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

# Thermal Gasification of Biomass Country Report Switzerland (brief update)



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



- General policy made by Swiss Federal Office of Energy (SFOE)
  - High efficiency
  - Increasing renewable energy
- CO<sub>2</sub> Act (Kyoto)
  - emissions reduction of 10% by 2010 (aim not fulfilled)
  - and of 20% by 2020 compared to 1990 levels
- Approved action plans by Swiss Federal Council 2008 // 2011
  - 50% renewable energy to overall energy consumption
  - reduce the consumption of fossil fuels by 20 per cent by 2020
  - 2010 -2020 max 5% increase of electricity consumption
  - After 2020 stabilise electricity consumption
- Vision
  - The 2000 Watt society is a long-term vision of sustainable per capita energy consumption
- Federal council decision to leave nuclear power production 25.5.2011
  - Federal office of Energy new Energy strategy 2050



## 1. Energy Efficiency improvement

## 2. Renewable Production Increase 2050

+ 3,2 TWh Hydro

+ 24.2 TWh (11.1 TWh PV; 6.4 TWh Biomass;  
4.4 TWh Geotherm; 4.3 TWh Wind)

=> + 6.4 TWh Biomass:

2.0 TWh BM used for CHP

1.6 TWh Biogas from waste BM

1.3 TWh incineration plant waste BM

1.2 TWh wood as solid fuel (Heating)

0.3 TWh BM recovery in waste water

## 3. Resting Demand to cover by

- Fossil fuel for electricity (CHP and CCPP)
- Imports

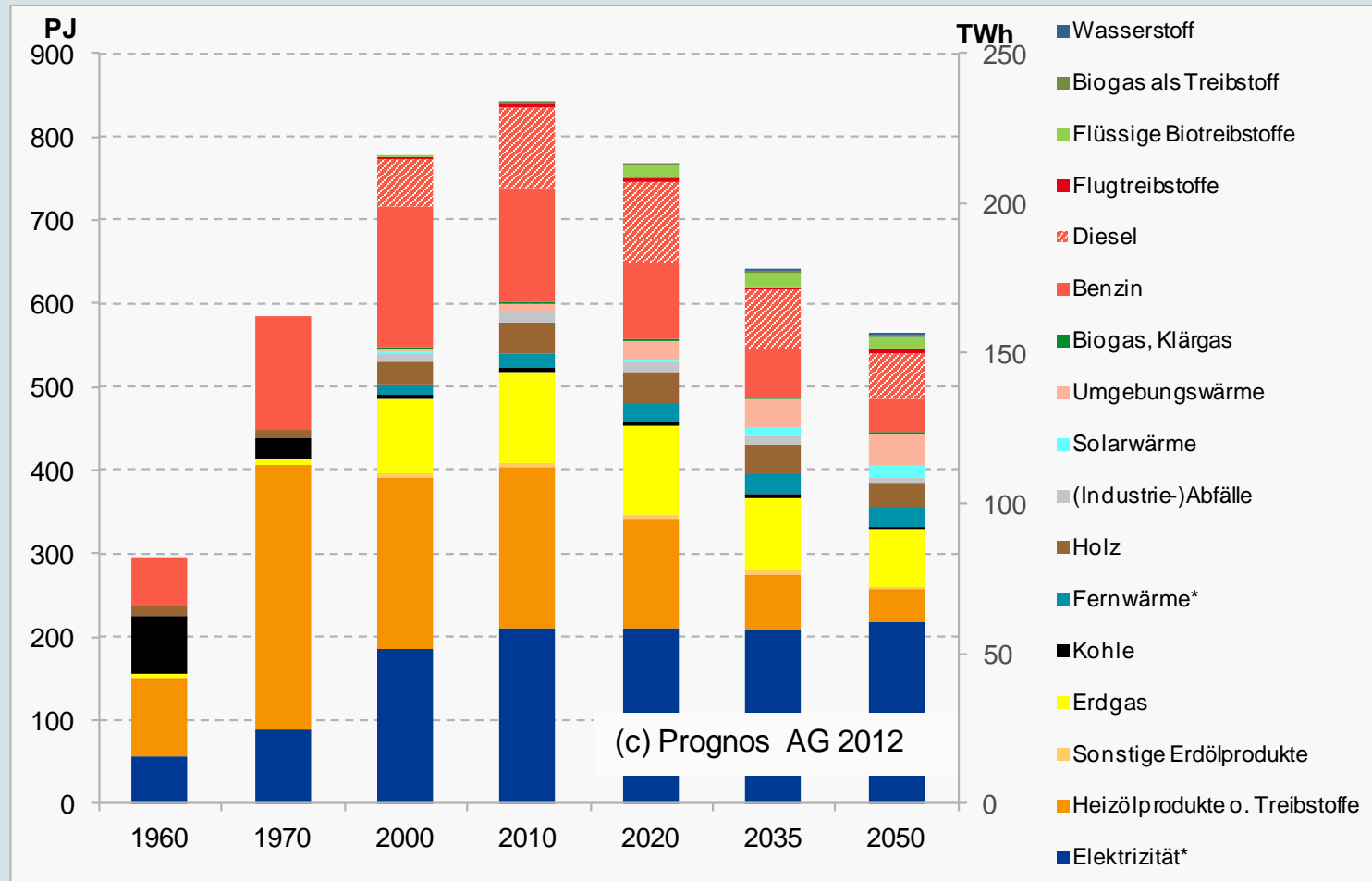




# General Swiss Energy Policy + Programs

## Energy Mix foreseen for ES 2050

3

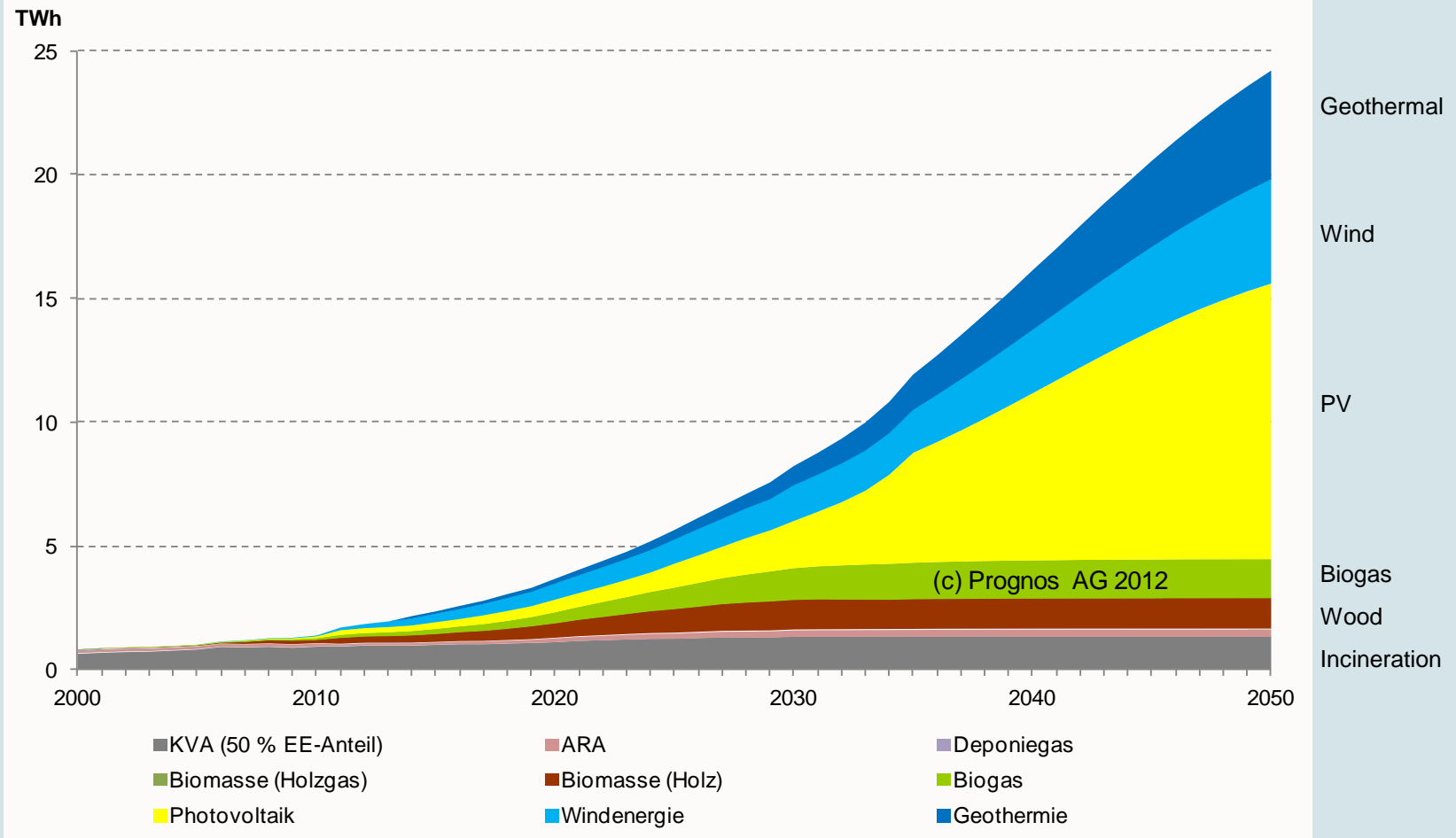




# General Swiss Energy Policy + Programs

## Energy Mix foreseen for ES 2050 “other renewables”

4





# General Swiss Energy Policy + Programs

## Energy Mix foreseen to 2050

4

- + Investment in efficiency
- Savings in energy costs/ imports
- + Investments Costs of production
- + Grid enforcement

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**= Total CHF 39 000 000 000.-**

Angebotsvariante C&E | Quellen: Prognos 2012, Consentec 2012





# Research Activities Situation October 2012

## Thermal Gasification of Biomass

PSI

[www.psi.ch](http://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 <http://tpe.web.psi.ch/>
    - Dr. Serge Biollaz [http://tpe.web.psi.ch/person/per\\_biollaz.htm](http://tpe.web.psi.ch/person/per_biollaz.htm)
- Gasification of wet biomass (manure, algae)
  - For SNG production
    - Dr. Frédéric Vogel [http://cpe.web.psi.ch/CPE/per\\_Vogel.html](http://cpe.web.psi.ch/CPE/per_Vogel.html)
- EU Infrastructure Project, collaboration with: BRISK  
(Biofuels Research Infrastructure for Sharing Knowledge)  
<http://www.briskeu.com/>



# Research Activities Situation October 2012

## Thermal Gasification of Biomass

CCEM Competence Center Energy and Mobility (PSI)

3 Projects related to "Thermal Gasification of Biomass".

- ARRMAT (Attrition Resistant Reactive Bed Materials in Fluidised Beds)
- WOODGAS-SOFC II
- SYNGAS Diagnosis

[http://www.ccem.ch/MediaBoard/Annual\\_Activity\\_Report\\_2011.pdf](http://www.ccem.ch/MediaBoard/Annual_Activity_Report_2011.pdf)

NFP66 (National R Program) 3 Project 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)

<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)

<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)

<http://www.nfp66.ch/E/projects/wood-source-energy/production-ultra-pure-hydrogen-wood/Pages/default.aspx>





# Research Activities Situation October 2012

## Thermal Gasification of Biomass

Engagement under EU SET-Plan (FP7-ERANET-2012-RTD) and  
European Industrial Bioenergy Initiative (EIBI)

ERA-NET Plus BESTF Program supported by the Swiss Federal Office of Energy

- Involved EU Member states: Denmark, Germany, Finland, UK, Portugal, Sweden, Region Navarra (Spain) and EU Associate State Switzerland
- ERA-NET-Plus funds will be used to support bioenergy P+D plant that fit into the EIBI value chains:
- **Synthetic liquid fuels and/or hydrocarbons and blending components via gasification**
  - **Bio-methane and other synthetic gaseous fuels from biomass via gasification**
  - **High-efficiency heat and power generation via gasification of biomass**
  - Bioenergy carriers via other thermochemical processes (e.g. pyrolysis, torrefaction)
  - Ethanol and higher alcohols from ligno-cellulosic feedstock via fermentation
  - Renewable hydrocarbons through biological and/or chemical synthesis from biomass containing carbohydrates
  - Bioenergy carriers from CO<sub>2</sub> and sunlight through microorganism-based production and upgrading into fuels and valuable bio-products



# Swiss Industries Situation October 2012

## Thermal Gasification of Biomass

- EKZ
  - Supplier for turnkey biomass gasifier plants (BMG technique similar to WILA Woodpower)
  - Energy contracting for biomass cogenerating plants

[www.ekz.ch](http://www.ekz.ch)



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

[www.xylopower.com](http://www.xylopower.com)



- BR Engineering GmbH CH-6006 Luzern
  - Engineering and commissioning of thermal Gasification plants and gasification components (Holzstrom Stans)

[www.br-engineering.ch](http://www.br-engineering.ch)



- CTU
  - Supplier for turnkey biomass gasifier plants

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

UMWELT & ENERGIETECHNIK  
WASTE TO ENERGY



- Foster Wheeler AG (published March 2010 Infos about BTL-Plant in Finland)
  - Foster Wheeler AG in Baar Switzerland
  - Foster Wheeler Engineering AG Basel
  - Foster Wheeler Management AG in Geneva Switzerland





# News Swiss Projects November 2012

## Thermal Gasification of Biomass

- EMPA EAWAG Dübendorf CHP gasifier Plant  
Project is in the stage of detail planning; in construction
  - Supplier will be EWZ Woodpower-type gasifier
  - 2 x 350 kW el
- 45 kW Spanner thermal Gasifier CHP Unit  
for District heating using waste wood of a sawmill  
(A. Steiner + Cie. AG Ettiswil /Luzern)
- PSI: Biomethane Development => 20-80MW BM-to-SNG plant in discussion  
based on BFB methanation technology



# Thermal Biomass Gasification CHP-Plants in Switzerland Summary 1    November 12

	<b>Aerni in Pratteln</b>	<b>Holzstrom in Stans</b>	<b>Woodpower EMPA</b>	<b>A. Steiner + Cie. AG</b>
<b>Gasifier</b>	1 Kuntschar	8 Pyroforce	Woodpower EKZ	Spanner
<b>Type</b>	downdraft	2-zone downdraft	downdraft	downdraft
<b>Gas engine</b>	1 x 130 kW Adapt. MAN	2 x 690 kW Jennbacher	2 x 350 kW el	45 kW el
<b>Waste heat therm</b>	230 kW for district heating	1,2 MW for district heating	district heating	district heating
<b>extra Boiler</b>	2MW wood chip district heating	1,6 MW W'chips + 1,7 MW oil for district heating		yes
<b>Commissioning</b>	2009	2007	2013/14	2012/2013
<b>Remarks</b>	<b>in modification</b>	24h_7d p week operation	<b>In construction</b>	<b>in commissioning</b>

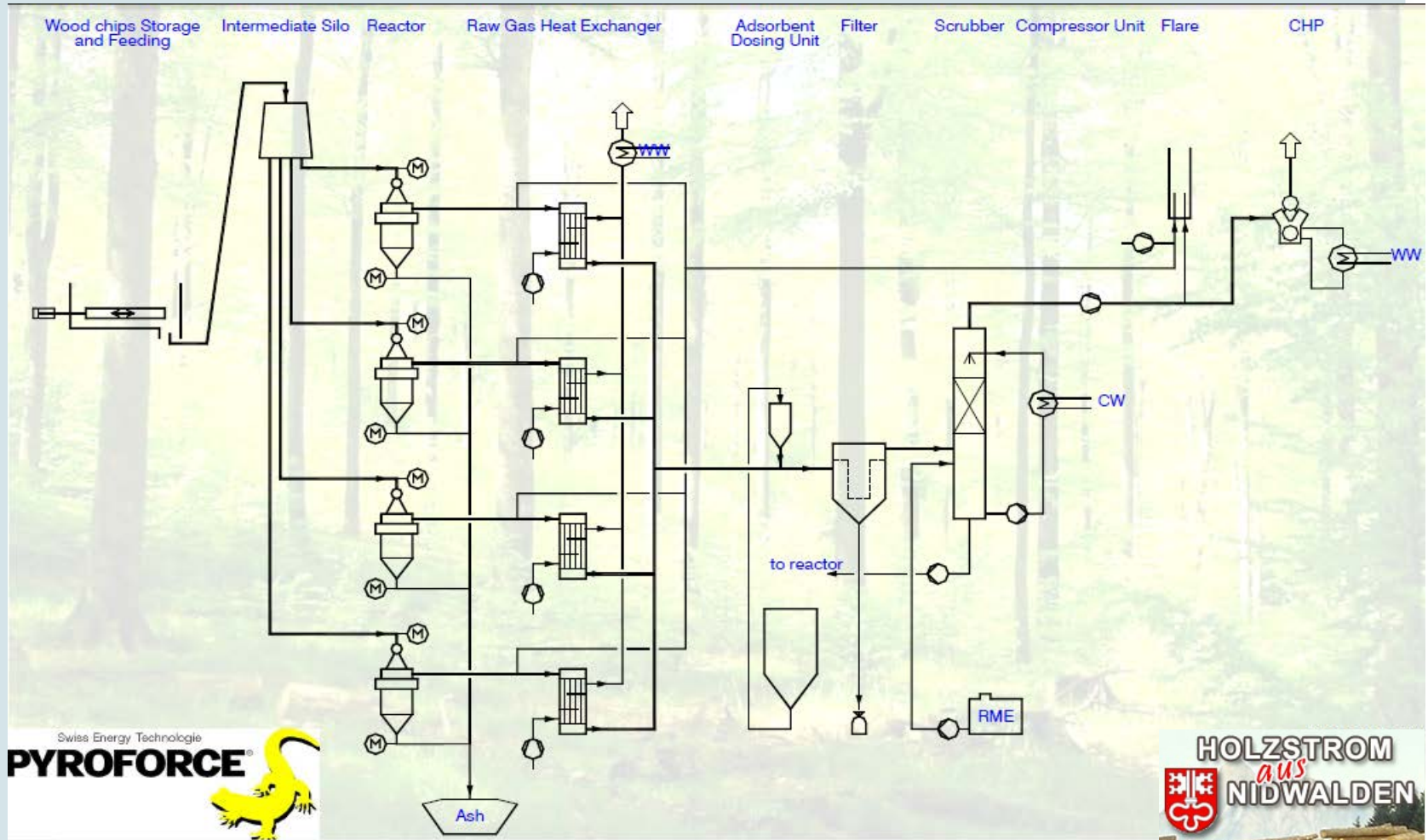


# Thermal Biomass Gasification CHP-Plants in Switzerland Summary 2 November 12

	<b>Aerni in Pratteln</b>	<b>Holzstrom in Stans</b>	<b>Woodpower EMPA</b>	<b>A. Steiner + Cie. AG</b>
<b>Fuel</b>	Dry clean wood chips	Dry demolition wood/scrap wood chips	Dry waste wood chips	Dry waste wood chips
<b>Moisture</b>	8%	10%	?	?
<b>Operating hours last 12 Months</b>	?	Block 1: 7'679 h Block 2: 6'419 h	n.a-	n.a.
<b>Declared revision / modification</b>	Gasifier	Block 1: non Block 2: non	-	-
<b>Total live time operation h April 2012</b>	?	Block 1: 19 979 h Block 2: 26 119 h	n.a	-
<b>Remarks</b>	<b>New design of gasifier</b>		<b>In construction</b>	<b>New plant</b>

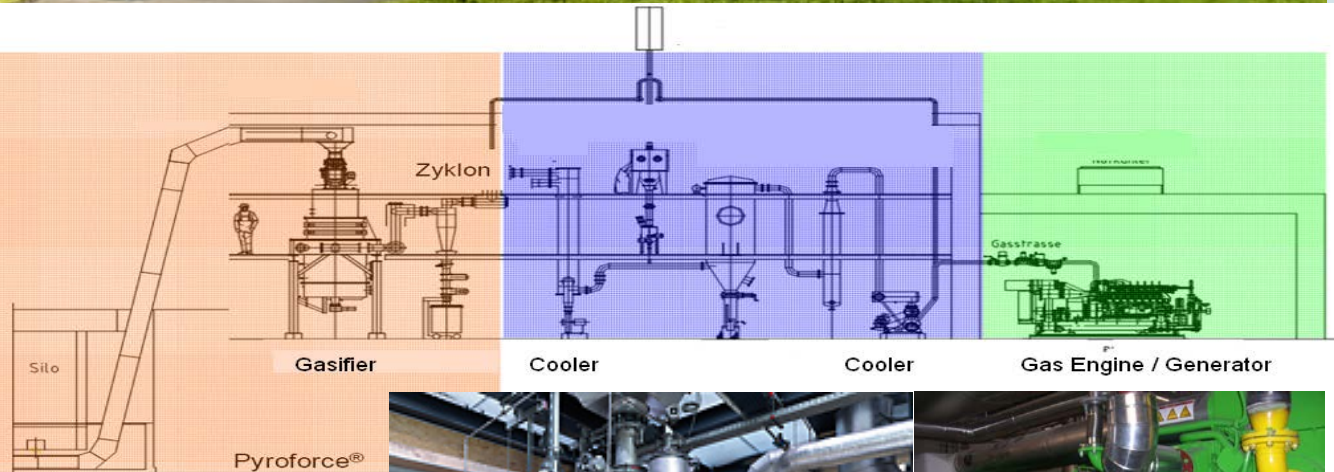


# Thermal Biomass Gasification CHP-Plants Stans Switzerland 1





# Thermal Biomass Gasification CHP-Plants Stans Switzerland 2





# Thermal Biomass Gasification CHP-Plants Pratteln Switzerland



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

Vienna Austria  
Nov 2012





# Thermal Biomass Gasification CHP-Plants Ettiswil Luzern Switzerland



A. STEINER + CIE AG  
SÄGEWERK RIEDBRUGG  
6218 ETTISWIL





# P+D Projects in Switzerland?

## Thermal Gasification of Biomass

### Facts today:

- 1 Plant in stable operation (Stans)
- 2 Project in construction
- 1 Plant in modification

### Facts of the past 3 years:

- 1 Plant closed down
- 3 Planned projects abandoned
- 1 Main supplier out of business

### Politics:

Visions clearly for renewable energy and promote renewable energy

### Reality:

- Cost-covering remuneration (KEV) for new projects pending
- Thermal gasification is technically complex (higher costs)
- Risk investments for biomass-energy projects not existing
- CO<sub>2</sub> -certificates, -contributions and -compensations unsecure in the future
- Public and private frames not in line with political visions
- Volatile biomass-fuel-price



Thanks for your attention,  
any Questions?

