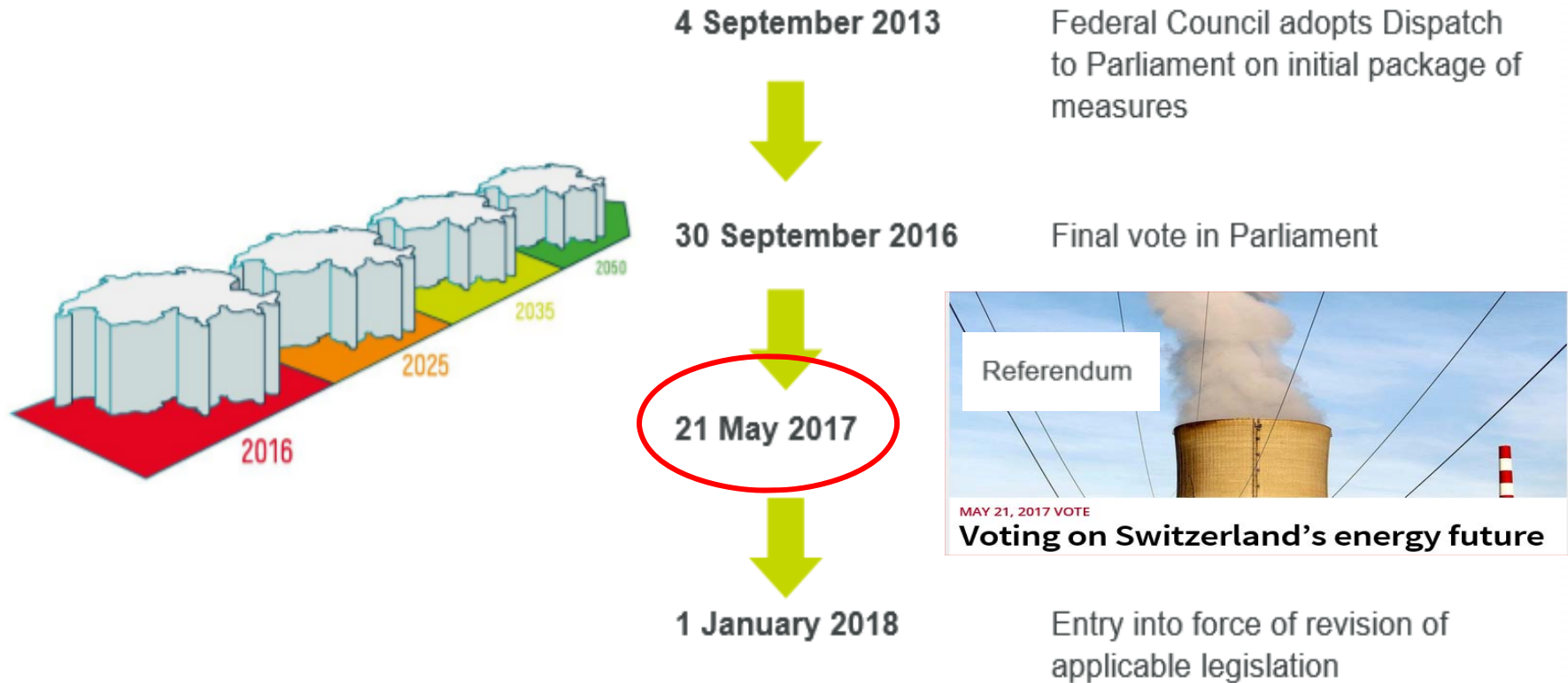
- No new general licences
- Step-by-step withdrawal – safety as sole criterion

SWISS FEDERAL OFFICE OF ENERGY • MEDIA AND POLITICAL AFFAIRS DIVISION • 1 FEBRUARY 2017

http://www.bfe.admin.ch/energiestrategie2050/index.html?lang=de&dossier_id=06702



CURRENT STATUS OF ENERGY STRATEGY 2050



SWISS FEDERAL OFFICE OF ENERGY - MEDIA AND POLITICAL AFFAIRS DIVISION - 1 FEBRUARY 2017

3

- <http://www.bfe.admin.ch/energiestrategie2050/index.html?lang=en>



Research on Gasification of Biomass and Waste Activities reported by

1

PSI

www.psi.ch

- Gasification of dry biomass (wood, grass)
 - Co-firing in NGCC for power generation
 - High & low temperature fuel cells for CHP
 - Gas processing for SNG production
 - Dr. Serge Biollaz
- Gasification of wet biomass (hydrothermal gasification of manure, algae)
 - For SNG production
 - Dr. Frédéric Vogel
- EU Infrastructure Project, collaboration with: BRISK
(Biofuels Research Infrastructure for Sharing Knowledge)

<http://www.briskeu.com/>



Research for Thermal Gasification of Biomass in within SCCER Biosweet

<http://www.sccer-biosweet.ch/>



News & Events

Industry

Research ▾

Biogas

Biomethane

Heat & Power

Liquid Biofuels

Scenario & Modelling

Category: Research Highlights



ESI Platform – new pathways to the energy system of the future



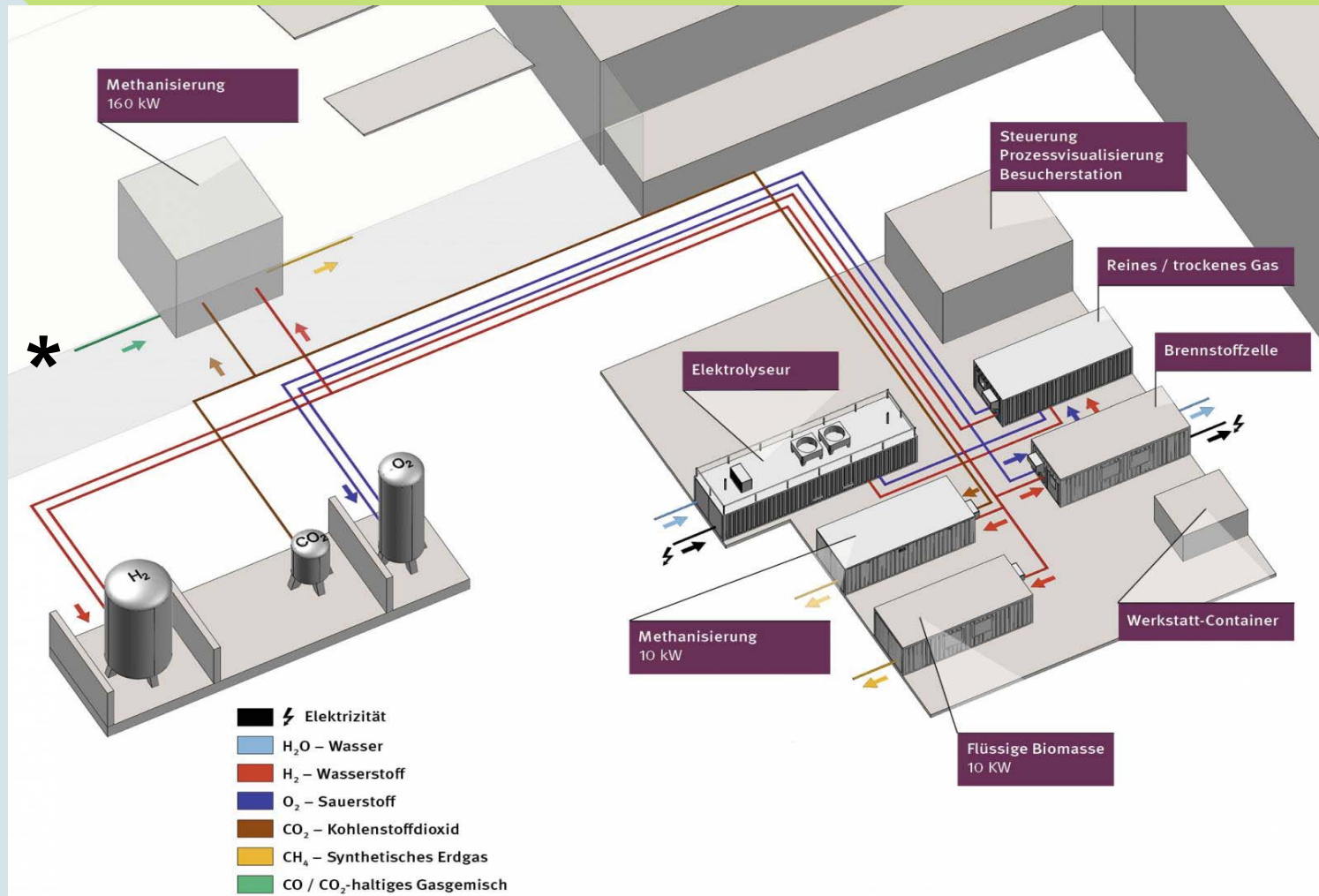
A new approach: Manure-to-Electricity at small-scale farms



Biomass Torrefaction by the HEIG-VD / Granit Technologies SA



Research: ESI Plattform at PSI <https://www.psi.ch/psiforum/energy-research-labs> uses also synthetic producer gas (* like from thermal gasifier)





Thermal Gasification of Biomass Swiss Industries 2017

1

- BR Engineering GmbH CH-6006 Luzern www.br-engineering.ch
 - Engineering and commissioning of thermal Gasification plants and gasification components (Holzstrom Stans)
 - Development of new Gasifier



- XyloPower AG www.xylopower.com
 - Supplier for turnkey biomass gasifier plants (BMG Technique similar to WILA)





Thermal Gasification of Biomass Swiss Industries Situation 2017

2

- Schmid Energy Solution CH-8360 Eschlikon

<http://www.holzfeuerung.ch/>

- Representation for Switzerland and south Germany
Burkhardt turnkey biomass gasifier plants
(taken over from Ölmühle Möriken)
see project



- CTU

<http://www.ctu.ch/de/home.html>

- Supplier for turnkey biomass gasifier plants, gas cleaning....

UMWELT & ENERGIETECHNIK
WASTE TO ENERGY





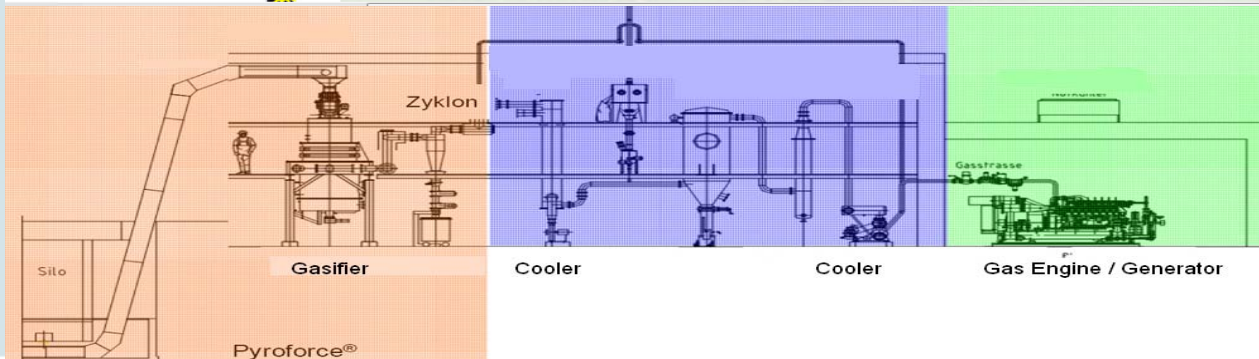
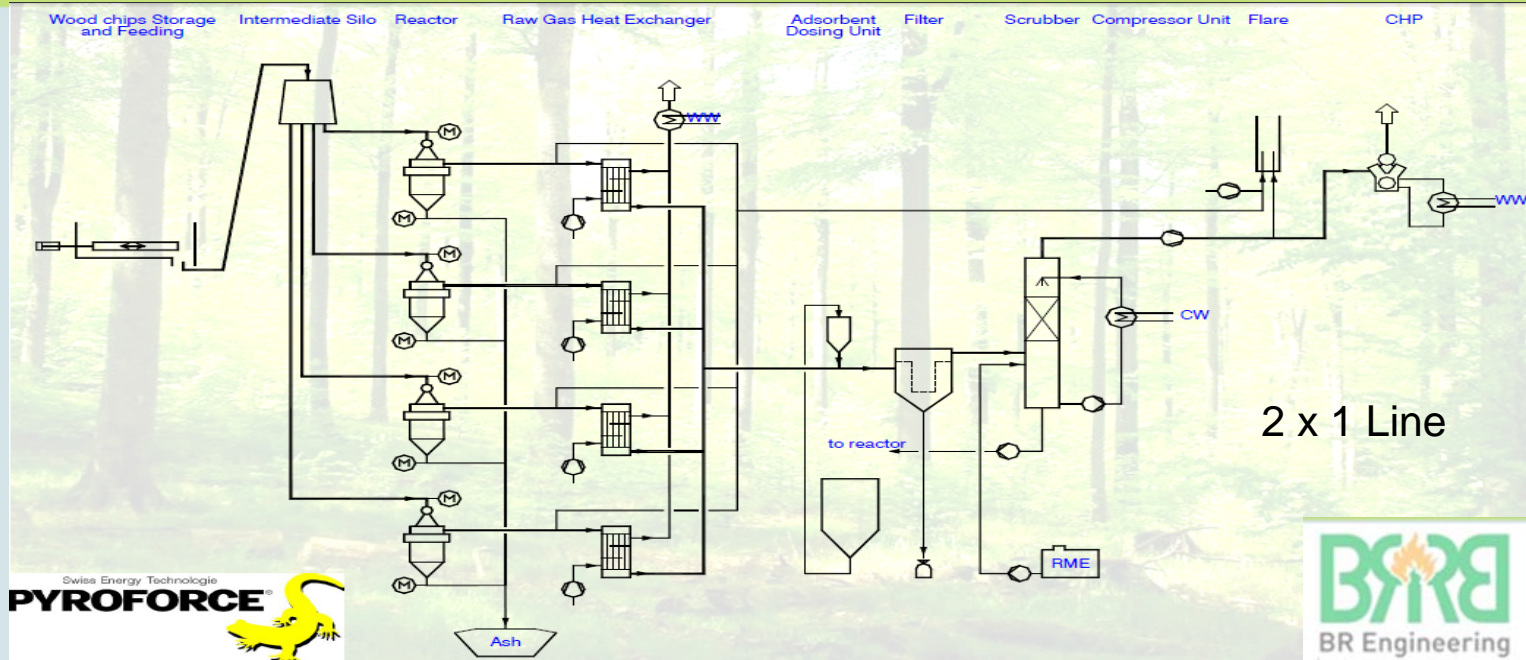
Stans Nidwalden 1 400 kW el. Thermal Biomass Gasification CHP-Plant

1





Stans Nidwalden 2 Lines Total = 1 400 kW el. 2 Thermal Biomass Gasification CHP-Plant





Stans Nidwalden **in the 10. year of successfully operation!** Thermal Biomass Gasification CHP-Plant



BETRIEBLEITER

Hans Bieri

«Die Auseinandersetzung mit erneuerbaren Energien wirkt die Energie auf mich aus und motiviert mich.»



BETRIEBLEITER STV.

Patrick Bader



Kari Bucher



Björn Schöffel

**It is work, a lot of work !
Success is made by humans
Motivation is made by support
Congratulations!**

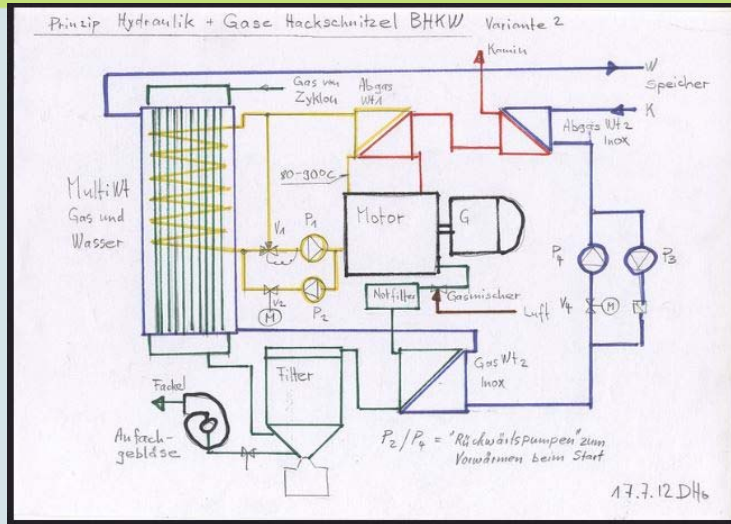


GENOSSEN RAT





Hofstetter Self Made-Unit 9 kW el. Thermal Biomass Gasification CHP-Unit



2009 start with experimental gasifier

2013/14 start with CHP 9kW 500h

2014/15 operated during heating season aprox.: 1000h

Investment 25 000.- Euro + 2,5 man-year
Legal approved unit by all authorities
receiving KEV (feed in tariff)





Ettiswil Luzern Switzerland 45 kW el. Thermal Biomass Gasification CHP-Unit «Spanner»



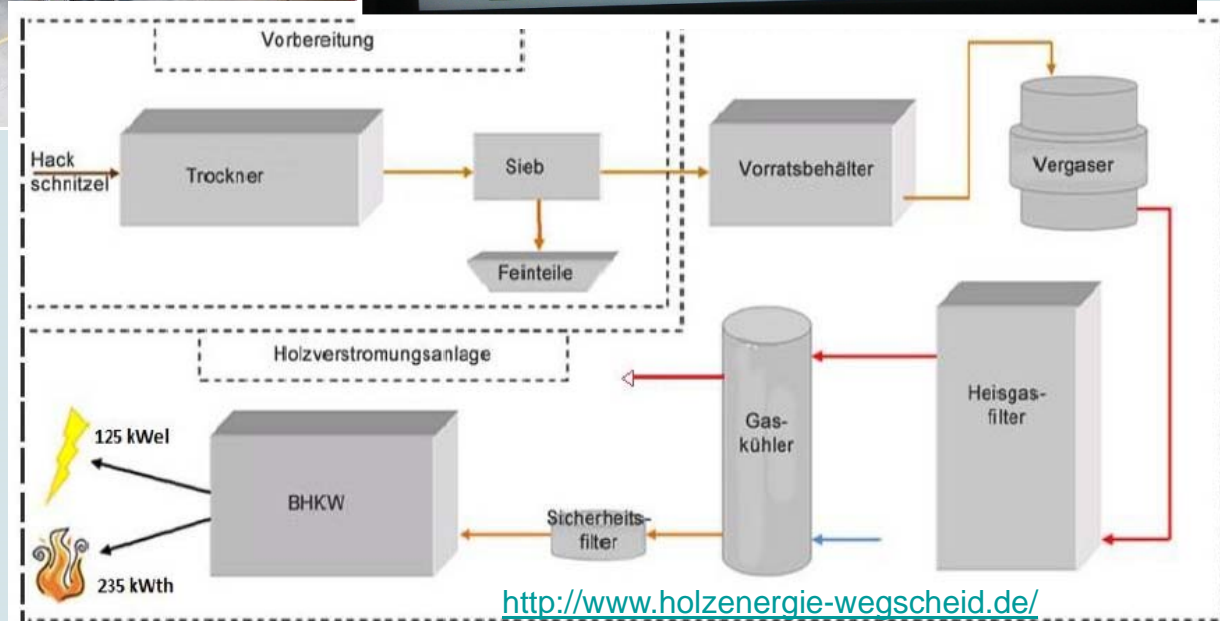
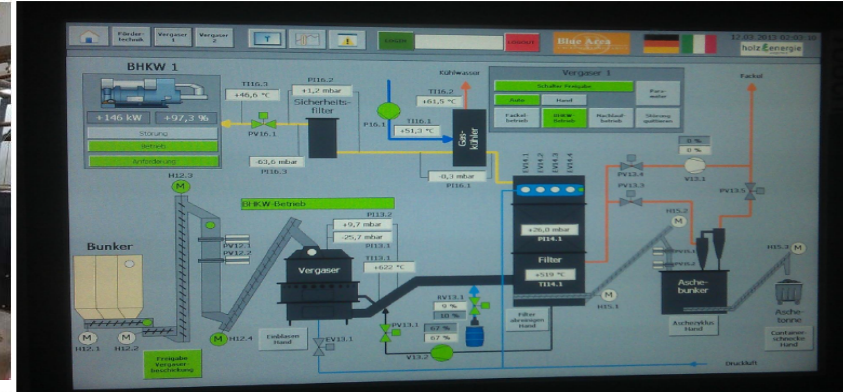
A. STEINER + CIE AG
SÄGEWERK RIEDBRUGG
6218 ETTISWIL





Escholzmatt Luzern Switzerland 125 kW el. Thermal Biomass Gasification CHP-Plant «Wegscheid»

1

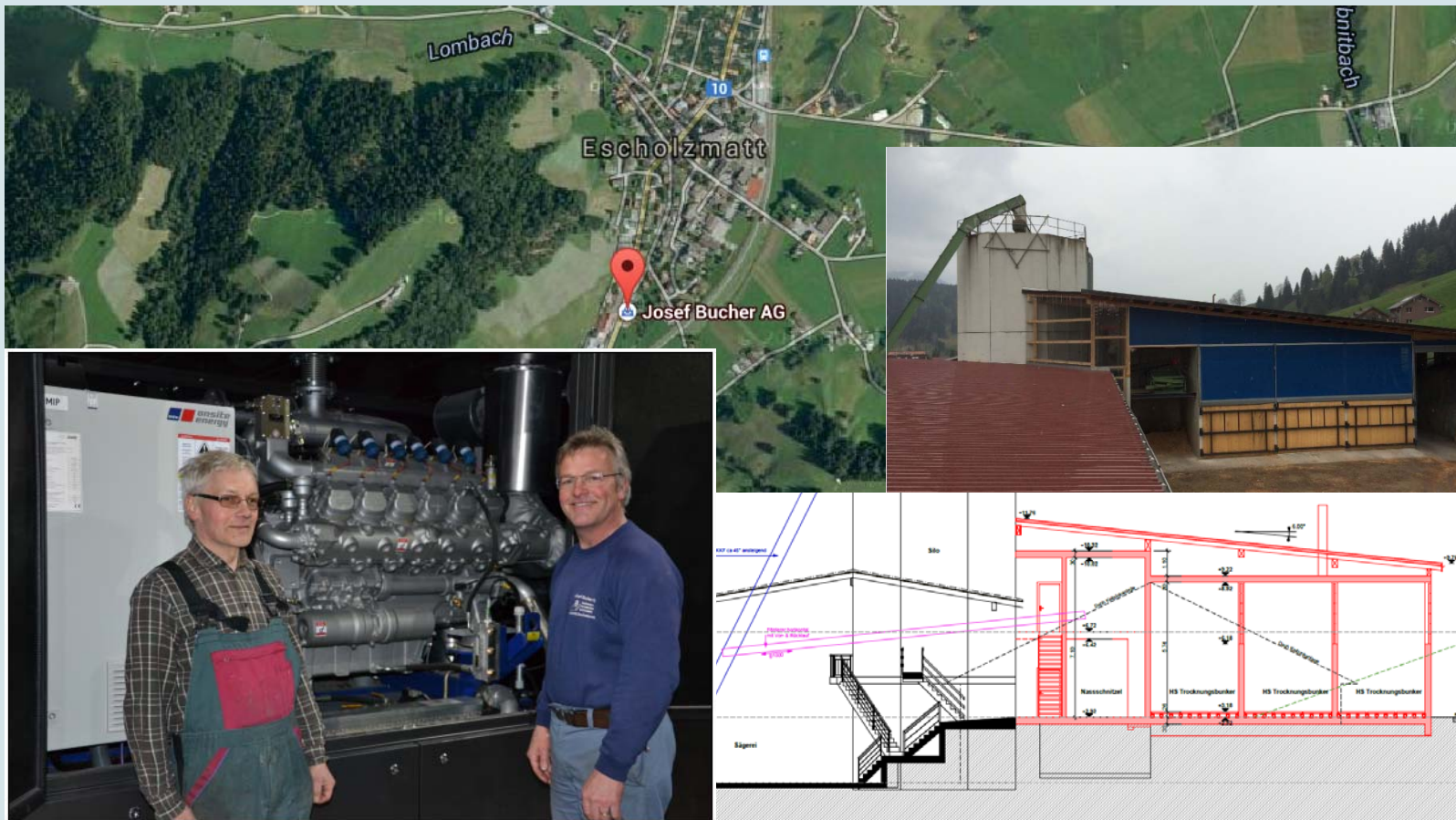




Escholzmatt Luzern Switzerland 125 kW el. Thermal Biomass Gasification CHP-Plant «Wegscheid»

2

Wegscheid Gasifier CHP 125 kW is added to a 2.1 MW district heating System



M. Rügsegger *ETECA GmbH*; CH-3617 Fahrni
IEA Bioenergy: Task 33 Gasification of Biomass and Waste

Innsbruck, Austria May 2017

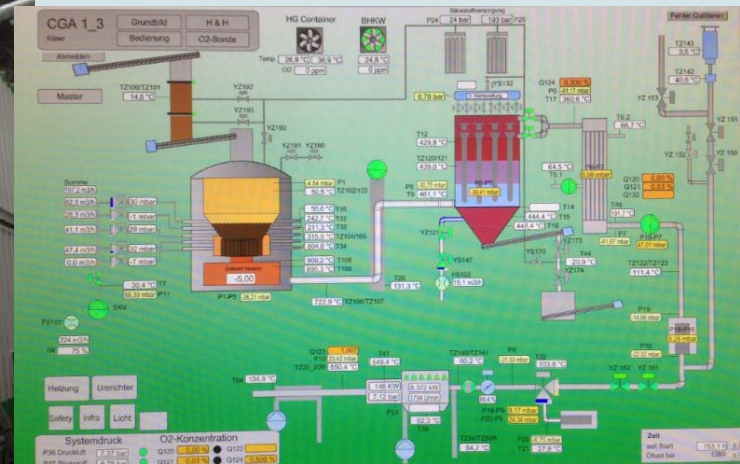


H.H. Käser GmbH, Gasel Köniz, 2 x 140 kW el. Thermal Biomass Gasification CHP-Unit

Chip Wood Supplier for biomass district heating
around Bern.

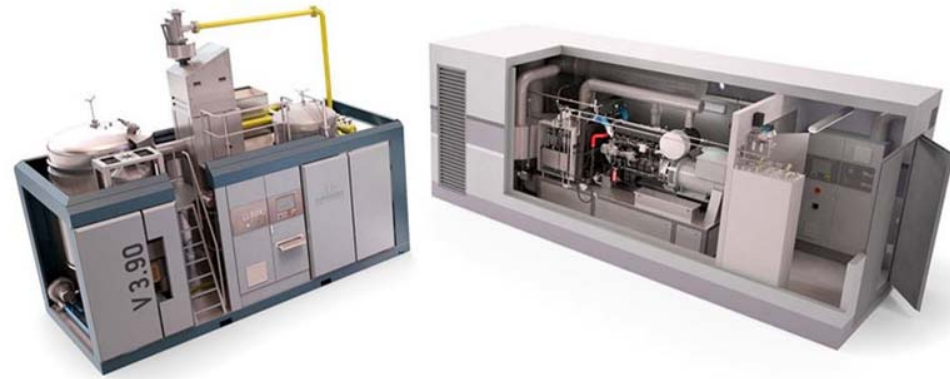
2 Gasifier CHP Unit “Ligento” serves for
electric power and heat for chip wood drying.

www.hhkaeser.ch





AEW Rheinfelden 165 kW el. Start end 2017 Thermal Biomass Gasification CHP-Unit for Wood Pellet's



- www.aew.ch/home.html
- <http://burkhardt-energy.com/hp538/Technik.htm>
- <http://www.rheinfelden.ch/de/>



Thermal Biomass Gasification CHP-Facilities in Switzerland Mai 2017

Summary 1

	Käser Gasel I + II	Holzstrom in Stans I + II	A. Steiner + Cie. AG	J. Bucher AG Escholzmatt
Gasifier	Ligento	8 Pyroforce	Spanner	Wegscheid
Type	downdraft	2-zone downdraft	downdraft	downdraft
Gas engine	1 x 140 kW	2 x 690 kW Jennbacher	45 kW el	125 kW
Waste heat therm	for drying	1,2 MW for district heating	district heating	district heating drying wood chips
extra Boiler		1,6 MW W'chips + 1,7 MW oil for district heating	yes	Yes
Commissioning	I = End 2015 II = Spring 2016	2007	2012/2013	1.4.2015
Remarks	24h_7d p week operation	24h_7d p week operation	24h_7d p week operation	24h_7d p week operation



Thermal Biomass Gasification CHP-Facilities in Switzerland Mai 2017

Summary

2

	Käser Gasel I+II	Holzstrom in Stans I+II	A. Steiner + Cie. AG	J. Bucher AG Escholzmatt
Fuel	Dry clean wood chips	Dry demolition wood/scrap wood chips	Dry waste wood chips	Dry waste wood chips G 30-100
Moisture	<10%	10%	Max 15%	<10%
Operating hours last 6 months	Block 1: 2'649 Block 2: 1'936	Block 1: 2'564 Block 2: 4'137	3 933	4 100
Total live time operation h	Block 1: 5'543 Block 2: 4'130	BHKW 1: 48 235 BHKW 2: 51 584	22 800	16 500
Remarks	2 Units in normal operation	2 unit in normal operation	Plant in normal operation	Plant in normal operation

**6 CHP gasifier Lines in stable operation
1 CHP in construction**

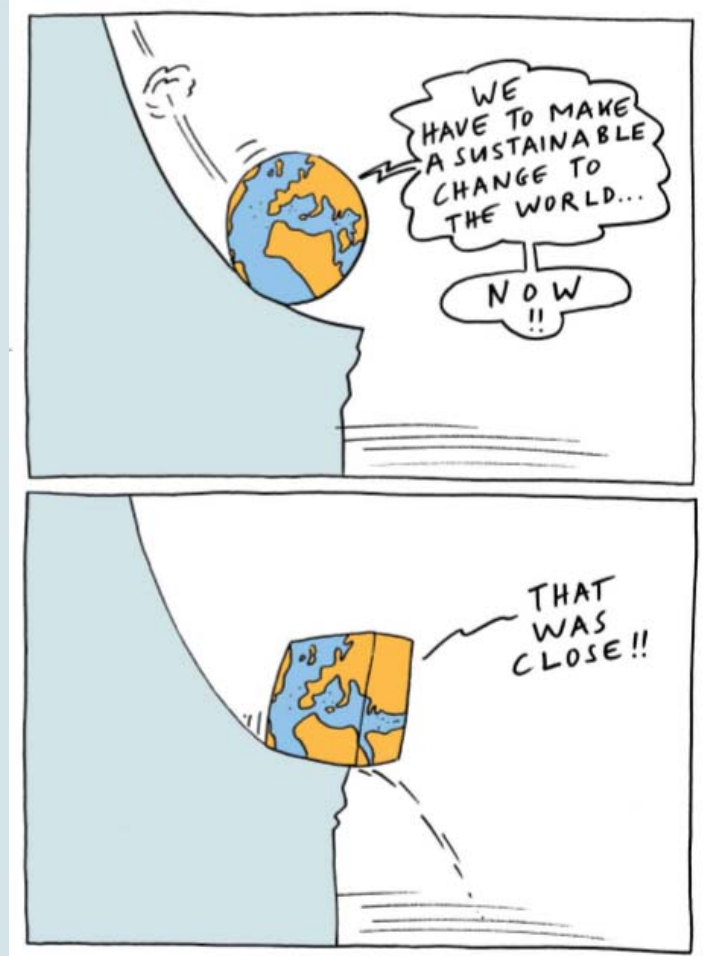


Thermal Gasification of Biomass Commercial Swiss Projects Mai 2017

- Gasifier 160 kW AEW Rheinfelden CHP, unit for pellets => start end of 2017
1 Burkhardt unit
- Gasifier 130 kW Bucher Eschholzmat, second unit => Decision 2017
1 Wegscheidt
 - Gasifier 220 kW Riggisberg CHP, unit for forest waste chip => building permission
pending
1 Xylogas unit
 - Several small scale gasifier CHP offered from supplier, decisions still pending
- Reason of activity: KEV (Feed in tariff) approx. 28 Eurocent per kWh*
- Project 4 unit Lिंगento near Basel 2016 cancelled due Lिंगento is out of business



Thanks for your attention, any questions?



Swiss Cleantech Masterplan ;-)
from Pfuschi-Cartoon, Bern