

Gasification Survey Country:

Switzerland

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On behalf of Swiss Federal Office of Energy (SFOE)

Date: 29th January 2011

1. Facts

The total energy consumption in Switzerland 2009 was 877 560 TJ (= 243 766 GWh). Two thirds (67.9%) were covered by imported fossil energy (heating oil, fuels, coal and natural gas). 50% of this fossil energy was used for traffic fuel. Renewable energy sources (Hydro, biomass, waste, wind and solar) contributed 18.9% of total final energy consumption.

Biomass contributed 2009 roughly 5.6% of the energy demand. (Wood and biogas 4.27%, biomass energy from waste treatment 1.19%, biomass energy from sewage treatment 0.20%, bio fuels 0.06%)

This energy from biomass conversion is used to, 50% for direct domestic heating applications, 20% for process heat, 15% for combined heat and power (CHP) and 15% for district heating.

Historically, Switzerland's longest-serving and most important source of renewable energy has been hydropower. But the "new" renewables including solar, wood, biomass, wind, geothermal and ambient heat also play an increasingly important role in today's Swiss energy mix. The long-term potentials of domestic renewable energy indicate that, for all forms, the prospects for electricity and heat are very important. However, it is also clear that, primarily for economic reasons, it will only be possible to fully utilise the major potentials of photovoltaics or geothermal energy in medium term future. Other renewables such as wood and biomass, ambient heat, electricity from small-scale hydropower plants and, to a modest extent, wind, are available now and in some cases are also already economically attractive.

2. Policy

In February 2007, the Federal Council decided to focus its energy policy on four main areas: energy efficiency, renewable energy, replacement of existing large-scale power plants and construction of new ones, and foreign energy policy. In order to implement this strategy, the Federal Department of the Environment, Transport, Energy and Communications (DETEC) prepared draft action plans for energy efficiency and the use of renewable energy, which were approved by the Federal Council on 20 February 2008.

These action plans set out to reduce the consumption of fossil fuels by 20 percent by 2020 in line with the declared climate objectives, to increase the proportion of renewable energy to overall energy consumption by 50 percent, and to limit the increase in electricity consumption to a maximum of 5 percent between 2010 and 2020. From 2020 onwards, the objective is to stabilise electricity consumption.

With regard to the signed Kyoto Protocol Switzerland is obliged to reduce its GHG emissions.

The CO₂ Act asks for an emissions reduction of 10% by 2010 and of 20% by 2020 compared to 1990 levels. Under the CO₂ and Energy Acts, the principles of subsidiarity and cooperation apply, i.e. priority is given to voluntary measures based on performance mandates with agencies and agreements on targets. SFOE vision is the 2000 Watt society. The 2000 Watt society is a long-term vision of sustainable per capita energy consumption. For Switzerland this means reducing energy use to a third of its current level and largely replacing fossil fuels with renewables.

3. Programs

Since about three decades Switzerland supported strongly energy related R&D programs for different biomass conversion technologies. **Thermal gasification** is also for a long period a major topic for research activities. There are still open questions and the potential for technology optimizations exist. Lately the expectation takes place that the collected research results and experiences with the several pilot and demonstration plants in past should be consolidated and implemented into commercial **thermal gasification** plant.

Direct available finances for research related to biomass as a versatile energy source are decreased down to a minimum which therefore affects also **thermal gasification**.

Switzerland searches the integration and cooperation into the European bioenergy programs such as EIBI etc.

Co-financing possibilities for demonstration plant for energy conversion shifted from the federal government (SFOE) down to the government's level of the cantons (provincial) and down to private initiatives.

With the introduction of remuneration at cost for input into the grid, one of the goals of Switzerland's energy policy is to increase the proportion of electricity produced from renewable energy by 5,400 GWh by 2030 compared to the electricity consumption of the year 2000. In the year 2009, 56.15% of Switzerland's overall electricity production comes from renewable sources; with hydropower was by far the biggest contributor (96.5%). The remuneration program showed for Biomass CHP installations lately a strong acceleration. The number of installations increased strongly. So, it is to observe that three commercial **thermal gasification plants** are actually in operation.

For biofuels and natural gas no mineral oil tax has to be paid in Switzerland. For the consumer the cost for biofuels are similar to the cost as for fossil liquid fuels. Even due to these advantageous conditions, there is no major increase of purchased biofuels noted.

4. R&D Institutes with activities in Thermal Gasification

- PSI (Paul Scherrer Institute) www.psi.ch
 - Gasification of dry biomass (wood, grass)
 - Usage of the product gas in fuel cells
 - Co-firing in NGCC for power generation
 - High temperature fuel cells for CHP
 - Gas processing for SNG production <http://tpe.web.psi.ch/>

- Process simulation of Fischer Tropsch fuels
 - Dr. Serge Biollaz http://tpe.web.psi.ch/person/per_biollaz.htm
- Gasification of moist biomass (manure, algae) for SNG production
 - Dr. Frédéric Vogel http://cpe.web.psi.ch/CPE/per_Vogel.html
- Energetic use of biomass (gasification, gas cleaning, fuel synthesis)
 - Dr Tilman Schildhauer <http://lem.web.psi.ch.....childhauer.htm>
- EMPA <http://www.empa.ch/>
 - Life Cycle Assessments
 - Dr. Rainer Zah <http://www.empa.ch..zah293>

5. Industries

- EKZ www.ekz.ch
 - Supplier for turnkey biomass gasifier plants (BMG technique similar to WILA Woodpower)
 - Energy contracting for biomass cogenerating plants
- Pyroforce Energietechnologie AG www.pyroforce.ch
 - Supplier for turnkey biomass gasifier plants (BMG technique according to Stans Nidwalden)
 - Other projects: Güssing: 300 kWel 2 gasifiers; 2009
Spiez: 200 kWel 1 gasifiers; 2000-2007
- XyloPower AG www.xylopower.com
 - Supplier for turnkey biomass gasifier plants (BMG Technique similar to WILA)
- Foster Wheeler AG (published March 2010 Infos about BTL-Plant in Finland)
 - Foster Wheeler AG in Baar Switzerland (April 2010 Zug)
 - Foster Wheeler Managment AG in Geneva Switzerland

6. Projects

- CHP Thermal Gasifier installation 700 kW el. 2x 350 with gasifier unit Woodpower. Decision made for realisation end 2010. Expected commissioning 2012. Installation site EMPA EAWAG Dübendorf <http://www.empa.ch/>
- **CHP/SNG Thermal Gasification** Project “Energie Hub Baden” is postponed due to economical reasons.

7. Contacts and Links Thermal Gasification

- Swiss Federal Office of Energy (SFOE)
[Biomass and Wood Energy Research Program](#) Dr. Sandra Hermle
- [Wood energy](#) Daniel Binggeli

- [Energy from Sewage and Waste](#) Bruno Guggisberg
- IEA Bioenergy ExCo Member for Switzerland:
Dr. Sandra Hermle SFOE
- IEA Bioenergy ExCo Alternate Member for Switzerland:
Bruno Guggisberg SFOE
- IEA Bioenergy **Thermal Gasification** Task 33,
Official Representation for Switzerland and National Expert:
Martin Rügsegger ETECA GmbH mandated by SFOE
- IEA Bioenergy **Thermal Gasification** Task 33 National Expert:
Dr. Serge Biollaz PSI

8. Implementations Status January 2011

COMPANY LOCATION	AERNI PRATTELN	HOLZSTROM IN STANS / NIDWALDEN	WOODPOWER IN WILA	PYROFORCE AMC SPIEZ
GASIFIER	1 KUNTSCHAR	8 PYROFORCE	1 MODIFIED DASAGREN	1 PYROFORCE
TYPE	DOWNDRAFT	2-ZONE DOWNDRAFT	DOWNDRAFT	DOWNDRAFT
GAS ENGINE	1 X 130 KW ADAPT. MAN	2 X 690 KW JENNBACHER	1 X 350 KW JENNBACHER	200 KW JENNBACHER
WASTE HEAT THERM	230 KW FOR DISTRICT HEATING	1,2 MW FOR DISTRICT HEATING	425 KW FOR WOOD CHIPS DRYING	DISTRICT HEATING
EXTRA BOILER	2MW WOOD CHIP DISTRICT HEATING	1,6 MW W'CHIPS + 1,7 MW OIL FOR DISTRICT HEATING	200KW WASTE COAL FOR DISTRICT HEATING	NON
COMMISSIONING	2009	2007	2007	2000 (-2007)
REMARKS	IN MODIFICATION	24H_7D P WEEK OPERATION	24H_7D P WEEK OPERATION	PILOT PLANT
STATUS	IN OPERATION	IN OPERATION	IN OPERATION	DESMANTELED AFTER DEMONSTRATION
LINK	--	WWW.HOLZSTROM.CH	WWW.WOODPOWER.CH	--