

WITT SOLAR

ENERGY SYSTEMS AND SEAWATER DISTILLATION

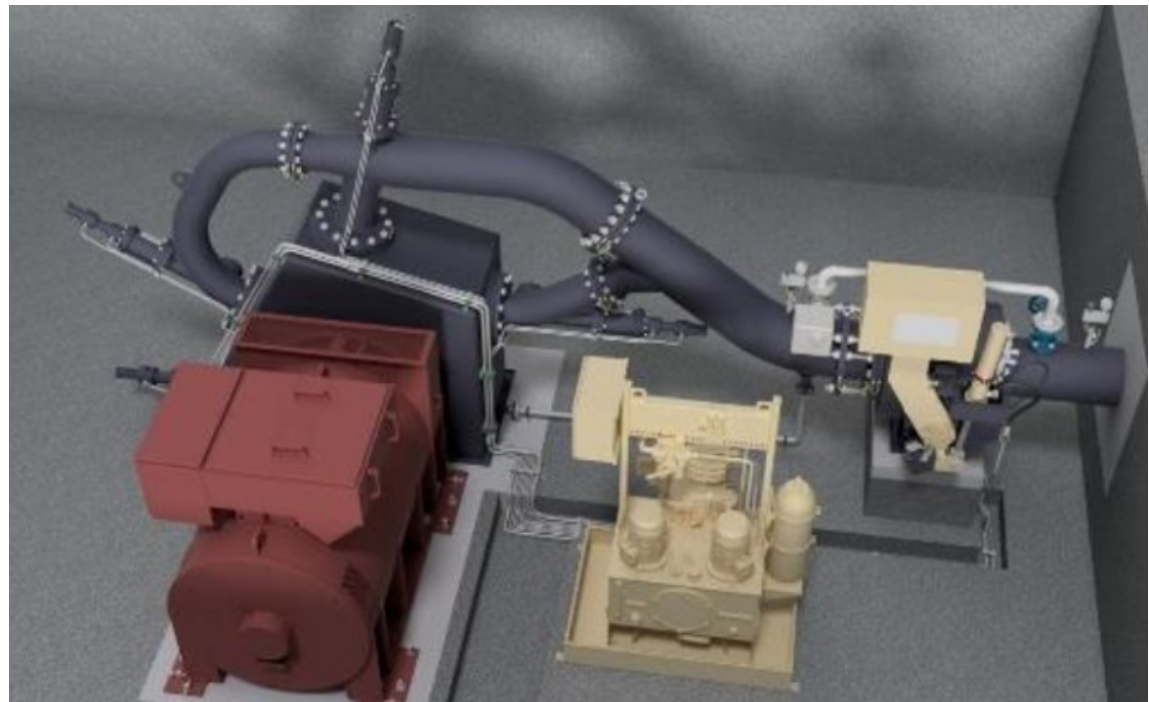


POWER FOR THE WORLD

**„DIVERSIFIZIERUNG VON
SPEICHERMÖGLICHKEITEN UND
INTELLIGENTES
NETZMANAGEMENT IN KAP
VERDE”**

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Services and Technologies

Services

WITT SOLAR AG is an innovative technology oriented engineering company holding several patents. We have the key to open the door towards a solar-based future with our technologies for the production of electricity and drinking water at one hand and energy storage and waste heat recovery at the other hand

The services cover master plans, consultancy, engineering and construction

- Master plans
- [Feasibility studies](#)
- Consultancy of utilities and governments for the base-load energy supply of the country
- [Engineering of energy related technologies](#)
- Engineering of integration of the MES power and desalination process into other technologies, like MES-Photovoltaic HYBRID or MES-MSF HYBRID
- [Engineering of waste heat to power applications](#)
- Engineering of energy storage solutions



Services and Technologies

Technologies

The technologies comprise

- Multi-Effect-Solar (**MES**) Power Plants with full-integrated 12-16 h energy storage and integrated desalination for up to 7.200 Full-Load-Operating-Hours (FLOH) per year with power production during day and night
- **MSF** desalination, solar-based or based on waste heat, even below 100°C
- High Saline Desalination (**HSD**) for the Desalination of high saline water
- Waste Heat Power Plants (**WHPP**) to convert waste heat from refineries, diesel generators and industries into electricity and drinking water
- Containerized reverse osmosis (RO) desalination plants
- High Pressure Pumped Storage hydropower plants (**HPS**), for large scale energy storage of surplus energy production from solar and wind
- Offshore production and intercontinental transport of Green Hydrogen (G-H₂) by Multi-media Energy Tankers (**MET**)
- Supply of 24/7 low-cost electricity and pure water for the production of G-H₂

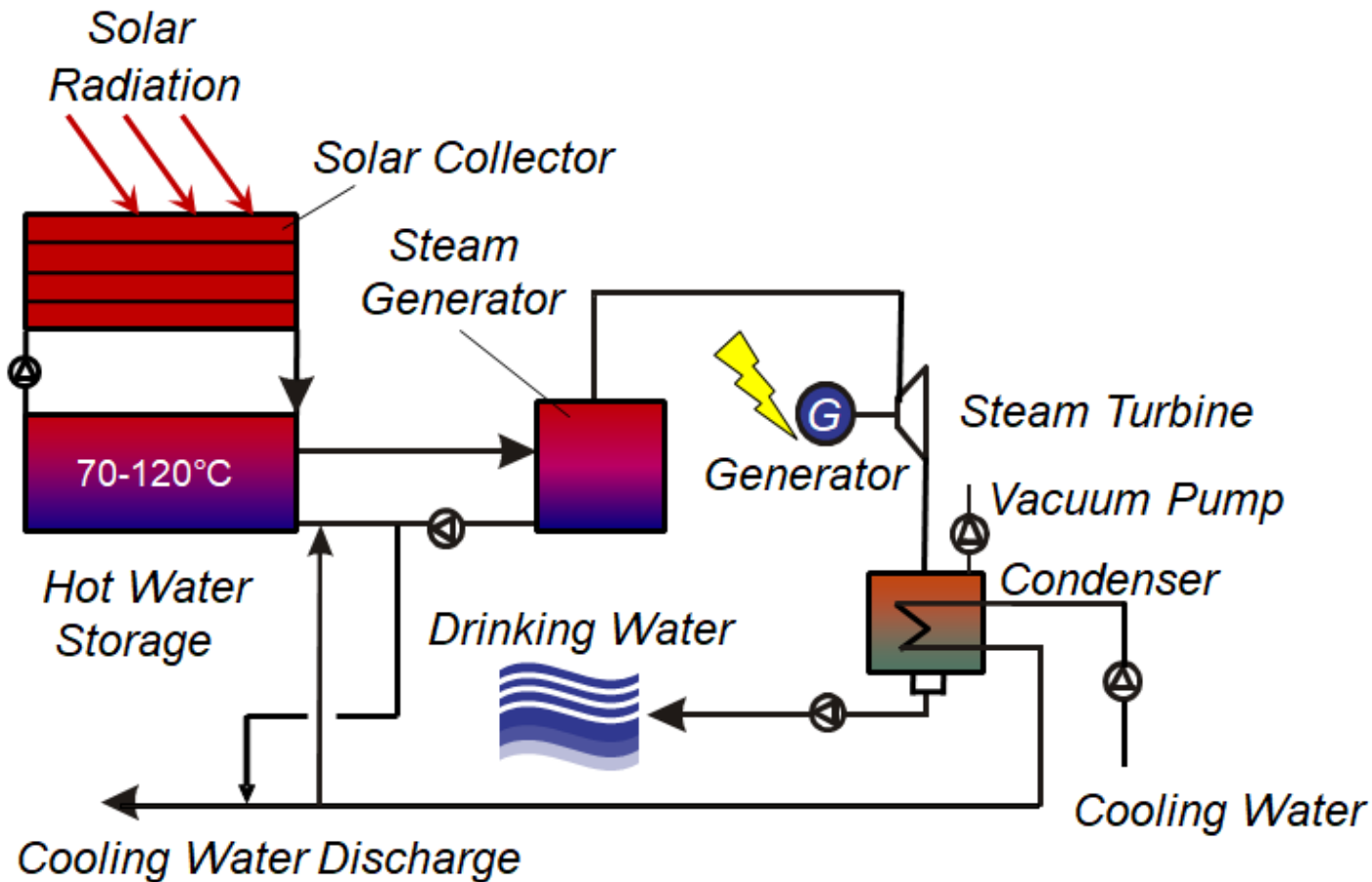


MES Technology

- **WITT SOLAR** has patented and built the **MULTI-EFFECT-SOLAR (MES) Power Plant**, the first solar thermal power plant in Germany with an integrated 12h energy storage for continuous power production at day and night.
- Each MES has an integrated desalination plant to produce drinking water from sea water, brackish water or river water.
- Due to its base-load operation capabilities, **MES** produce electricity and water at lower cost than oil-fired power plants or diesel generators at world market prices
- **WITT SOLAR** also works as a consultant for Governments to formulate the road map to enter solar age with the lowest total cost for solar power and drinking water



Basic Flow Scheme of Multi-Effect-Solar (MES) Power Plant



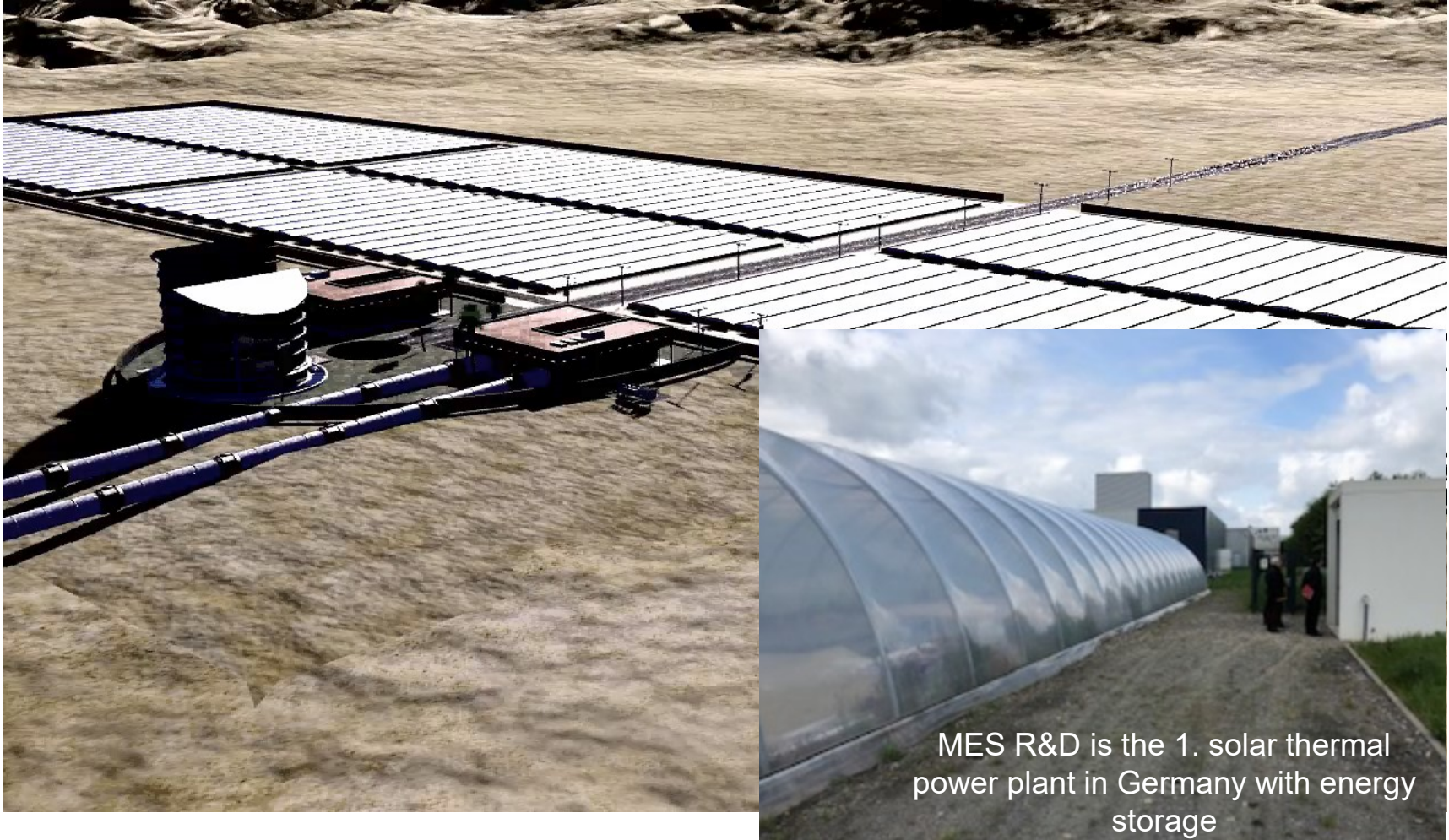
German Patent 10 2012 024 526 B4

European Patent 1 108 191 B1

US - Patent 6,367,257 B1

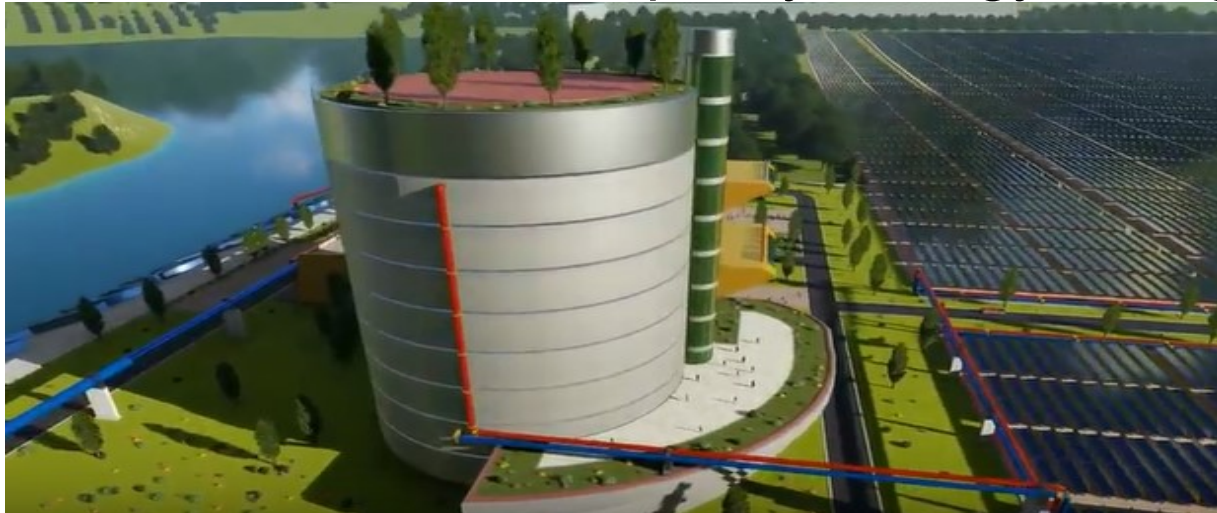


3-D View of a Multi-Effect-Solar (MES) Power Plant





Plant view of a 50 MW MES plant with 30.000 m³/d desalination capacity, energy storage



View of steam turbine hall





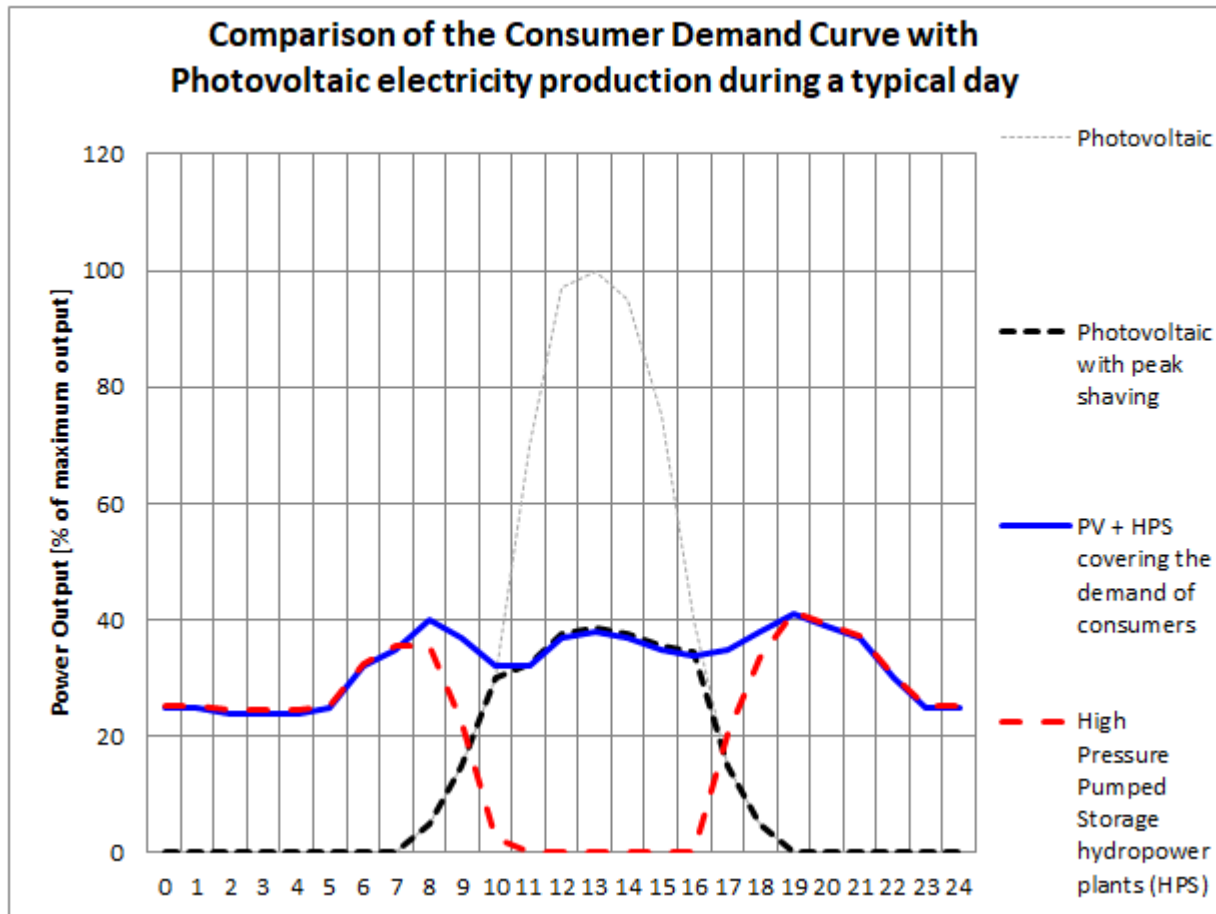
High Pressure Pumped Storage Hydropower Plant (HPS)

- With the breakthrough of Renewable Energies (RE), fluctuations in the power supply of photovoltaic (PV) and wind energy converters (WEC) increase and an exponential demand for energy storage solutions for more than 8 hours discharge time will arise.
- [World-wide proven hydro turbines are used to produce electricity](#)
- Capacity range is from 100 kW to 10 MW per unit with storage capacities from 400 kWh to more than 100 MWh



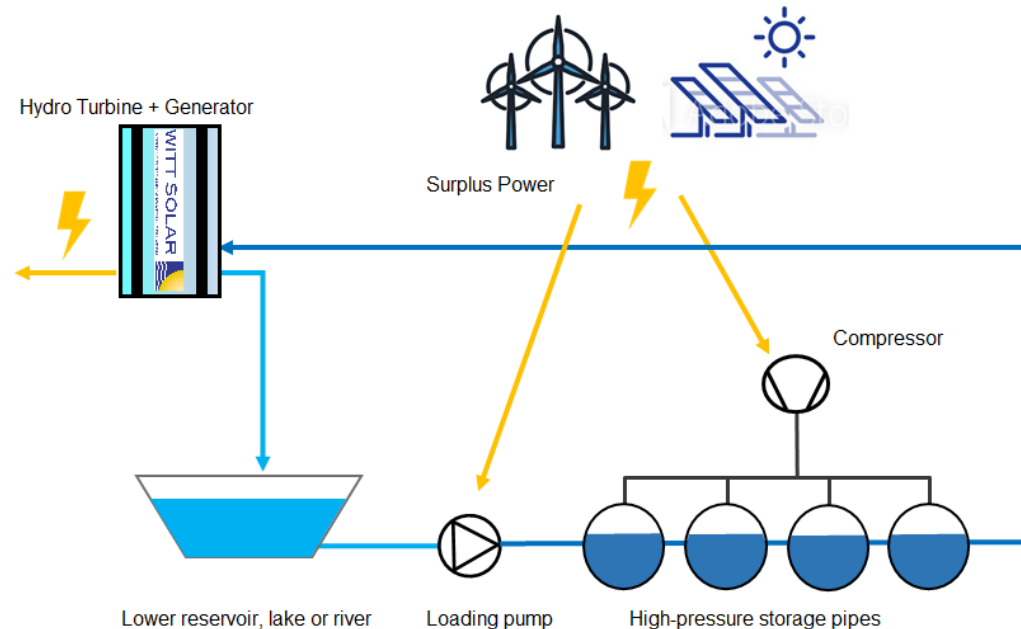


Power Supply during 24 h using **HPS-System** in Combination with PV





Technology of the High Pressure Pumped Storage Hydropower Plant (HPS) - Patent Nr. 10 2020 005 091, granted at 28.07.2022

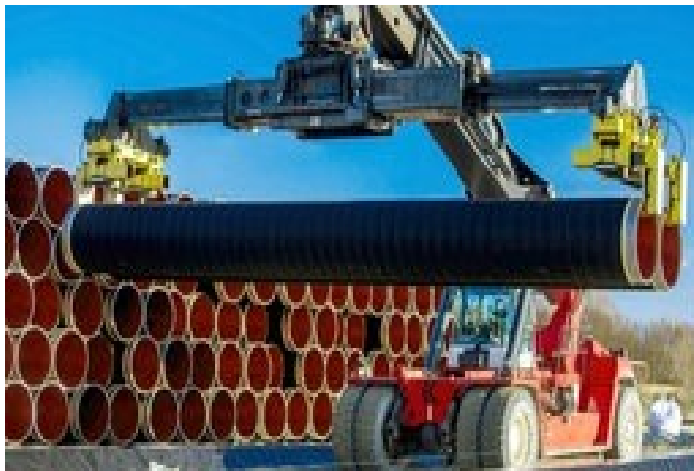


- The high pressure storage pipes contain gas (air, H₂, natural gas or CO₂) , which has been pressurized by the compressor
- When the surplus power from RE is available, the loading pump is pumping water from the lower reservoir into high pressure storage pipes, while the pressure is increasing
- To supply power to the grid, the hydro turbine with the generator is driven by the water flow from the pipes before the water is entering again the lower reservoir
- HPS systems do not need dams in the mountains



Approach

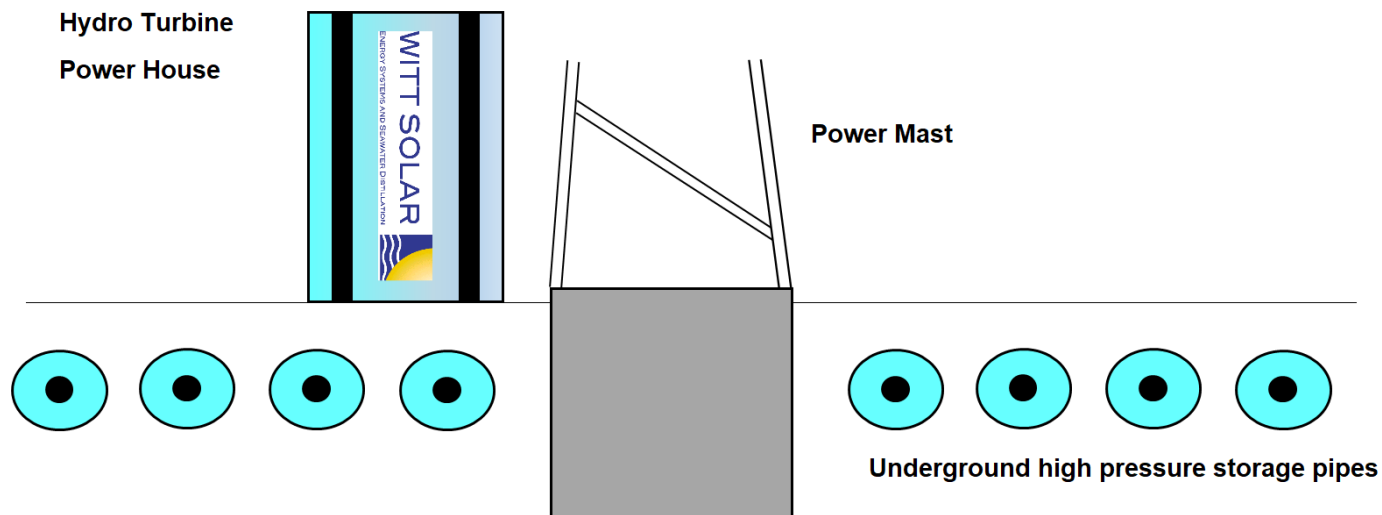
- Typically we are using high-pressure standard pipes from proven manufacturers from Germany
- HPS plants can be installed invisible in the underground or in water bodies
- International hybrid-energy projects with production, storage and oversea transportation of hydrogen and pressurized water are possible with the **HPS**-technology





Applications for the HPS for grid companies

- Electricity grids:
 - Wherever the grid needs to be stabilized or reinforced, a **HPS** may be installed along sections of the power lines
 - For a storage capacity of 1 GWh (for example 50 MW x 20 hours) between 20 ha and 60 ha of agricultural land need to be excavated and can be re-used for agriculture after installation

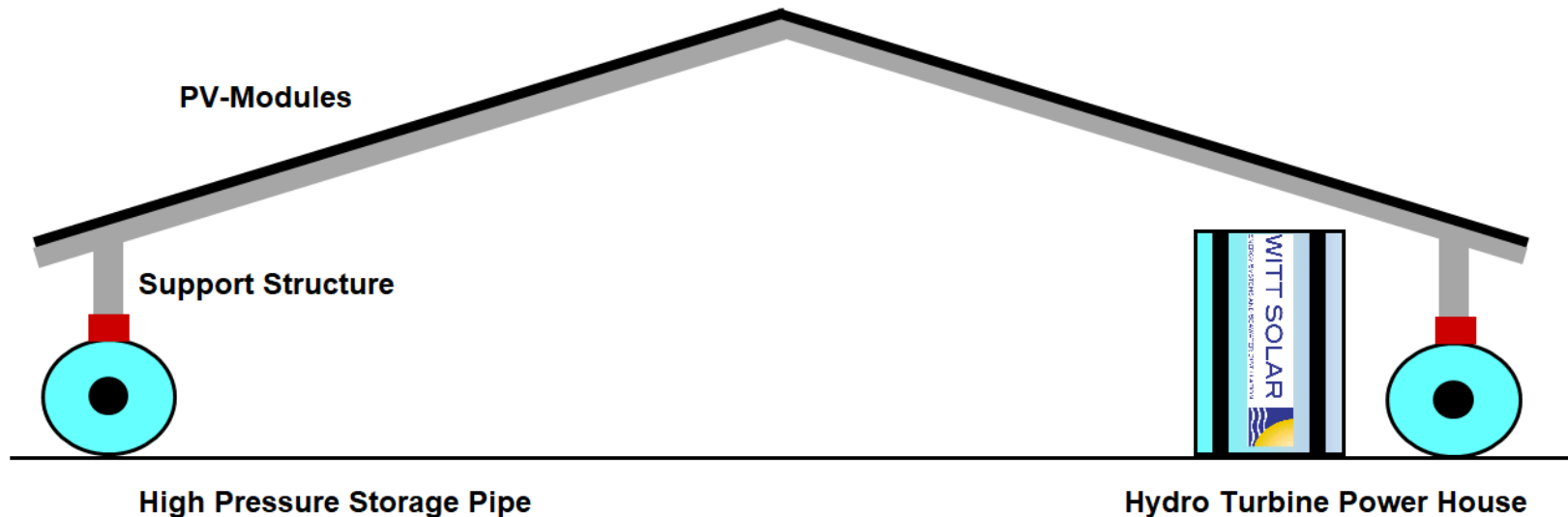


High Pressure Pumped Storage Hydropower Plant (HPS) along high voltage and medium voltage power lines



Technology for small and medium sized plants

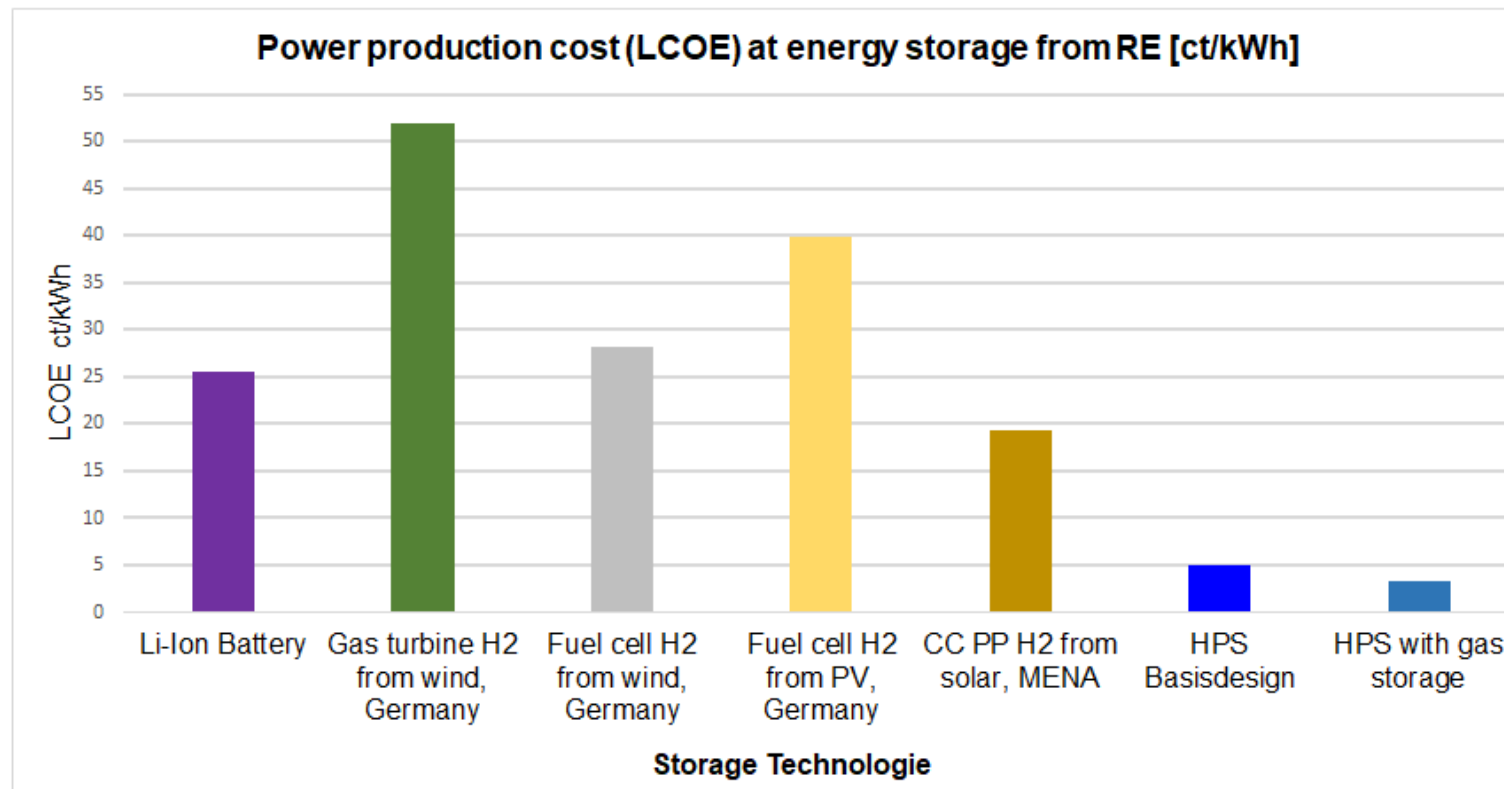
The sketch below shows the **HPS** under a PV-plant, where the steel pipes of the **HPS** can serve as support for the PV-modules at difficult ground conditions and at normal conditions, allowing double use for agriculture and even swimming PV plants



High Pressure Pumped Storage Hydropower Plant (HPS)
under a PV-plant, allowing double use for agriculture



Comparison of LCOE from different energy storage technologies
Basis: output 100 MW; usage 12 hrs/day; storage capacity 1,2 GWh



Thank you

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