CARNOT BATTERIES

for security of supply and increased flexibility

AALBORG CSP
- Changing Energy

CARNOT BATTERIES
for utilization of excess electricity

One of the greatest barriers to the green energy transition is storing surplus power generation from renewables such as solar and wind. The growth of fluctuating renewable energy sources requires flexible, low-cost and efficient electrical storage such as Carnot Batteries to create balance between supply and demand as well as security of supply.

By integrating Carnot Batteries in their existing infrastructure, combined heat and power (CHP) plants and coal-fired power plants are able to reduce or eliminate the use of fossil fuels from their production. Likewise, integration across energy sectors is strengthened and the system flexibility is increased.

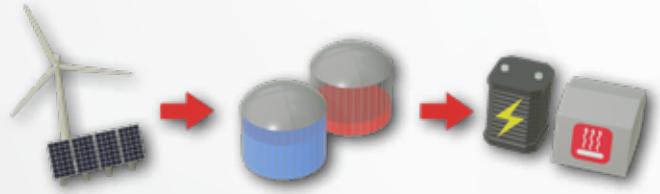
Since 1988, Aalborg CSP has utilized its immense expertise within design and delivery of renewable energy technologies, integrated energy systems and energy storage.

Our deep understanding of individual energy needs as well as technology- and system integration combined with year-long experience in integrating and combining solutions and technologies allows us to offer tailored Carnot Battery solutions.

CARNOT BATTERY BENEFITS

- ✓ Utilization of excess wind- and solar power
- ✓ Cost-efficient energy storage
- ✓ Security of supply
- ✓ Balance between supply and demand
- ✓ Increased flexibility
- ✓ Supports electrification

OPTIMUM ENERGY UTILIZATION
with high-temperature storage



Excess power converted to thermal heat | Thermal energy storage | Thermal heat converted to power and district heating

A Carnot Battery transforms electricity into thermal energy. During the charging process, excess electricity from PV panels and wind turbines is converted into heat and stored in molten salt tanks. The salt has a temperature of up to 565 °C.

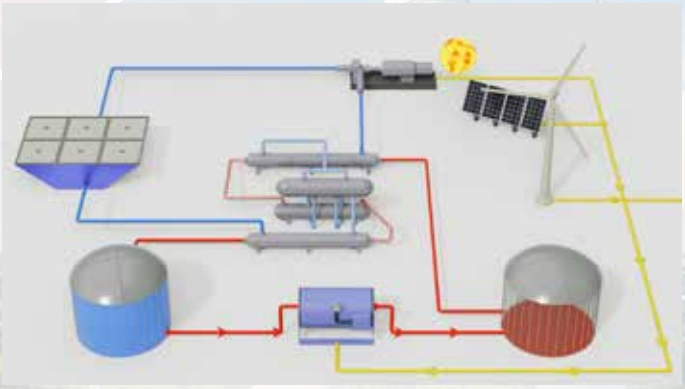
During the discharging process, the stored heat is converted back into electricity through a thermodynamic cycle. A Carnot Battery helps balance the electricity grid, while the energy utilization is likewise optimized significantly. Moreover, security of supply during peak load periods is created. The waste heat from this process can subsequently be used for district heating.

GREEN ENERGY PRODUCTION
strenghtens security of supply

Did you know that combined heat and power (CHP) plants can be converted into green power plants by replacing fossil fuels such as gas and coal with a Carnot Battery consisting of two molten salt tanks?

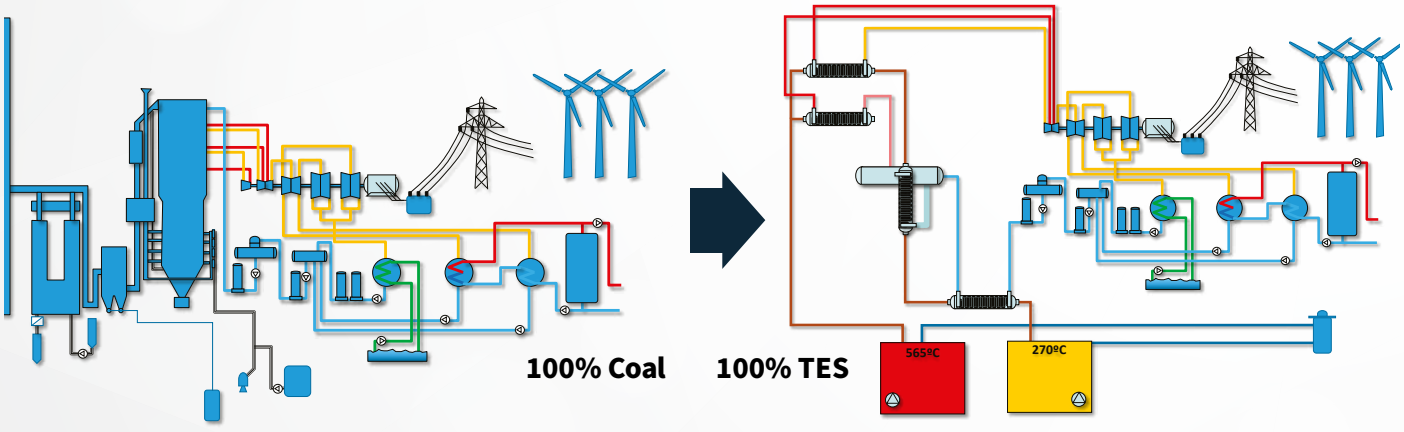
By integrating molten salt tanks in the existing infrastructure, CHP plants relying on gas, coal or biomass for heat production can reduce or completely eliminate fossil fuels from their production. Depending on individual energy requirements, a molten salt Carnot battery can act as supplement to an existing energy source in order to reduce fossil-fuel consumption or as a stand-alone unit for complete fossil fuel displacement.

The molten salt tanks act as a thermal energy storage. The CHP plant purchases electricity from the grid when the price is low, meaning when the electricity supply exceeds the demand. The electricity is then converted into heat, which is then used for heating up the molten salt. When the electricity demand exceeds the supply, the heat from the salt is converted back into electricity, which is then sold and send back to the grid. The waste heat from this process is used for district heating purposes.



Carnot battery combined with a Pit Thermal Energy Storage (PTES) for efficient and flexible heat and power production.

RETROFIT AF COAL FIRED-PLANTS
with molten salt storage



It is, by means of PTXSALT molten salt energy storage, possible to convert the existing plants into profitable producers of green and sustainable energy. To facilitate a complete replacement, an electric heated molten salt heater and two molten salt storage tanks with integrated steam generation systems must be installed.

Phasing out the use of coal in e.g., electricity generation is a key factor in tackling climate changes. Did you know that coal power plants destined for phase-out could see new life serving the green economy as thermal Carnot Batteries?

The fossil fuel boiler will be replaced by two molten salt tanks. The salt has a temperature of up to 565 °C and will be used for generating steam for operating a turbine which in the end will generate electricity.

A large part of the existing infrastructure can be re-used for the generation of electricity. Original components such as the steam turbine, generators and condensing heat exchangers as well as high value components for switching, transforming, and transmitting high voltage power can all be re-used.

CHANGING ENERGY
around the world

Aalborg CSP A/S is a leading developer and supplier of innovative, renewable technologies with the vision Changing Energy aiming at changing the way energy is produced and stored today. We design and supply green solutions and integrated energy systems based on solar power, energy storage within power-to-X (PTXHEAT and PTXSALT), heat exchange and much more for industries and power plants worldwide.

Since 1988, Aalborg CSP has utilized its immense expertise within design and delivery of boilers, complex systems, renewable energy technologies and energy storage. Thereby, we have a deep understanding of individual energy needs, technology- and system integration as well as optimization with key competences such as performance modelling and system design.

Aalborg CSP A/S places strong focus on R&D activities and works both internally within the company and externally with Danish and international knowledge-based companies and institutions in continuously creating innovative and sustainable technologies.

Aalborg CSP offers a wide variety of renewable energy solutions including high- and low temperature energy storage, solar panels, heat pumps, boilers, integrated energy systems as well as customized Power-to-X solutions. We match individual energy needs with the right systems and technologies and integrates and combines solutions to achieve synergies between both sectors and technologies. We do so in order to create optimum value for our clients, while also optimizing the utilization of the world's energy sources aiming for a CO_2 neutral future.

Headquartered in Aalborg (Denmark) and with a sales & service office in Spain, Aalborg CSP A/S has realized cost-effective green energy solutions worldwide.

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