

Technology Fact Sheet – Cogeneration/CHP

provided by Berlin Energy Agency

Step by step to implement a feasibility study

1. Analysing Status Quo

Which energy carriers are currently in use for heating/warm water? How much is the total energy consumption?

- Heating: in m³ natural gas; in l heating oil; district heating in kWh, other carriers
- Electricity in kWh

How is the consumption profile during a whole year?

What is the thermal output in kW in total?

What is the age of the existing heating facility?

What are the relevant energy prices (fuel and electricity)?

Which type of boiler is currently in use?

Is the heating demand more specifiable?

- Room heating in kWh
- Energy consumption for warm water in kWh
- Energy consumption for cooling devices
- Process heating

How is the generation of warm water implemented?

- Centralised
- Decentralised
- Use of solarthermal facilities

Are there any incentives available?

2. Technical Assessment

- Access electricity (voltage level)
- Access natural gas (high pressure, medium pressure)
- Space for the CHP plant
- Noise insulation etc.

3. Further assumptions

- Development of relevant energy prices in the next 10 years

4. Economical calculation

- Calculation of total costs
 - Investments
 - Fuel
 - Operation
 - Others
 - Financing
- Calculation of total revenues
 - Heating revenues
 - Electricity revenues (incl. incentives if available; e.g.
- Profit and loss statement

5. Recommendation

Overview key figures of selected CHP plants

CHP facility - electrical capacity producer construction type fuel		50 kW 2G CE Natural Gas	50 kW Equad MGT Natural Gas	140 kW 2G CE Natural Gas	450 kW 2G CE Natural Gas	450 kW 2G CE Natural Gas	600 kW Equad GT Natural Gas	2000 kW 2G CE Natural Gas	5700 kW Turbomach GT Natural Gas	7800 kW Turbomach GT Natural Gas
Life of installation in years		10	10	10	10	10	10	10	15	15
electrical capacity	kW(el)	48	50	140	450	450	600	2.000	5.670	7.819
electrical efficiency		32,5%	26,0%	36,4%	41,0%	41,0%	33,0%	43,6%	31,5%	32,2%
thermal capacity	kW(th)	97	110	207	481	481	858	1.987	9.538	12.748
thermal efficiency		65,7%	57,2%	53,8%	43,8%	43,8%	47,2%	43,3%	53,0%	52,5%
Specific investment costs	EUR/kW(el)	3.038,98	3.356,10	2.033,04	1.443,32	1.382,58	1.710,68	858,88	1.034,09	1.214,99
Total investment costs	EUR	145.871	167.805	284.625	649.495	622.160	1.026.410	1.717.760	5.863.300	9.500.000
Generation unit	EUR	70.000	79.500	130.000	300.000	300.000	583.500	905.000	3.700.000	5.100.000
Construction costs	EUR	11.500	11.500	20.750	43.000	43.000	43.000	83.000	390.000	1.350.000
Infrastructur for gas supply	EUR	4.000	13.600	10.250	36.000	20.000	62.000	37.000	350.000	650.000
Infrastructur for electricity	EUR	24.310	25.150	68.950	150.150	141.300	183.300	430.300	200.300	400.000
Expert opinions, licenses, fees	EUR	2.500	2.500	3.500	28.000	28.000	28.000	30.000	65.000	75.000
Delivery, construction, installation, starting up	EUR	2.500	2.500	5.000	8.000	8.000	8.000	16.000	50.000	100.000
Planning	EUR	13.261	15.255	25.875	59.045	56.560	93.310	156.160	808.000	925.000
other expenses	EUR	17.800	17.800	20.300	25.300	25.300	25.300	60.300	300.000	900.000
Operation management	h/a	30	30	50	75	75	75	125	320	320
Service and maintenance of CHP unit	Cent/kWh(el)	2,50	2,00	1,75	1,25	1,25	1,00	0,75	0,58	0,58
Service and maintenance of peripheral devices	% Invest	2,00%	2,00%	2,00%	2,00%	2,00%	2,00%	2,00%	0,80%	0,80%

Explanations: CE - combustion engine ; MGT - micro gas turbine ; GT - gas turbine