

One step ahead

Bio-energy grid compensation power plants
Natural gas cogeneration engines with turbines





AGO is Latin and means „I move“, „I bring forward“ and „I operate“. These are exactly the features that we offer. We are developing and implementing projects and support you in all aspects concerning energy and medium supply.

Turnover 2009: 50.3 million EUR (IFRS)

Employees 2009: 164 within the Group

2006 Change of name and legal form: AGO AG Energie + Anlagen

2007 AGO's initial public offering at the Frankfurt Stock Exchange

2010 30 year company anniversary

▶ **heatengineering**

▶ **refrigerationengineering**

▶ **powersupply**

▶ **service**

▶ **consulting**

heat plant engineering	biomass cogeneration plants	combined heat and power plants
contracting	operation	ECo-Plus* climate protection program
refrigeration plant engineering	process refrigeration	trigeneration
congelato - make cold out of waste heat	solar process heat	contracting
combined heat and power plants	biomass cogeneration plants	trigeneration
waste to energy	solar process heat	contracting
operation	contracting	service
raw material management	emissions trading	ECo-Plus* climate protection program
heat plant engineering	refrigeration plant engineering	trigeneration
location survey	energy efficiency consulting	emissions trading



„Aims and attributes“ → coordinated EU energy strategy required

1. Affordable energy prices

- Increasing energy prices for primary energy on the long run
- Competition and liberalization

2. Secure supply

- Worldwide increasing demand for energy
- Fossil resources run short

3. Protection of climate and environment

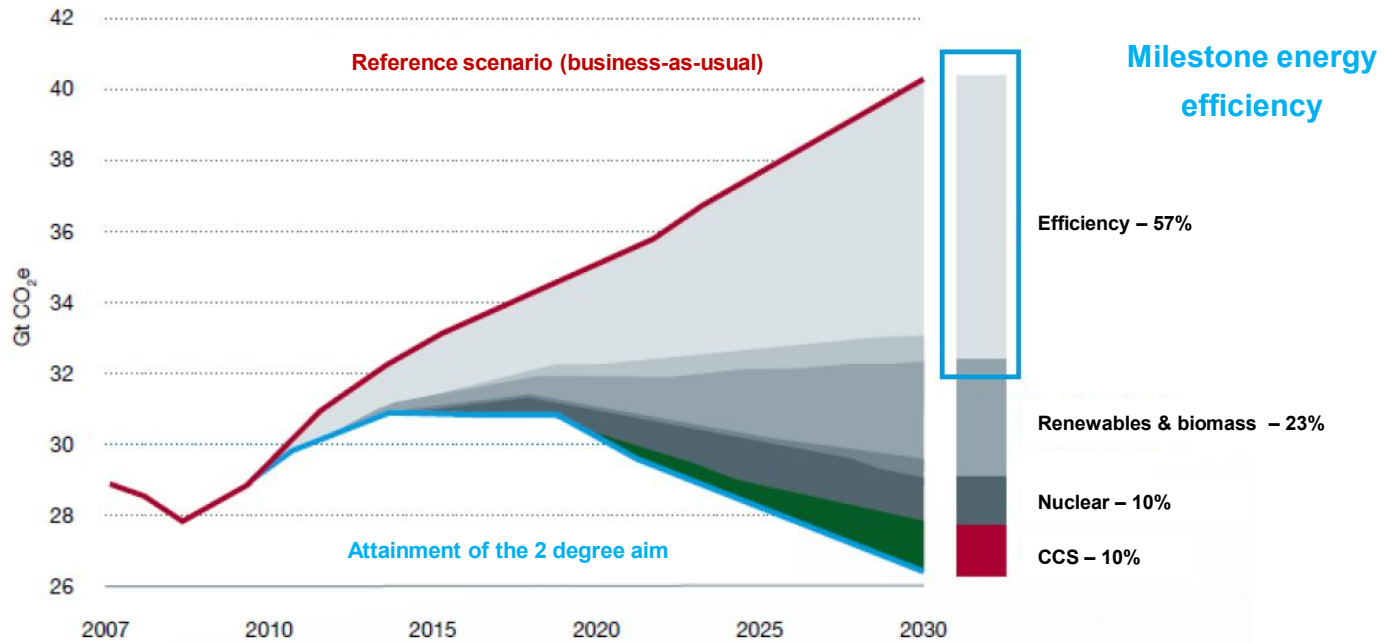
- Development / preservation of CO₂-free energy sources
- Save energy (energy efficiency)

EU energy and climate package (2008): 20/20/20 objectives

- ▶ Reduction of greenhouse gases by 20 % as opposed to 1990 [or 30 % if post-Kyoto agreement with ambitious objectives for other industrial countries comes about]
- ▶ Increase of energy efficiency by 20 % as opposed to 1990
- ▶ Increase of the share of renewable energies to 20 % of the EU's energy consumption



Global aim



Source: World Energy Outlook



Voting – question to the auditorium

✓ Do you think we are at the moment globally on the right way to reach the 2°C aim?

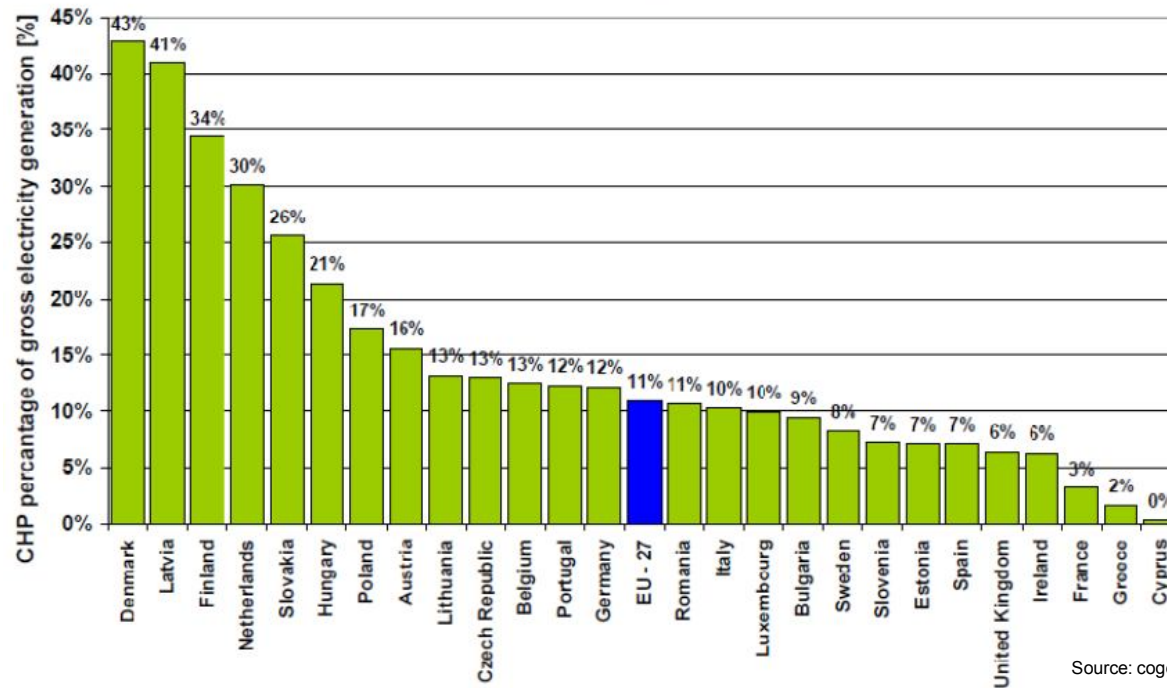
1 – yes

2 – no



Electricity generated by cogeneration in 2007

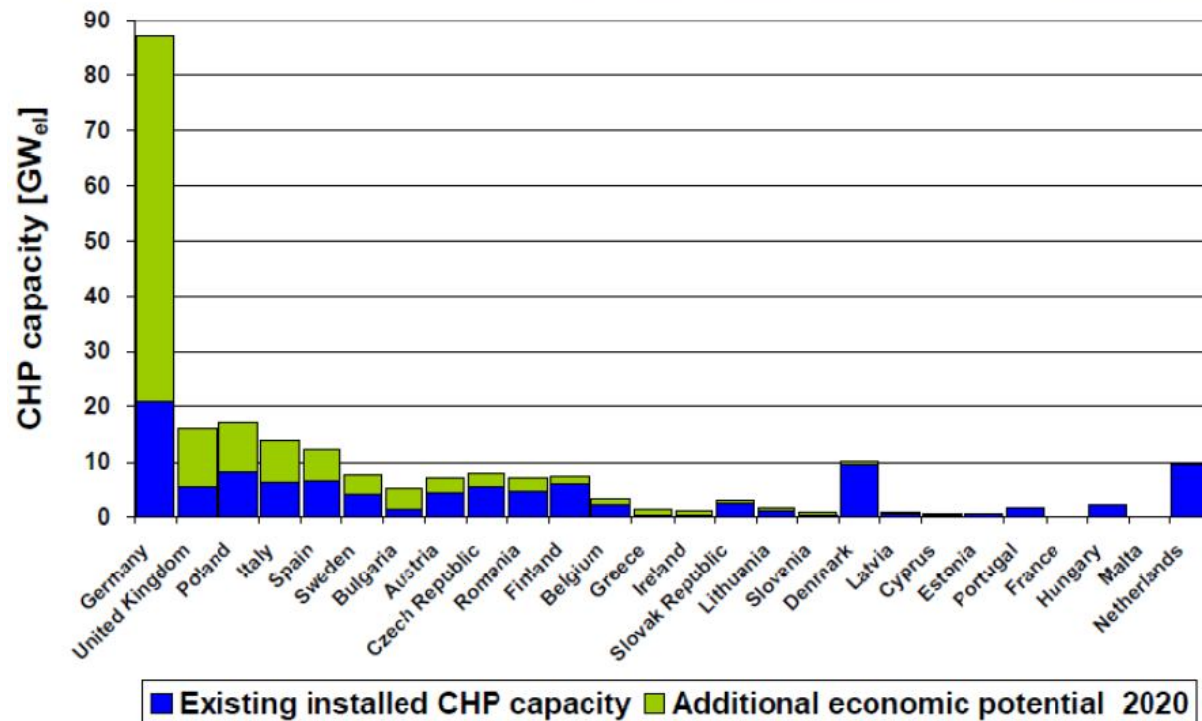
- Total installed CHP electrical capacity: 97,7 GW_{el}
- Total CHP electricity production: 364,4 TWh_{el}
- Total CHP heat production: 845,1 TWh_h



Source: cogeneurope



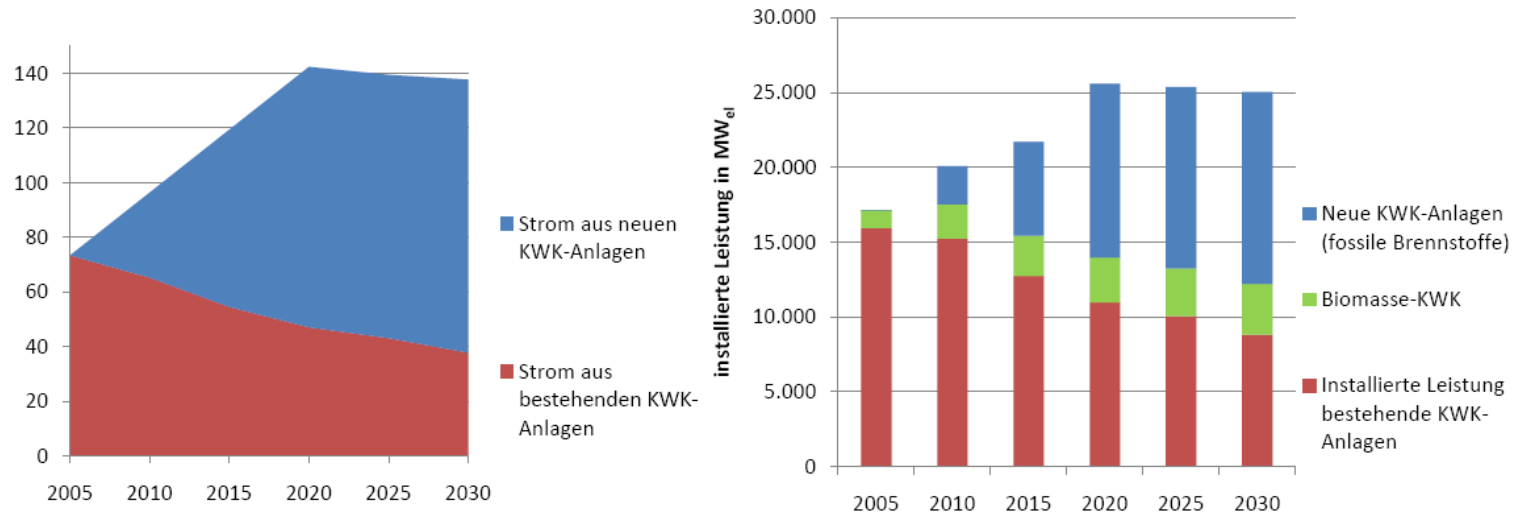
European economic potential for cogeneration in 2020



Source: cogeneurope



German potential for cogeneration



Development of electricity production and installed capacity from CHP according to the 25%-aim within the scenario "Energieprogramm Bundesregierung"













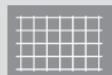
Source: BMU



CHP in the context of the German CHP-law (feed-in-tariff-system)

- Coal
- Waste
- Waste heat
- Biomass
- Gaseous or fluid fuels



Combustion engine			Generator
Gas turbine			Generator
Steam turbine			Generator
Steam engine			Generator
Stirling engine			Generator
ORC turbine			Generator
Fuel cell			



CHP Plant Serres, Greece

Employer / Owner

Thermie Serres S.A.

Scope of Delivery

Engineering, construction and commissioning

Technical Data

Electrical power : 4 x 4,006 kW at 11 kV

Thermal output: 4 x 4,239 kW

Fuel capacity: 4 x 9,566 kW





CHP Plant Serres, Greece

Implementation Period

May 2007 to January 2008

Contract Value

9.4 million Euro

Characteristics / Description

The new combined heat and power plant supplies the city of Serres with its 100,000 residents with power and hot water. The building and boiler plant, currently with 75 MW (final stage approx. 115 MW), were erected by a Greek company. The complete gas engine plant with Deutz engines, incl. the entire electrical engineering, medium voltage system, SCADA system were done by AGO.





Energy Center EVC II, Dresden

Employer / Owner

Zweites Energieversorgungscenter Dresden Stage I + Stage II

Scope of Delivery

Preliminary design, implementation design, detailed design, supply, installation, commissioning, performance tests, test run and documentation of the energy center in Dresden.

Contract Value

25.2 million €

Characteristics / Description

Hot water heating system heated by cogeneration units which are operated by natural gas and heat exchangers which are heated by saturated steam of 10 bar from gas engines and steam boilers for the supply of AMD's FAB 36 in Dresden.





Energy Center EVC II, Dresden

Technical Data

9 x gas engines with 2,560 kW each $\Sigma = 23,040$ kW hot water

3 x heat exchangers with 5,000 kW each $\Sigma = 15,000$ kW hot water

5 x turbo chillers with 5,900 kW each $\Sigma = 29,500$ kW

3 x double effect absorption chillers
with 5,800 kW each $\Sigma = 17,400$ kW

2 x single effect absorption chillers
with 3,200 kW each $\Sigma = 6,400$ kW

Heat recovery from cooling water with 24,000 kW

14 x cooling towers with 6,500 kW each $\Sigma = 91,000$ kW

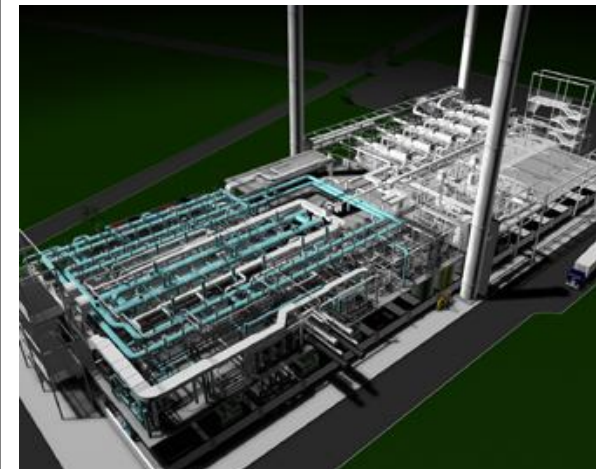




Energy Center EVC II, Dresden

Design and construction period:

Preliminary design	Nov. 2003 – Dec. 2003
Implementation design	March – June 2004
Start of construction	1 st August 2004
Installation	Aug. 2004 – Jan. 2005
Commissioning	Jan. / Feb. 2005
Test run	Feb. / March / Apr. 2005
Hand over	1 st April 2005
Documentation	July 2005





Voting – question to the auditorium

✓ What are your mainly needed energy media ?

1 – electricity

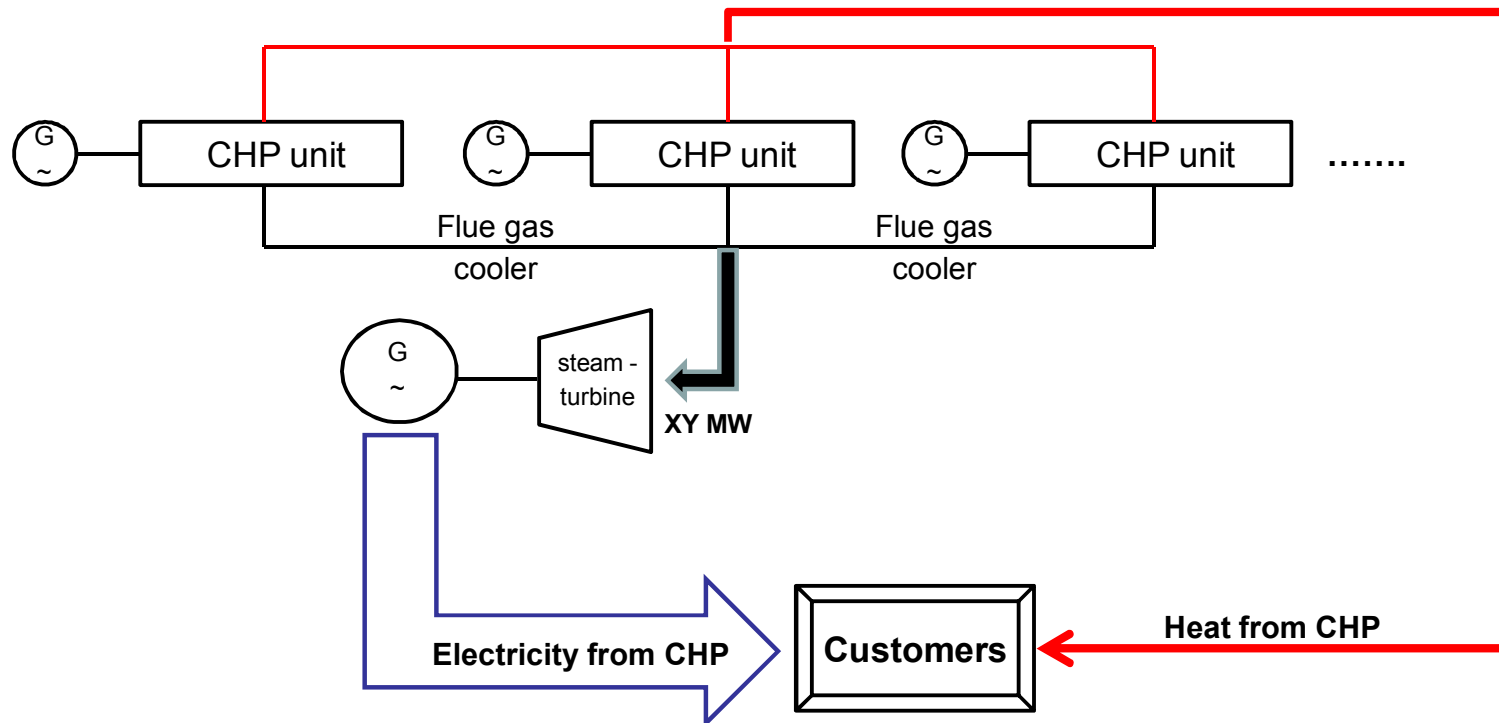
2 – process heat (steam, hot water)

3 – warm water (heating)

4 – cold



CHP as base load system



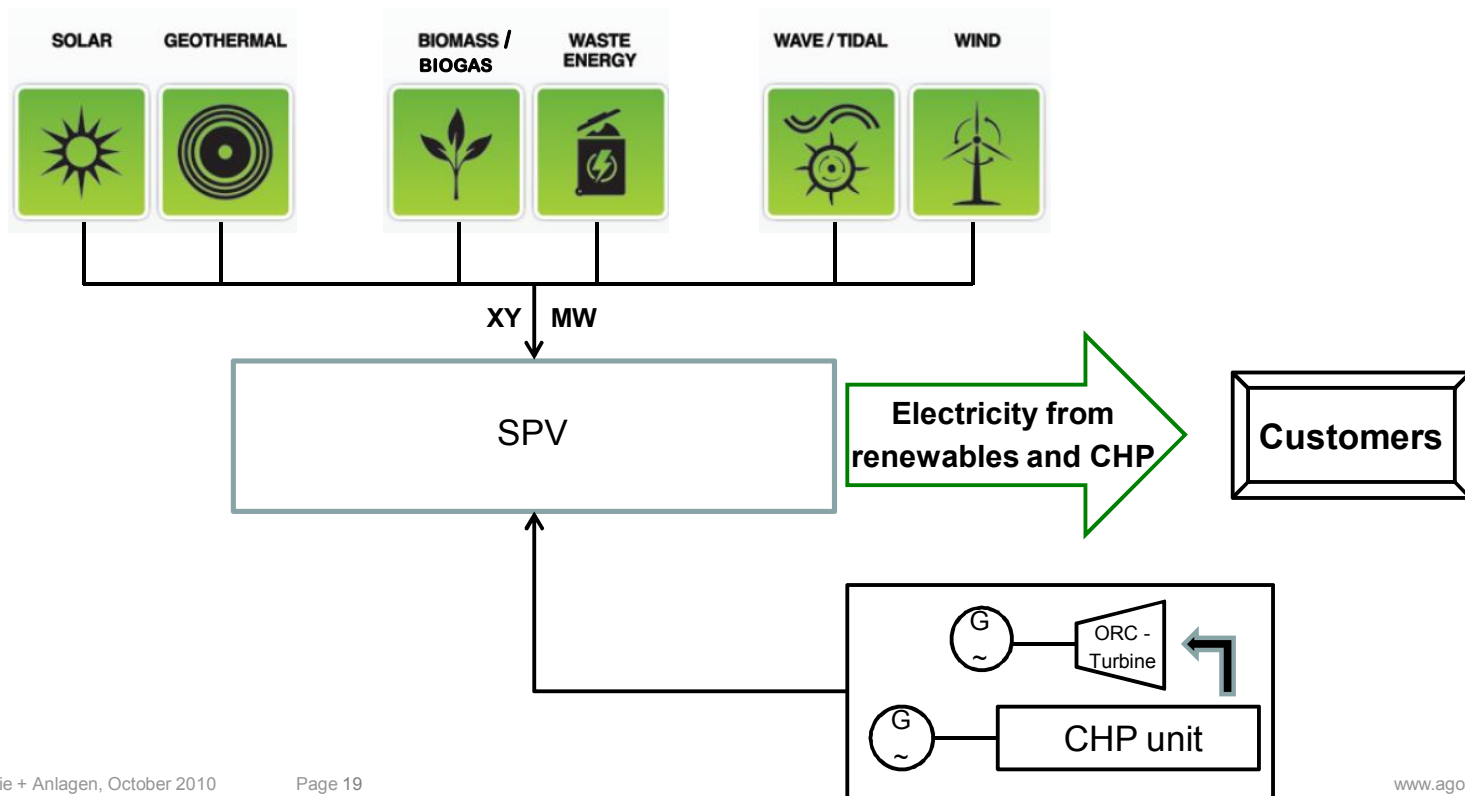


Concept features

- ✓ Cogeneration of electricity and heat → max. efficiency factor [overall efficiency > 80%]
- ✓ Realization of higher electrical power output performance
- ✓ Base load concept with option of load diversification in a certain range
- ✓ Use of CHP waste heat by means of downstream steam turbine
 - Heat source:
 - Flue gas cooler CHP (gas engines)
 - Heat sinks:
 - Turbine
 - Heat exchanger condensate
 - Remote heat exchanger
 - Emergency cooler



Energy from regional renewable sources



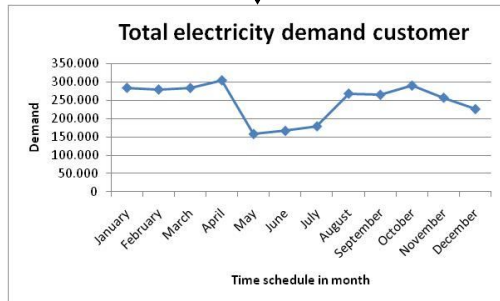
Supplement energy via cogeneration engines + ORC



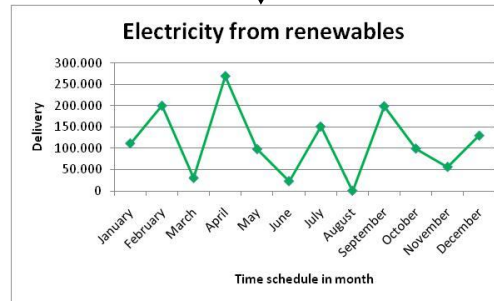
Control system



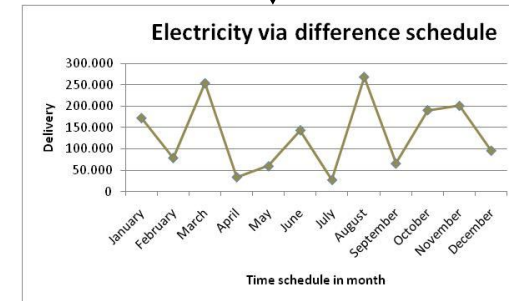
Primary control unit



Customer's schedule



Bio-electricity schedule



Difference schedule



Concept features

- ✓ Direct marketing of „bio-electricity“
- ✓ Supplement energy as a compensation for volatile renewable energies
- ✓ Supplement energy as the difference between the generation of bio-electricity and the customer's operating schedule
- ✓ Difference schedule as a control variable for CHP modules (via central control technology)
- ✓ Use of CHP waste heat by means of downstream organic rankine cycle
 - Heat source:
 - Flue gas cooler CHP (gas engines)
 - Heat sinks:
 - ORC module (evaporator)
 - Heat exchanger condensate
 - Remote heat exchanger
 - Emergency cooler



General Conclusion

- ✓ Diversification of the energy mix
- ✓ Useful combination of alternative energy supply systems
- ✓ Increase of energy efficiency
- ✓ Increase of the share of renewable energies as well as the share of cogeneration
- ✓ Reduction of CO₂ emissions
- ✓ Efficient use of waste heat
- ✓ Varying energy concept
- ✓ Cogeneration of electricity and heat
- ✓ Load diversification in a certain range



Voting – question to the auditorium

- ✓ Do you think a combined heat and power generation could optimize your specific energy supply system ?

1 – yes

2 – no

3 – not relevant for us



One step ahead

Long-term reliability – implementation in due time

„It is important that everything works reliably.“ We often hear this sentence from our customers and have understood what is primarily asked from us: facilities and solutions lasting for years and decades which we expect them to.

Airbus	Nestle
AMD	Opel
Audi	Quiagen
August Storck	Quelle
AXA	Raumedic
Avacon	R.Bosch
Deutsche Bahn	Real
Deutsche Cell	SAP
E.ON	Saturn
Getrag	Semikron
HUK Coburg	T-Mobile
IBM	Toyota
Kapp	Varta
Mainfrucht	Wacker
Megalith	Wiesauplast
Meßmer	ZF Sachs
Metro	Zott