



IEA Bioenergy Conference 2015

Berlin, 27.10.2015

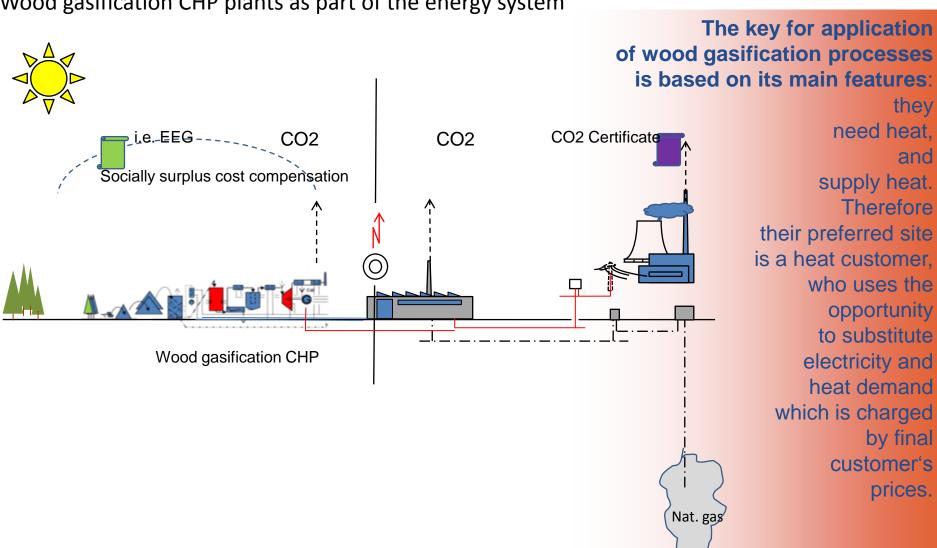
Latest developments in German biomass gasification processes for Power&Heat

Dr.-Ing. Georg Wagener-Lohse, Dipl.-Ing. Dieter Bräkow Society for the Promotion of Renewable Energies e.V.

info@fee-ev.de, www.fee-ev.de



Wood gasification CHP plants as part of the energy system





3 documents expressing political convictions changed the world of wood gasification in Germany only recently

Gesetz für den Ausbau erneuerbarer Energien (Erneuerbare-Energien-Gesetz - EEG 2014) Nicht-amtliche Lesefassung des EEG in der ab 1. August 2014 geltenden Fassung (unter Zugrundelegung der Bundestags-Beschlüsse vom 27. Juni 2014 und 4. Juli 2014: die Fassung ist unverbindlich – nur die Veröffentlichung im Bundesgesetzblatt ist verbindlich) Inhaltsübersicht Teil 1 Allgemeine Bestimmungen § 1 Zweck und Ziel des Gesetzes § 2 Grundsätze des Gesetzes Ausbaupfad § 4 Geltungsbereich § 5 Begriffsbestimmungen § 6 Anlagenregister § 7 Gesetzliches Schuldverhältnis Teil 2 Anschluss, Abnahme, Übertragung und Verteilung Allgemeine Bestimmungen § 8 Anschluss § 9 Technische Vorgaben § 10 Ausführung und Nutzung des Anschlusses § 11 Abnahme, Übertragung und Verteilung

Gesetzentwurf der Bundesregierung Entwurf eines Gesetzes zur Neuregelung des Kraft-Wärme-Kopplungsgesetzes A. Problem und Ziel Um die Effizienz im Bereich der Strom- und Wärmeerzeugung zu steigern, unterstützt die Bunde sregierung den Ausbau von Kraft-Wärme-Kopplung (KWK) insbesondere durch das Kraft-Wärme-Kopplungs-Gesetz (WWKG) und verfolgt damit das Ziel, den Anteil von KWK-Strom an der Stromerzeugung zu steigem Durch das geltende KWKG wird die Stromerzeugung von hocheffizienten KWK-Anlagen durch umlagefinanzierte Zuschläge auf den Marktpreis bei Modernisierung und Neubau von Anlagen gefördert. Die Förderung ist zeitlich grundsätzlich auf 30 .000 Vollbenutzungsstunden beschränkt. Für kleinere Anlagen (Leistung bis 50 Kilowatt) ist die Förderung zeitlich grundsätzlich auf 10 Jahre befristet. Weiterhin wird auch der Neu- und Ausbau von Wärmenetzen und -speichern durch das KWKG gefördert. Seit 2012 werden auch die technologisch verwandten Kraft-Wärme-Kälte-Anlagen sowie die entsprechende Infrastruktur Die Umlage ist derzeit auf einen Betrag von maximal 750 Millionen Euro pro Jahr begrenzt Davon können 150 Millionen Euro pro Jahr auf die Unterstützung von Netzen und Speichern entfallen. Im Jahr 2015 betragen die Kosten der Umlage rund 630 Millionen Euro. Nicht privilegierte Endkunden zahlen in diesem Jahr rund 0.25 Cent ie Kilowattstunde auf ihren jeweiligen Stromverbrauch zur Finanzierung der Förderung des KWKG. Für Endkunden mit hohem Verbrauch reduziert sich die Umlage auf maximal 0.05 Cent ie Kilowattstunde für den Stromverbrauch, der 100 000 kWh übersteigt. Für Endkunden mit hohem Verbrauch im produzierenden Glewerbe reduziert sich die Umlage auf maximal 0.025 Cent ie Kilowattstunde für den Stromwerbrauch, der 100 000 kWh übersteigt. Die im Jahr 2014 vom Bundeswirtschaftsministerium durchgeführte Analyse von Kosten, Nutzen und Potenzialen von KWK sowie die Zwischenüberprüfung des KWKG haben ergeben.



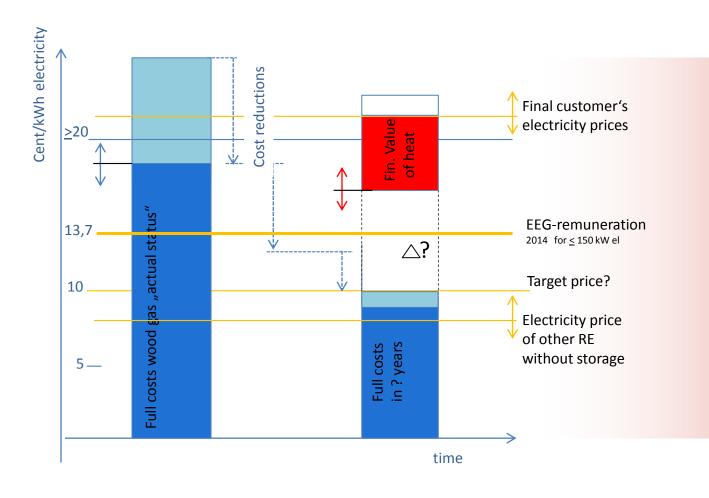
Feed-In law (EEG) 2014

Amendment of German CHP-law

Main features of a new German energy law



An economic display of changed framework conditions

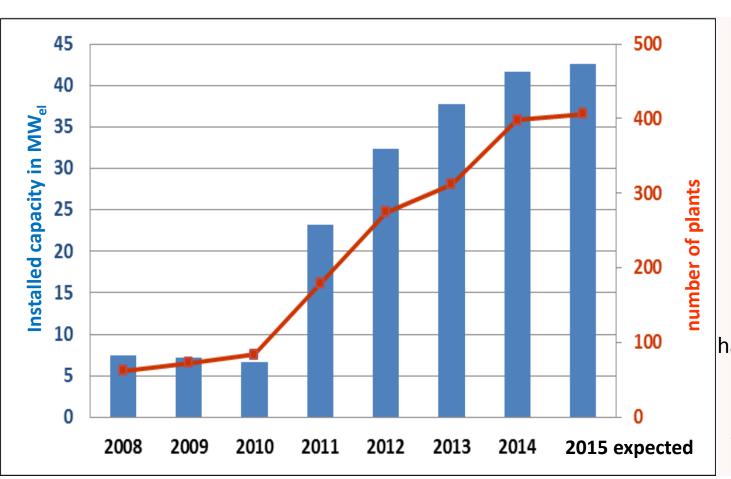


Rapid cost reductions based on process engineering or production engineering are actually not at hand.

This way applications remain dependent on frame work conditions and (tailored) adaptations to the specific site constraints.



Changed frame work conditions show ...



.... stagnation, which can be seen trough the development line in Germany after 1.8.2014.

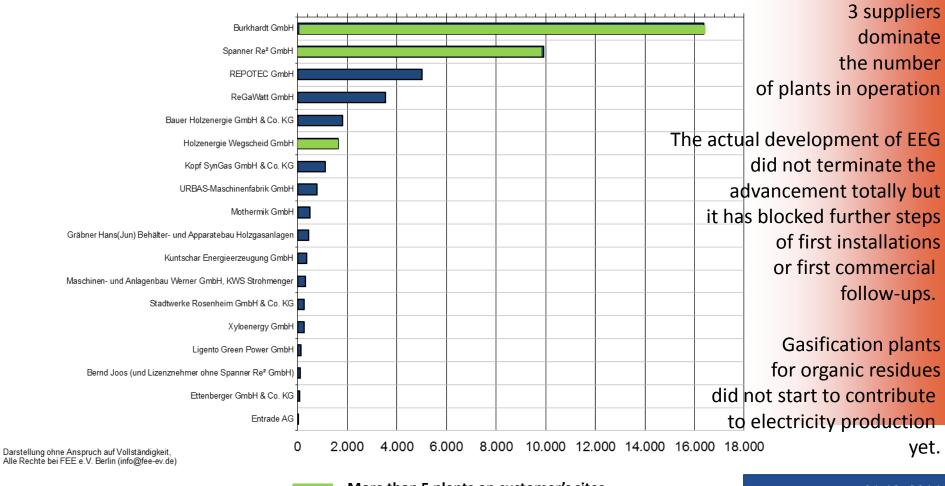
On the basis of EEG 2014 up to now no new plants have been handed over to German customers.

App. 20 plants started operation only on other conditions.



Expressed differently.....

total electric power installed from CHP units based on biomass gasification in Germany as kW

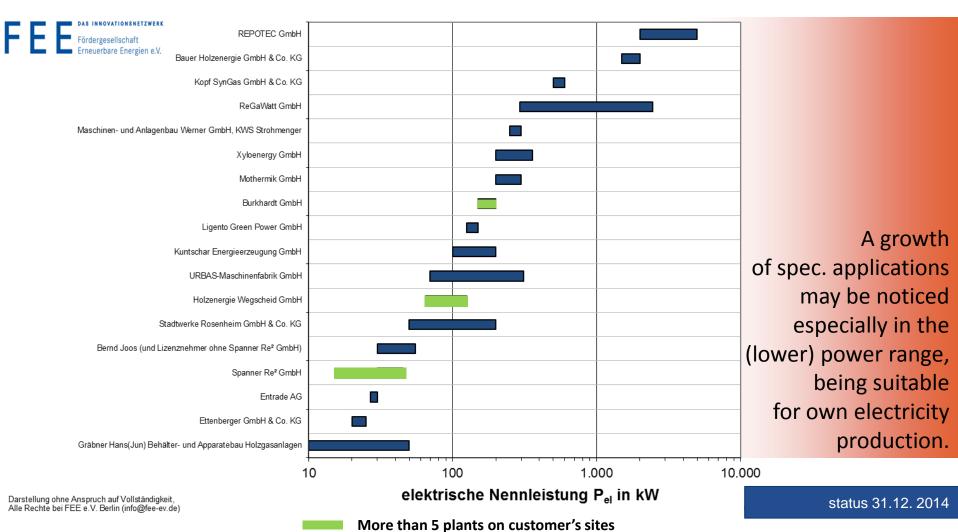


More than 5 plants on customer's sites

status 31.12. 2014



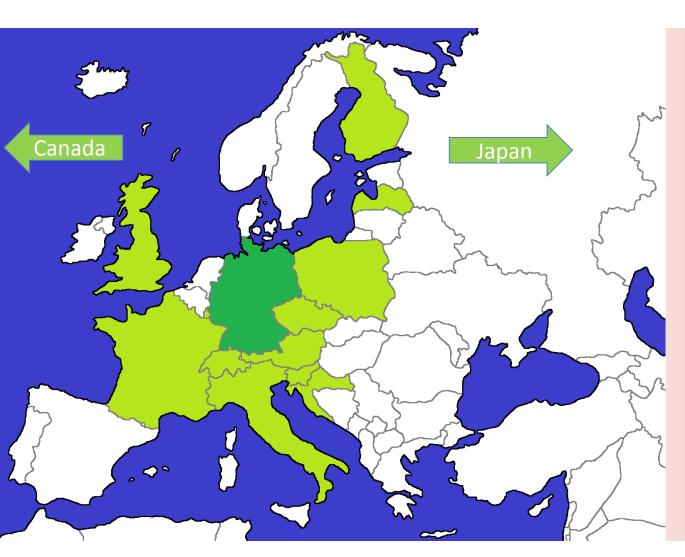
Spread of suppliers in Germany which characterizes the operation of wood gasification CHP plants



At least one prototype with more than 5.000 running hours



First reactions of manufacturers: Export, Export, Export,



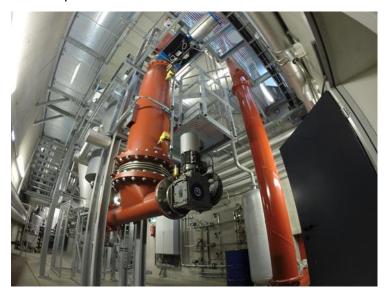
Three German producers so far have exported app. 300 plants out of a total of app. 650 plants.



Side reaction: competition.....has been kindled, among each other and with other countries



Source: producer



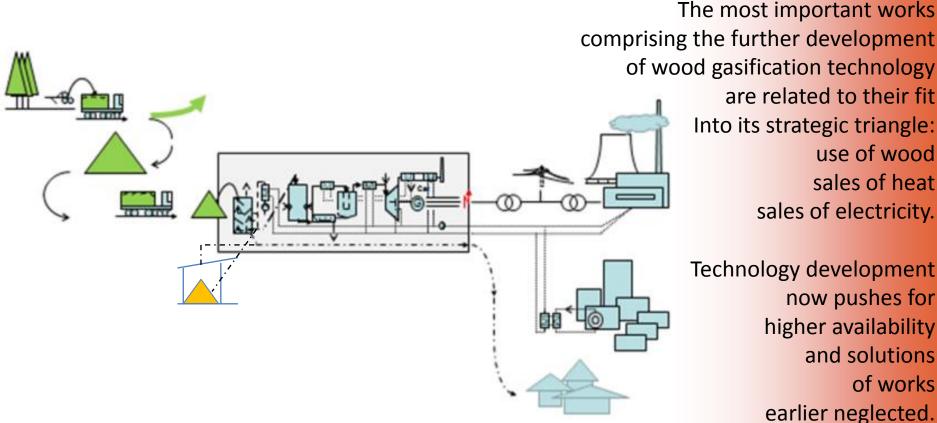
The Finish manufacturer Volter Ltd,
Offers complete solid bed wood gasification plants
at an electric power of 40 kWel
supporting 100 kW heated water and 20 kW hot air
Based on wood chips (water content <18%
and particle size 30-50 mm.

Austrian manufacturers supply well proved plants as well. As one example SynCraft Engineering GmbH should be mentioned, which offers a technology based on a floating bed transforming complex wood mixtures (water content<15% and size 30-50 mm) to an electric power of 180-324 kWel and thermal capacity of 350-625 kWth.

Source: producer



It is crucial that the technology brings even more to bear its own specific advantages



comprising the further development of wood gasification technology are related to their fit Into its strategic triangle: use of wood sales of heat sales of electricity.

> Technology development now pushes for higher availability and solutions of works earlier neglected.



Example for increase in reliability and efficiency





Technical data:
electric power
165 and 180 kW
thermal power
260 and 270 kW
consumption of pellets
110 kg/h
plant efficiency
el. 30%

Source: producer

11

Updraft co-current gas production combined with fluidized bed, and wood gas -CHP, no available together with shown Otto-engine = ECO 165 HG



Example for increase in reliability and efficiency





Technical data:
electric power
165 and 180 kW
thermal power
260 and 270 kW
consumption of pellets
110 kg/h
plant efficiency
el. 30%

Source: producer

12

Updraft co-current gas production combined with fluidized bed, and wood gas -CHP, no available together with shown Otto-engine = ECO 165 HG



Example for adaptation according to customers demand for on site power production and full use of heat



Spanner Reg

Technical data:
electric power
now:
from 9 to 45 kW,
thermal capacity
from 25 to 108 kW
Consumption
of wood chips
from 10 to 45 kg/h
plant efficiency
el. 23-25%

Source: producer

Gasification unit using down draft co-current flow and dry gas cleaning New development of displayed 9 kW-plant is based on know-how from 400 plants

Status III/2015: 475 plants on customer's sites, out of that 232 abroad.



Example for adaptation according to customers demand for on site power production and full use of heat



Spanner Reg

Technical data:
electric power
now:
from 9 to 45 kW,
thermal capacity
from 25 to 108 kW
Consumption
of wood chips
from 10 to 45 kg/h
plant efficiency
el. 23-25%

Source: producer

Gasification units using down draft co-current flow and dry gas cleaning New development of displayed 9 kW-plant is based on know-how from 400 plants

Status III/2015: 475 plants on customer's sites, out of that 232 abroad.



Example for building up a product spectrum......





Technical data: electric power 65, 125,140 kW

thermal capacities 110, 230, 260 kW

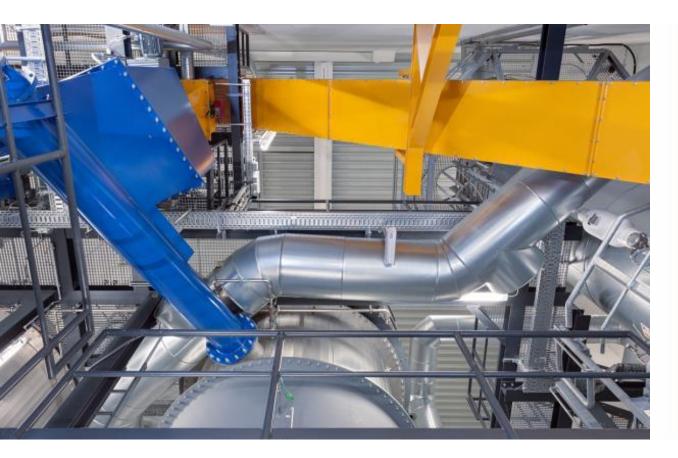
Gasification unit based on down draft solid bed reactor co-current flow and hot gas cleaning

Source: producer

Status III/2015: 42 Modules on customer's sites, out of that 22 abroad



Example for a shift to more complicated fuels





Biomass-Kombi-Power-System®

technical data:
electric power
2.450 kW
Thermal capacity
4.300 kW
electric efficiency
30 %

Source: producer

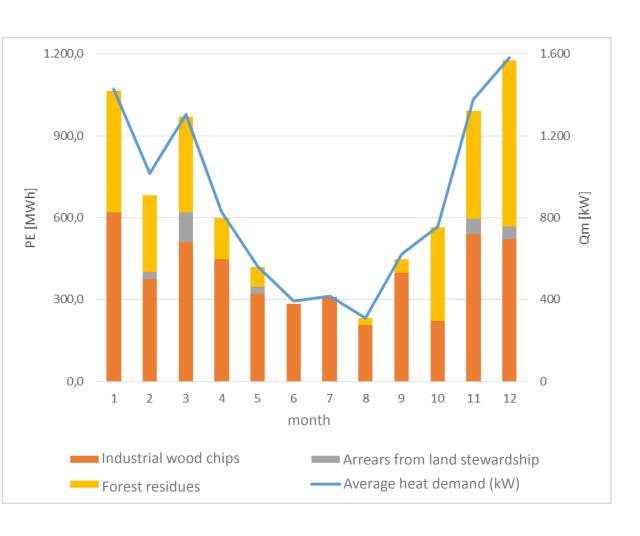
Gasification based on down draft solid bed counter-current flow added by a combustion chamber and optional electricity production alternatives (hot gas turbine) under construction:

Counter current gasification, flue gas cleaning and gas motors

Status III/2015: gasification units 4x on customers sites, gas exploitation site specific



Example for the opportunity to establish CHP units on the occasion of heating plants improvement



No chance without calculation, Without calculation, no chance!



A necessity: exploitation or shipment of solid residues has to be mastered correctly



A "black chapter" Is being transformed to a grey one.

recollection to potassium as recyclable should be considered

Latest developments in German biomass gasification plants





German Working group on gasification of biomass run by FEE e.V. needs to be adapted as well.

It keeps contact to those engaged in amending and developing obligations and acts on energy and related fields like air cleaning.

It follows new electricity market design developments and the new tender processes (EEG16).

> It is engaged in more efficient Cooperation on R&D.

Simply, we are there... when gasification of biomass is on the agenda.





Please check carefully repeatedly the conditions for CHP units based on gases generated from biomass/wood.

Please check repeatedly offers and references and talk to users, visit sites with running plants.

Please calculate repeatedly, first on micro economic basis than on macro (=regional) economic basis

Thanks to all who supported the preparation of this presentation.

Thank you for your attention!

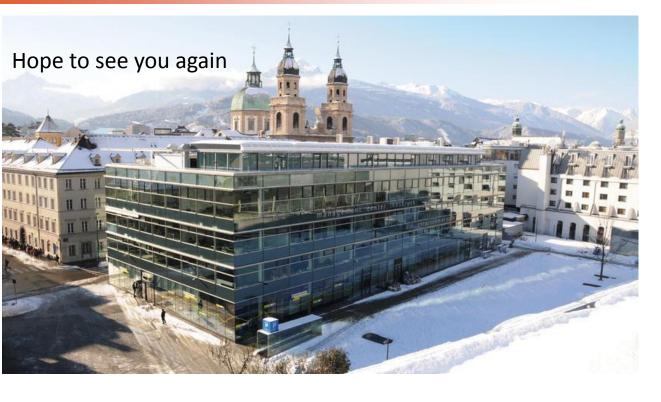
More Information on:

Society for the promotion of Renewable Energies e.V. info@fee-ev.de
www.fee-ev.de









December 2nd, 2015
8. International Appliers Conference Biomass Gasification Innsbruck , Austria

A common event of "IEA Task 33" (part of IEA Bionenergy), Management Center Innsbruck (MCI) and FEE e.V.