



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

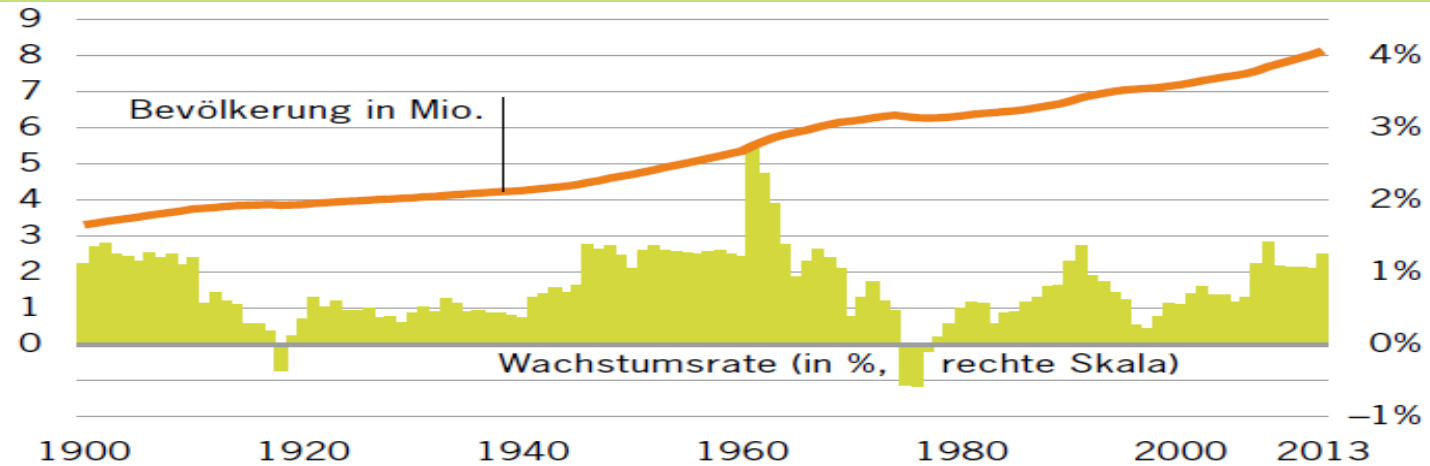
Thermal Gasification of Biomass Country Report Switzerland



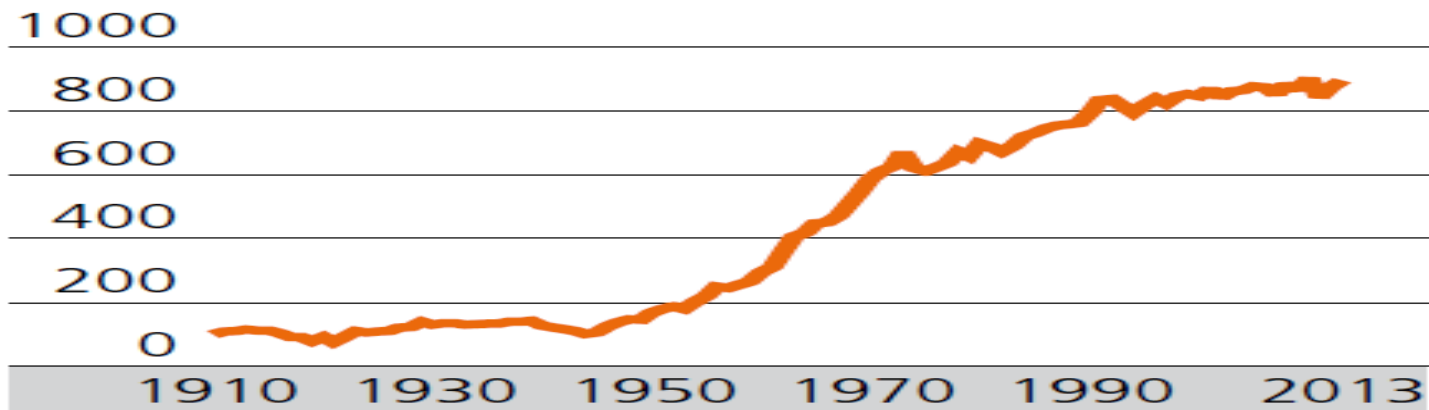
Martin Rügsegger, *ETECA GmbH*, CH-3617 Fahrni



Population



Final energy consumption in '000 TJ

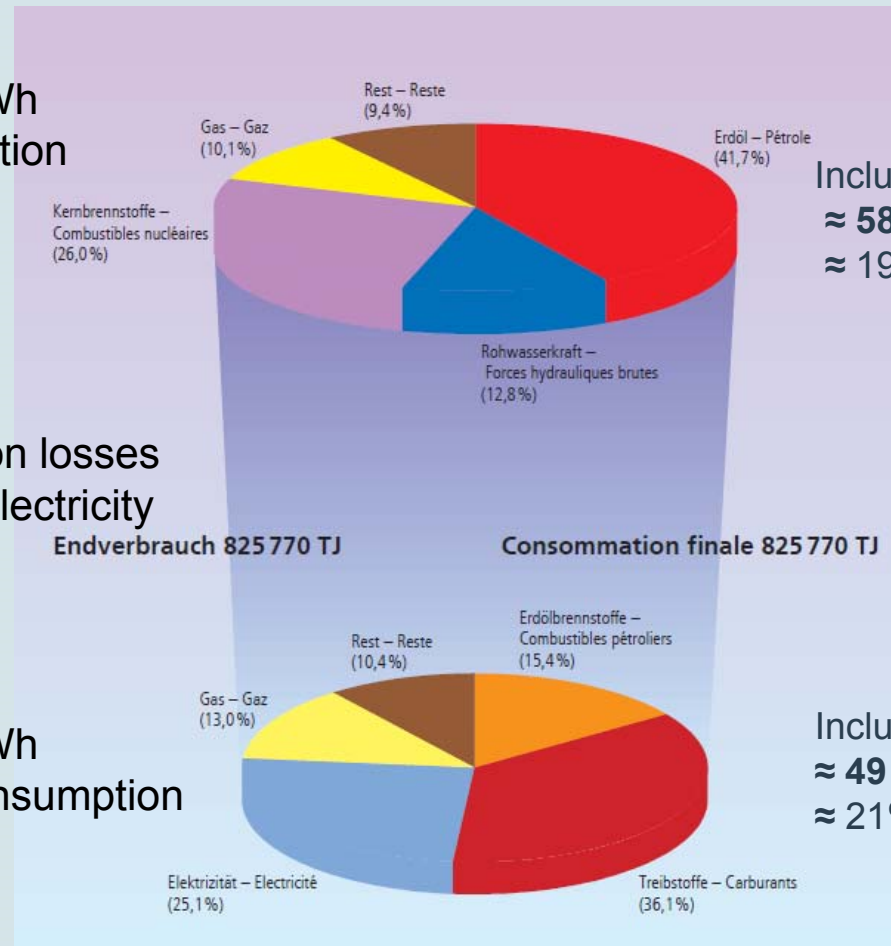




134% \approx 308 TWh
gross consumption

-32% conversion losses
- 1.8% export electricity

100% \approx 229 TWh
final energy consumption



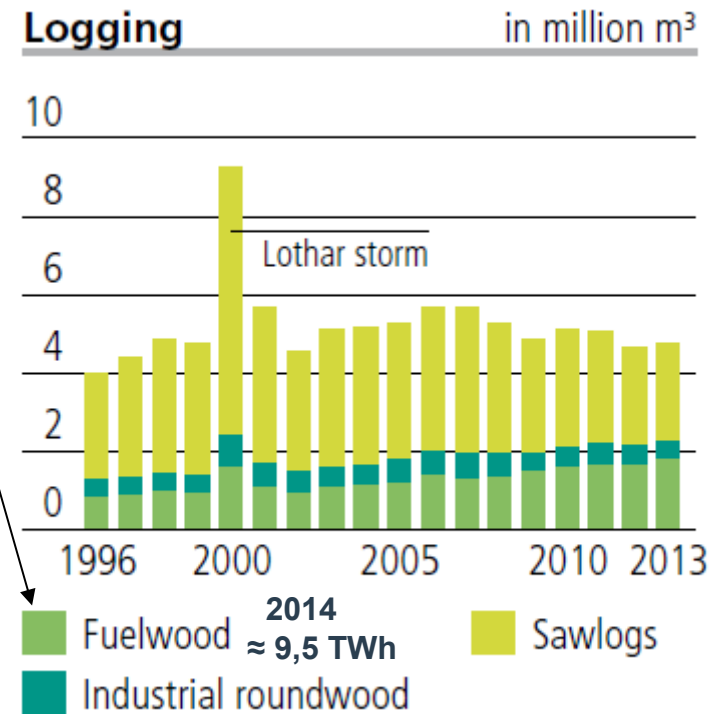
Including Renewable Energy
 \approx 58 TWh
 \approx 19%

Including Renewable Energy
 \approx 49 TWh
 \approx 21%



Renewable energy, 2014 \approx 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





Energy-Impact-Problem, Politics, Program, Strategies,

1970 Oil crises

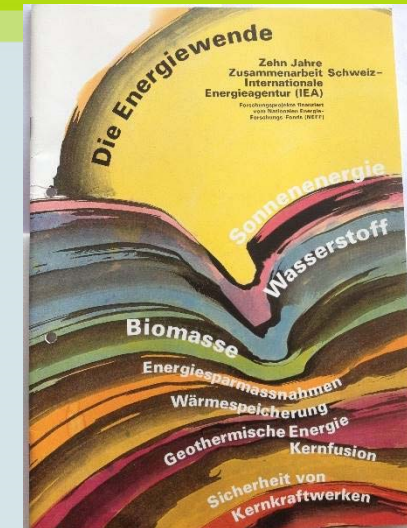
- 1980 **first ENERGIEWENDE** in Switzerland
- Program: “energieschweiz”
- Strategie: Save, Efficiency, RE, Research

40 years later



2011 Fukushima

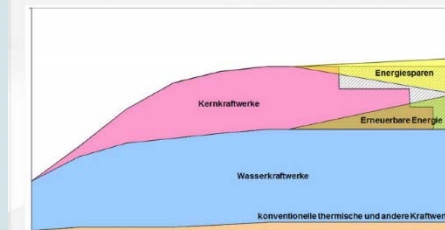
- 2012 **second ENERGIEWENDE**
- Program: “Energiesstrategie 2050”
- Strategie: Save, Efficiency, RE, Research



ENERGIEWENDE

Warum eine Energiewende?

Verschiedene Ereignisse und die daraus beschlossenen Massnahmen haben Auswirkungen auf die schweizerische Energiepolitik: weg von atomaren Risiken und Umstellung auf erneuerbare Energien. Das Ziel einer zuverlässigen, wettbewerbsfähigen, unabhängigen und umweltfreundlichen Energieversorgung kann nur mit Energiesparen sowie dem Einsatz von erneuerbarer Energie erreicht werden.





Future Energy Strategy 2050 of Switzerland,

2016 October

- **Swiss Energy Strategy 2050 approved**
by the government
- **But Referendum is pending**
- **Ore will be presented by Dr. Sandra Hermle**

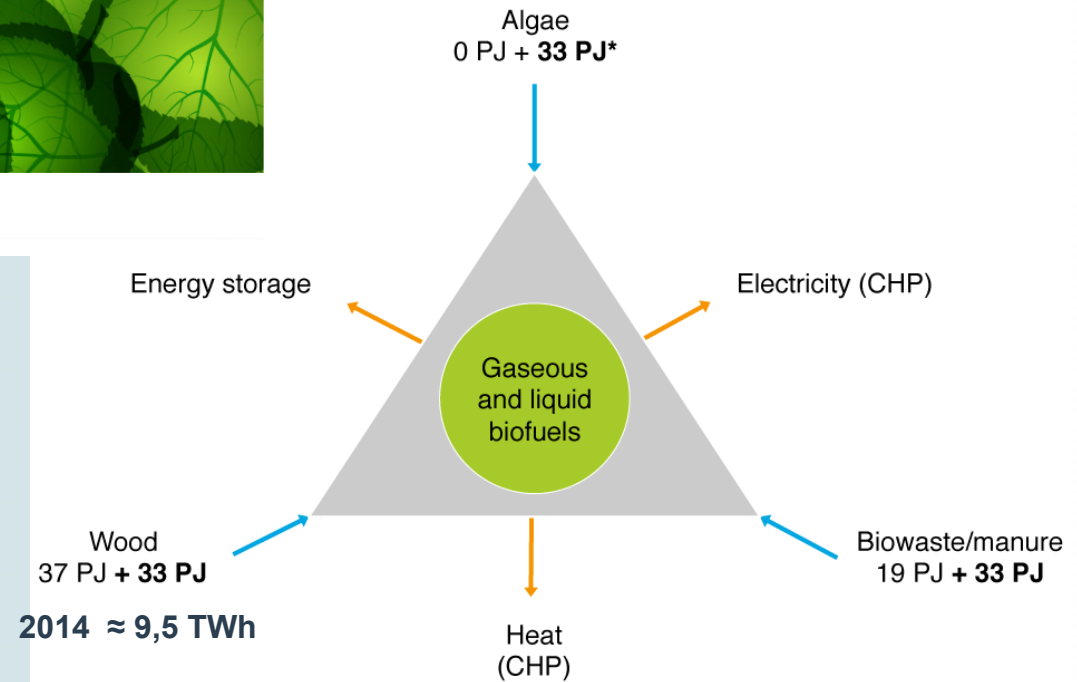


SCCCR Know How, Competence Building and Education VISION more Biomass for Energy



Biomass for Swiss Energy Future

+ 100 Petajoule Vision
(+ 27 TWh = 8000h x 3,3 GW)



*production mainly outside Switzerland



SCCER Biosweet includes Research for Thermal Gasification of Biomass

<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



Thermal Gasification of Biomass Research Activities 2016 reported by

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/>



Thermal Gasification of Biomass Recently Completed Research Projects

NFP66 (National R Program) 3 Projects related to
"Thermal Gasification of Biomass"

1. Hot gas cleaning of producer gas from wood gasification for production of bioSNG and electricity from wood (Hot gas cleaning wood gasification) (PSI)
2012-September 2015
<http://www.nfp66.ch/E/projects/wood-source-energy/gas-cleaning-economical-energy-wood/Pages/default.aspx>
2. Predicting the complex coupling of chemistry and hydrodynamics in fluidised bed methanation reactors for SNG production from wood (PSI)
(bio-SNG - fundamentals of methanation)
Synthetic natural gas from wood — How can the synthesis be optimised?
2012-January 2016
<http://www.nfp66.ch/E/projects/wood-source-energy/synthetic-natural-gas-wood/Pages/default.aspx>
3. Distributed production of ultra-pure hydrogen from woody biomass (ETHZ)
2012- December 2016
<http://www.nfp66.ch/E/projects/wood-source-energy/production-ultra-pure-hydrogen-wood/Pages/default.aspx>



Thermal Gasification of Biomass Swiss Industries 2016

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 2016

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>

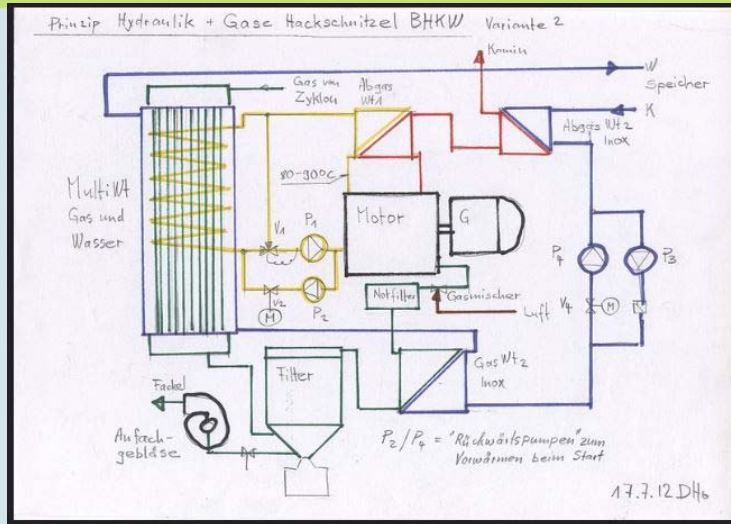
- Supplier for turnkey biomass gasifier plants, gas cleaning....

UMWELT & ENERGIETECHNIK
WASTE TO ENERGY





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 approx.: 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

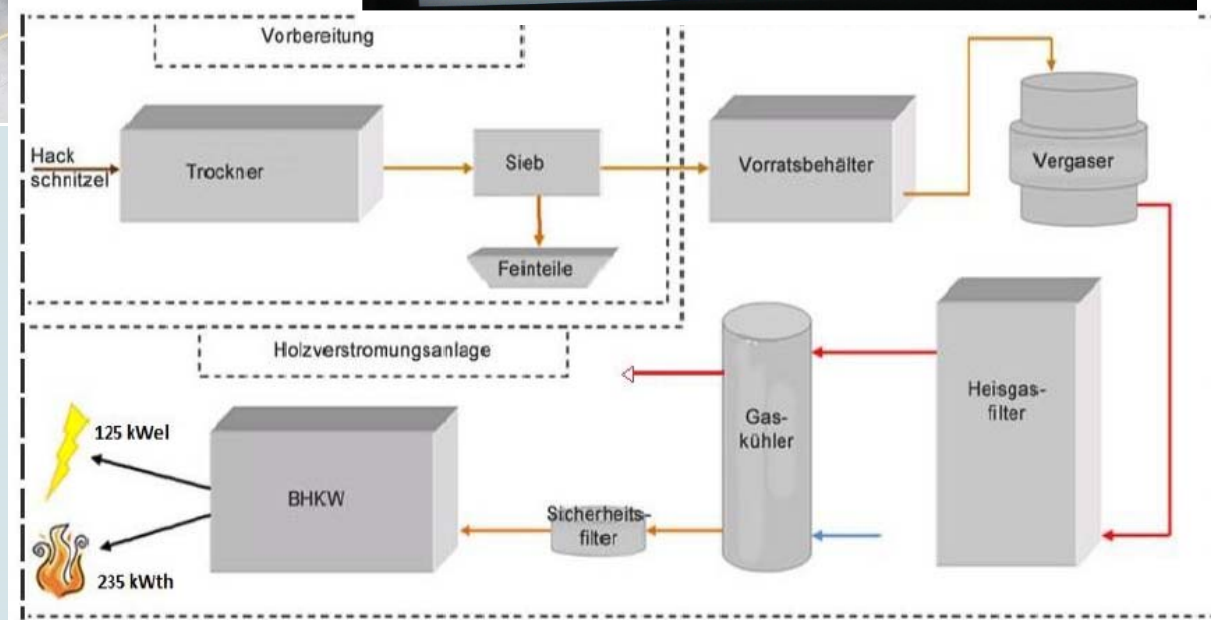
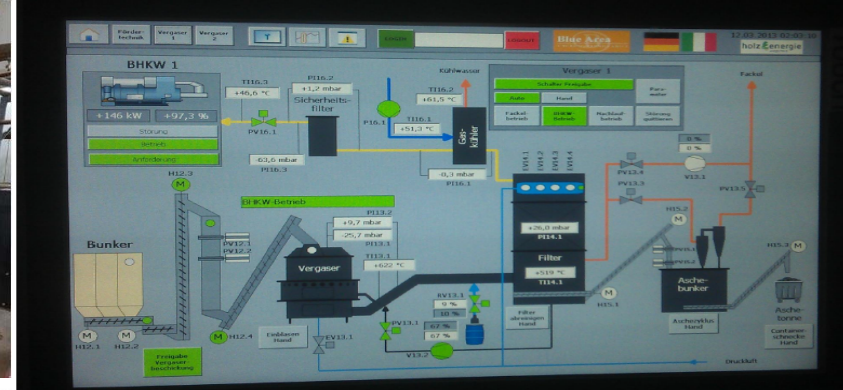


M. Rügsegger *ETECA GmbH*; CH-3617 Fahrni
IEA Bioenergy: Task 33 Thermal Gasification of Biomass

Luzern, Switzerland 2016



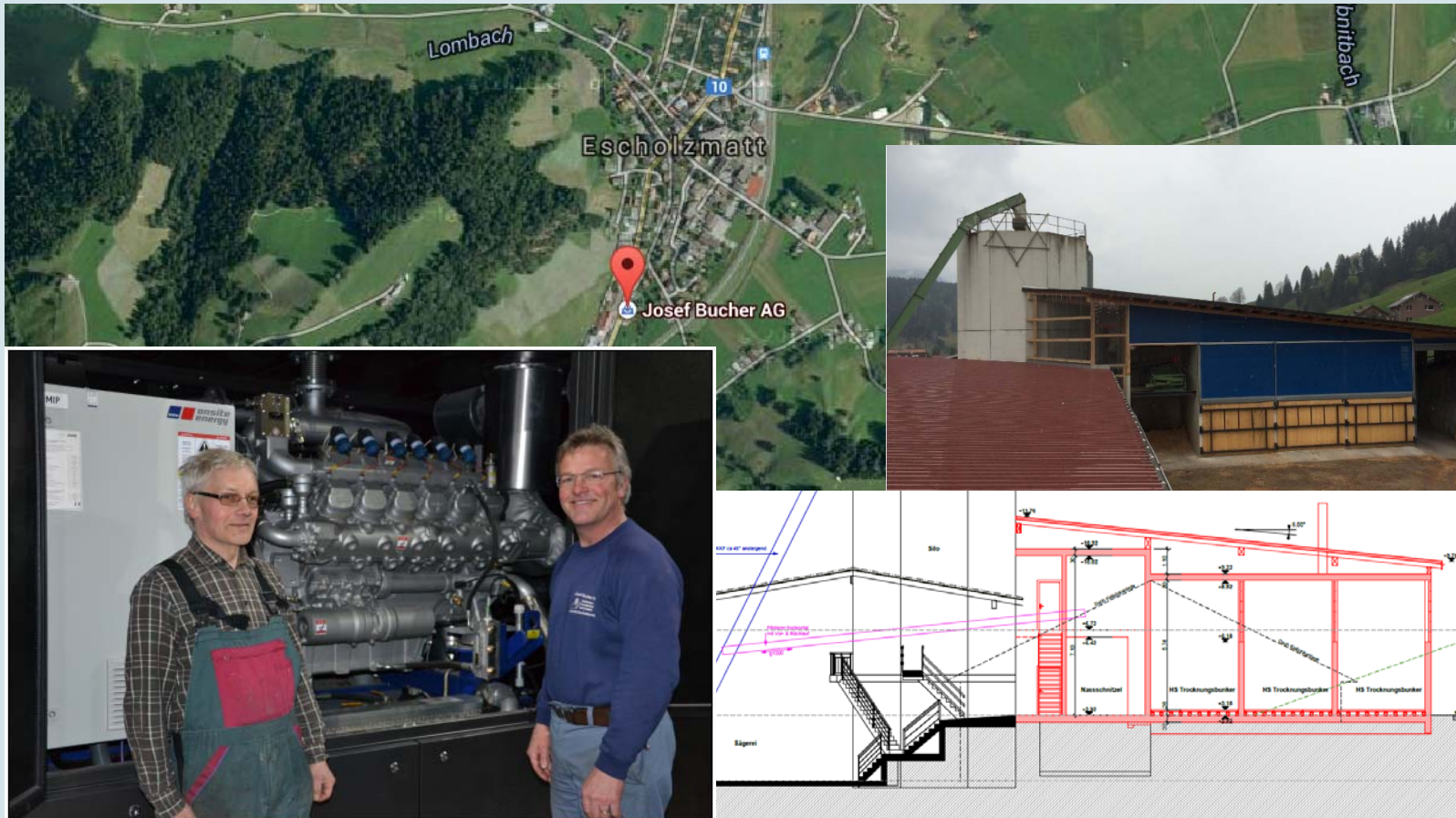
Escholzmatt Luzern Switzerland 125 kW el. Thermal Biomass Gasification CHP-Plant (Start Operation 1. April 2015)





Escholzmatt Luzern Switzerland 125 kW el. 2 Thermal Biomass Gasification CHP-Plant (Start Operation 1. April 2015)

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 Thermal Gasification of Biomass

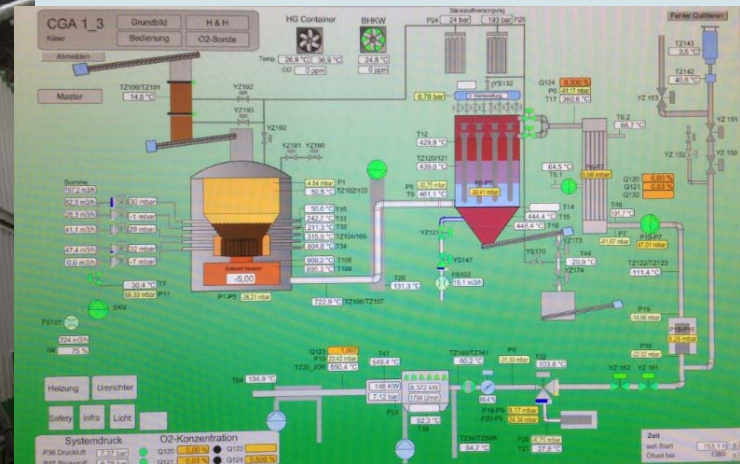


H.H. Käser GmbH, Gassel Köniz, 2 x 140 kW el. Thermal Biomass Gasification CHP-Unit

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



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

Luzern, Switzerland 2016



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

1



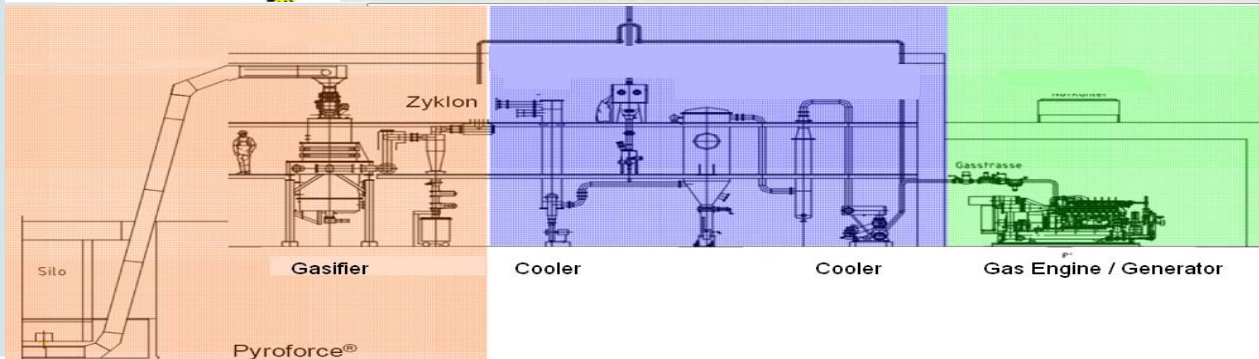
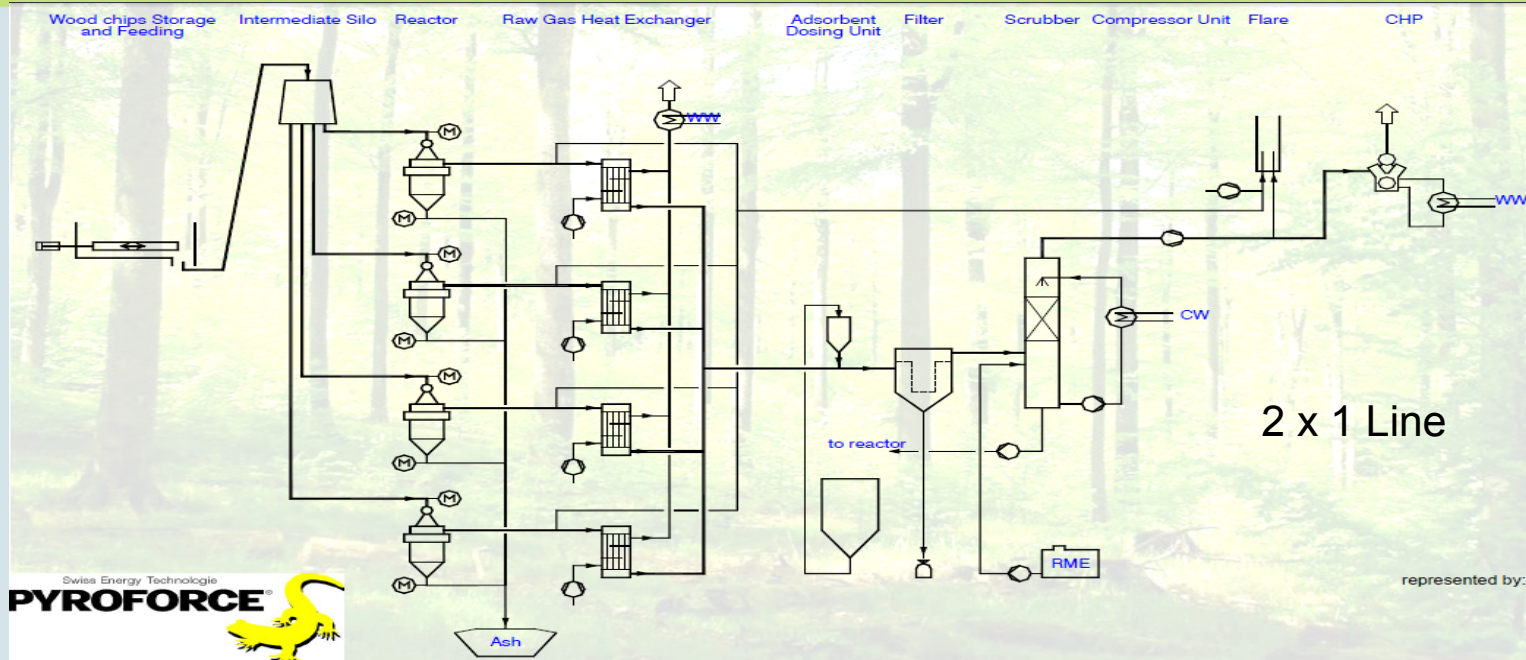
M. Rügsegger *ETECA GmbH*; CH-3617 Fahrni
IEA Bioenergy: Task 33 Thermal Gasification of Biomass

Luzern, Switzerland 2016

18



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



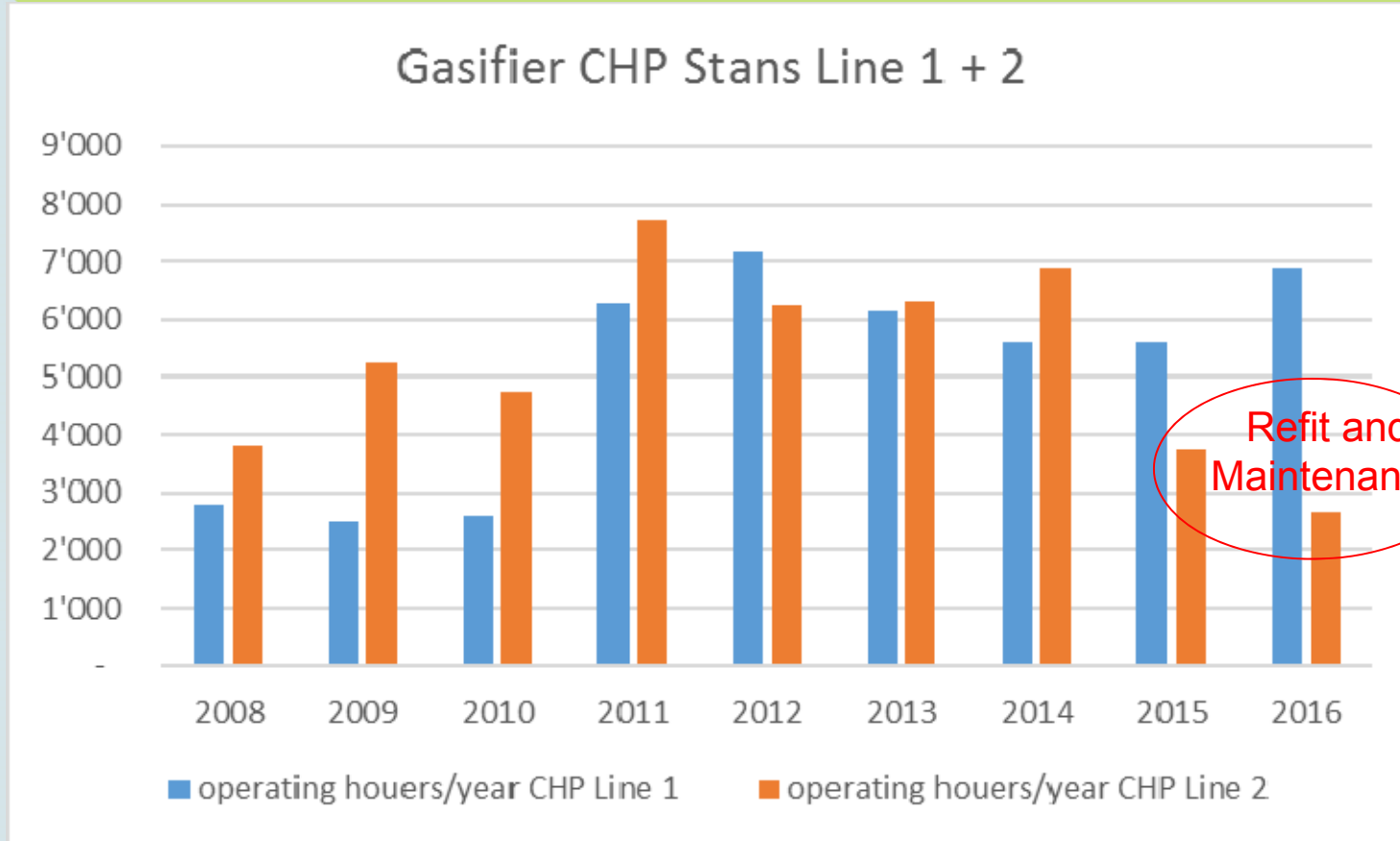
M. Rügsegger **ETECA GmbH**; CH-3617 Fahrni
IEA Bioenergy: Task 33 Thermal Gasification of Biomass

Luzern, Switzerland 2016



Stans Nidwalden **9 years of successfully operation!** Thermal Biomass Gasification CHP-Plant

3





Stans Nidwalden **9 years of successfully operation!** Thermal Biomass Gasification CHP-Plant

4



BETRIEBLEITER

Hans Bieri

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

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



BETRIEBLEITER STV.

Patrick Bader



Kari Bucher



Björn Schöffel



GENOSSEN RAT





Thermal Biomass Gasification CHP-Facilities in Switzerland October 2016

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 October 2016

Summary

2

	Käser Gasel I+II	Holzstrom in Stans	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: 1'544 Block 2: 1'244	Block 1: 1'193 Block 2: 2'631	1 417	4 200
Total live time operation h	Block 1: 2'894 Block 2: 2'194	BHKW 1: 45 671 BHKW 2: 47 447	18 867	12 400
Remarks	2 Units in normal operation	1 unit in normal operation 1 unit under maintenance	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 October 2016

Gasifier 160 kW AEW Rheinfelden CHP, unit for pellets => Ordered
1 Burkhardt unit

Re-design due of special provincial fire regulation (in whole Europe Container standard accepted!!)

Swiss provincial extra rules => delay one year + extra costs

- Gasifier 130 kW Bucher Eschholzmat, second unit => Decision End 2016
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



Thanks for your attention, any questions?

