

Climate-neutral cooling with water



Data and facts

Reference customers:	Siemens, British Telecom, German Aerospace Center (DLR), Gardena, Sparkassen-IT and others
Investors:	MIG Fonds Santo Venture Capital GmbH (both founding investors of Biontech)
Sponsored by:	German Federal Environmental Foundation (DBU), Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology (StMWIVT)
Product:	Cooling & heating with water
Foundation:	2006
Employees:	87

About Efficient Energy

Efficient Energy is the world's only supplier of a patented, mass-produced refrigeration system that enables climate neutral cooling. Instead of the usual toxic and climate-damaging F-gases, the eChiller works with conventional tap water as a refrigerant. It consumes only up to one fifth of the electricity needed by conventional units. Currently, more than 90 percent of all refrigeration machines worldwide are still operated with F-gases as refrigerants. By 2030, however, increasingly strict regulations worldwide will mean that around four fifths of F-gases used today will have to disappear from the EU market.

The refrigeration industry's influence on man-made climate change is currently around twice as great as that of global air traffic. The industry is thus facing an at least as profound upheaval as the automotive industry is currently undergoing. Efficient Energy wants to help ensure that - unlike in many other areas of climate protection - the global demand for cooling can be converted into a climate neutral technology without sacrificing or losing quality of life. Meanwhile, eChillers are available in a wide range of performance classes, cooling data centers, industrial plants and buildings.

Management team



Dr.-Ing. Daniel Porzig
Head of R&D



Georg Dietrich
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Water as a refrigerant

Cooling with water sounds simple - but in fact, the eChiller from Efficient Energy is complex engineering "Made in Germany": In order for water to be used for refrigeration and transport at room temperature, it must be evaporated at this ambient temperature. This requires a vacuum, which only played a role in space technology for a long time. Efficient Energy has succeeded in building a system that generates such a vacuum in a much smaller space than most experts would have thought possible 15 years ago.

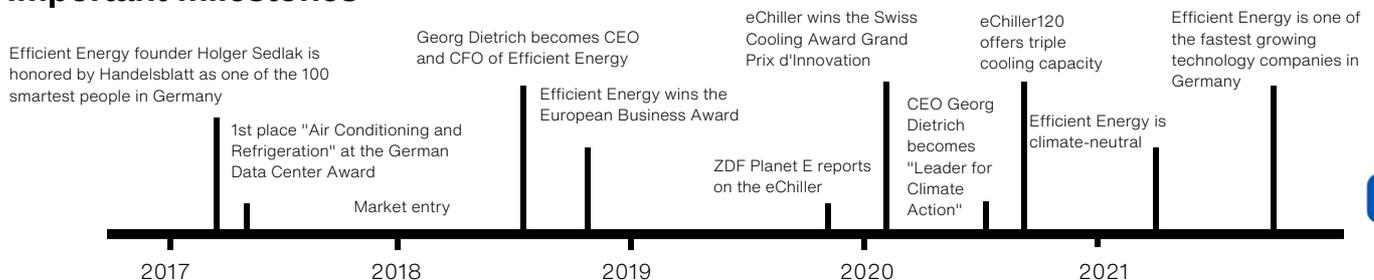
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Important milestones



Frequently asked questions

Why was water not used as a refrigerant for so long?

Everyone knows about cooling with water, for example from the crate of beer cooled in the river. At Efficient Energy, water is used for refrigeration machines that work with compression refrigeration just like the refrigerator at home. For a long time, the problem was the size. Initially, a refrigeration system needed about nine square meters of space. Efficient Energy has managed to shrink the technology to the size of a laptop. Today, we are the only company in the world that can offer chillers using water as a refrigerant on an industrial scale - an innovation protected by around 200 patents. In the meantime, large established customers such as Siemens, British Telecom, DLR, Sparkassen-IT and well-known German car manufacturers including their suppliers are using the technology.

What are the advantages and disadvantages of water compared to other refrigerants?

Water is climate-neutral, cost-effective, highly available, non-explosive, non-toxic, non-flammable and poses no threat to the ozone layer or to groundwater. It is extremely efficient: our chillers require up to 80 percent less electricity than comparable machines using conventional refrigerants and are therefore also particularly cost-effective to operate. Regulations on F-gases and fire protection do not play a role for water, so no certified maintenance is required for chillers with water. In all countries of the European Union, there are also local subsidy programs for the purchase. Unlike F-gases, water is restricted to an ambient temperature above freezing point. The systems are somewhat more expensive than chillers using F-gases - but due to high electricity prices, the amortization is accelerating.

Doesn't cooling with water increase water consumption?

No, the tap water in our chillers is used in a closed circuit. No water is consumed.

Further information:

- [Website Efficient Energy](#)
- [Cool Insights Blog](#)
- [LinkedIn](#)
- [VDI report on Efficient Energy](#)
- [ZDF planet e. report on Efficient Energy](#)



How big is the impact of refrigeration on global climate warming?

Around 17 percent of global electricity consumption is used for refrigeration. At around 7 percent, the industry's climate-damaging contribution is about twice as much as that of global air traffic. Simply replacing the very climate-damaging F-gases (Kigali Amendment) with less harmful refrigerants would already lead to a reduction of the expected global warming by 0.1 to 0.3 degrees Celsius. Since water as a refrigerant is completely climate-neutral, the impact in this case is therefore even greater. Indirect emissions from the high electricity consumption are not taken into account either. With a global switch to water as a refrigerant, we assume that this alone could reduce man-made global warming by 0.5 degrees Celsius.

What's the problem with F-gases?

The best-known F-gas is CFC, which was banned in the 1980s because it damages the ozone layer. At that time, CFCs were mostly replaced by HFC gases, some of which are still in use today. Although HFC gases no longer damage the ozone layer, they are up to 24,000 times more harmful to the climate than CO₂. Although they are used in a theoretically closed refrigeration cycle, a significant proportion of the gases escape into the atmosphere during the life cycle of such a system. Because of the climatic hazards posed by F-gases, plants that use them as refrigerants are subject to strict regulations during maintenance and operation. To address this issue, the refrigeration industry has begun replacing HFC gases with HFO (hydrofluoroolefins). HFOs are F-gases that are less harmful to the climate than HFC gases, but merely shift the problem. Their degradation product TFA permanently contaminates water bodies. In addition to the direct effect of F-gases on global warming, the power consumption of chillers is also a problem.

What can be expected in terms of regulation in the coming years? What does this mean for water as a refrigerant?

The current F-gas regulation of the European Union provides for a so-called phase-down plan for the climate-damaging gases by 2030. By then, only 20 percent of the F-gases used today may be sold. This means that only one in five refrigeration systems operated with F-gases could still be used. Numerous other industrialized countries, such as the USA, are also planning much stricter regulation of F-gases.

