Energy storage system[1] for horizontal or vertical wind turbines

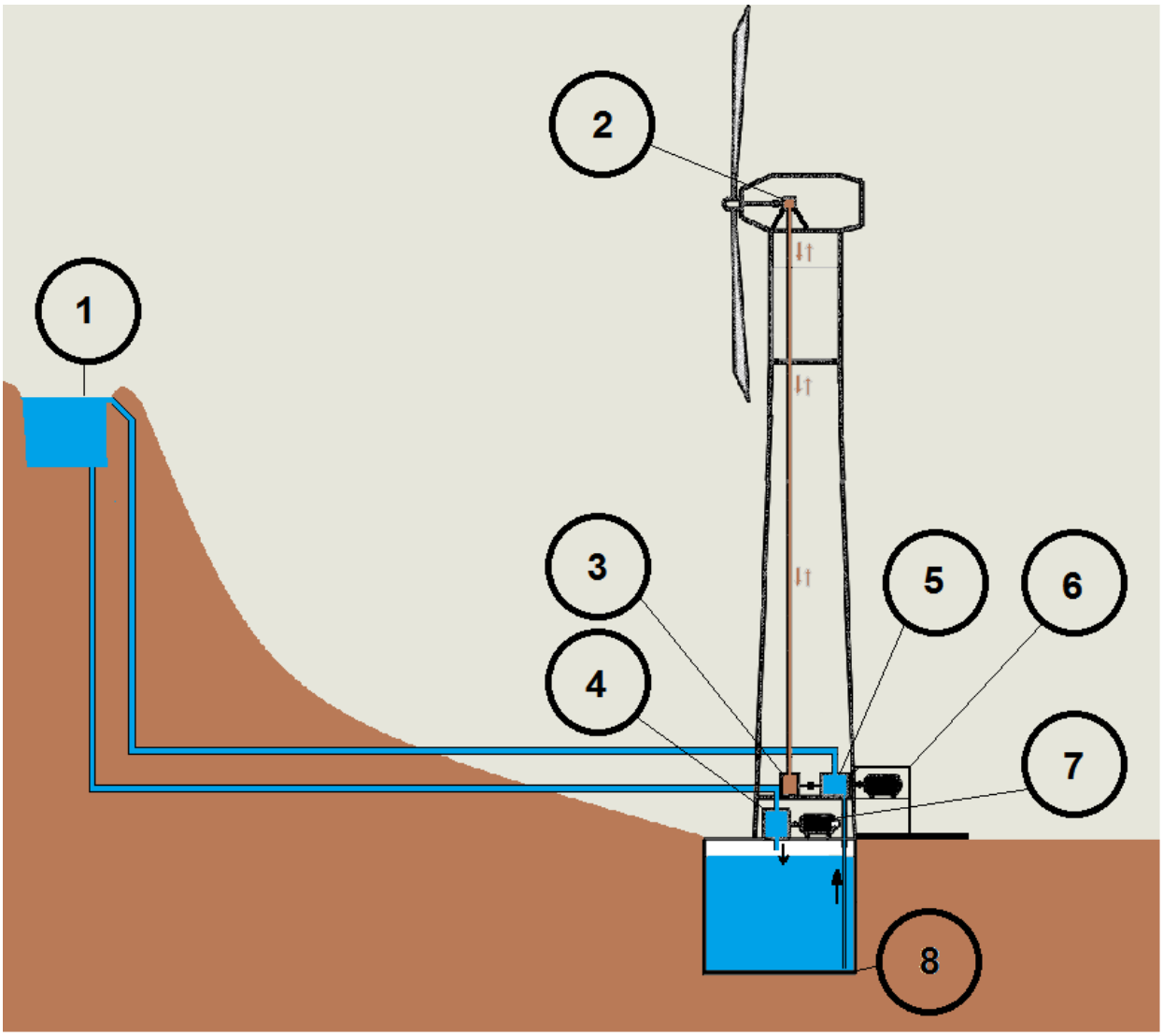
Example plant: Horizontal wind turbine with three rotor blades

- Storage medium: water (or low viscosity liquids)
- Tower height: 120m
- Rotor diameter: 80m
- Rotor revolutions: approx. 17-25 rpm
- 2 x transmissions: 1:10 and 1:50
- 2 x water tank **1.8**
- 1 x Zired engine as water engine (torque from first turn): **4**
- 1 x Zired motor as water pump (pumps from the first revolution): **5**
- 2 x Zired engine as hydraulic pump (power transmission from the first revolution): **2,3**
- 1 x commercial power generator: **7**

Option

- 1 x Zired motor as water pump (pumps from the first revolution): **6**
- 1 x electric motor with gearbox: **6**

Wind turbine with external water storage



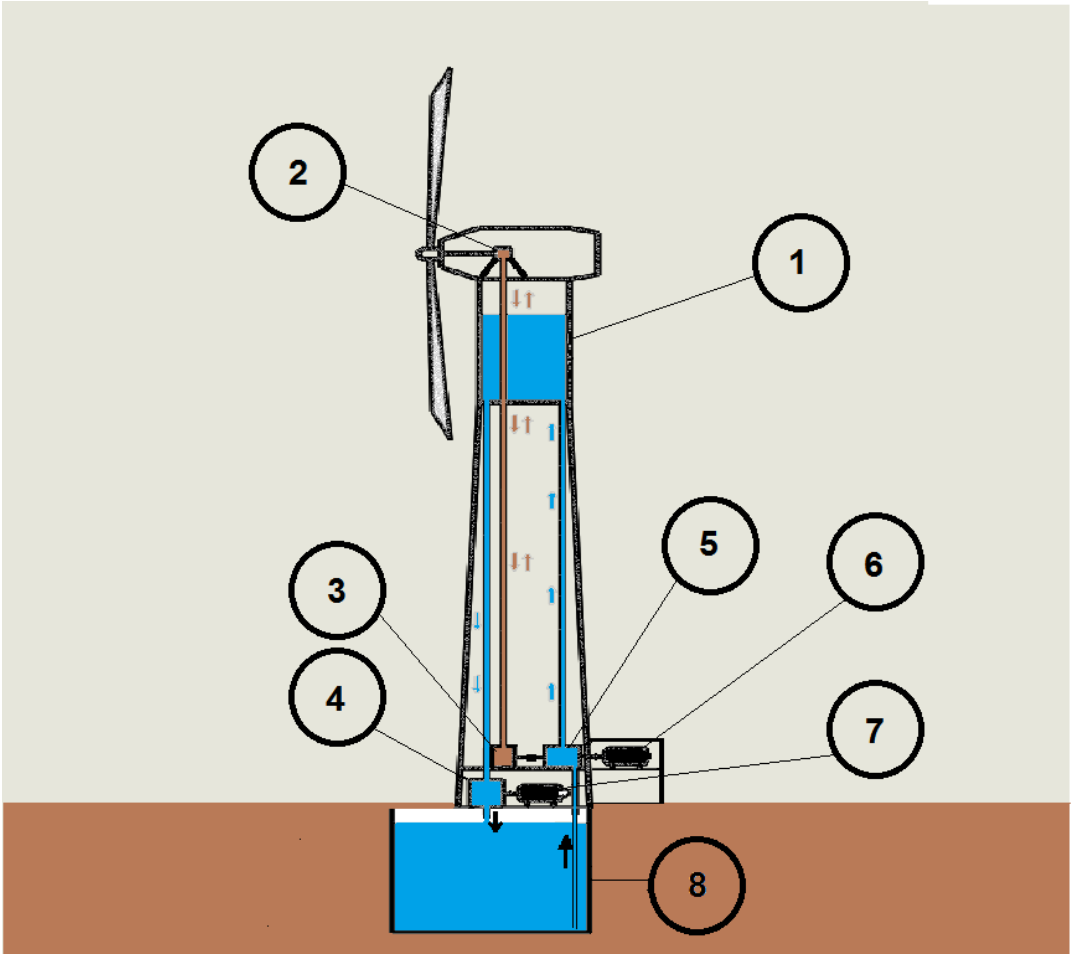
Benefits:

- 100% self-sufficient power supply
- Simple, robust and cost-effective wind turbine design
- 100% eco-friendly technology
- Low maintenance
- Power Consumption Optimization [2] (option)
- 24 hours a day stable power production with a normal power generator
- Uninterrupted and stable power production even with up to four weeks and more calm (prerequisite: a pool least 10000 m3 volume and either or both functions for optimizing power consumption)

Disadvantage:

- It requires the construction of a water basin, outside the windmill, with at least 30m difference in height

Wind turbine with internal water storage



Benefits:

- Almost self-sufficient power supply
- Simple, robust and cost-effective design
- 100% eco-friendly technology
- Low maintenance
- Power Consumption Optimization [2] (option)
- 24 hours a day stable power production with a commercial power generator
- Uninterrupted and stable power production even with up to 48 hours of calm (prerequisite: water tank with at least 800 m3 volume and either or both functions for power optimization)

Disadvantage:

- It requires the construction of a water basin, inside the windmill, with at least 30m difference in height

Function Description

The axis of the Zired engine (hydraulic pump 2) above (see both pictures) is coupled by a gearbox to the axle of a vertical or horizontal wind turbine (in our example a horizontal wind turbine with three rotor blades). The inlet and outlet of the upper Zired engine (hydraulic pump 2) is respectively connected by metallic tube to the outlet and inlet of the lower Zired engine (hydraulic pump 3). It uses oil as a medium. Thus, each revolution of the upper engine is transferred almost lossless to the lower. It is also possible, by design, to implement different ratios, e.g. 1: 1, 1: 2, 2: 1, etc. The axis of the lower Zired engine (hydraulic pump 3) is coupled to the Zired engine (water pump 5) axis. Thus, in this case, the Zired engine, which acts as a water pump, is driven by the rotor blades.

The outlet of the Zired engine (water pump operation) is connected through a pipe to the water tank **1** and the inlet to the water tank **8**. So Zired engine (water pump) can pump the water from tank **8** high in tank **1** and that in several meters height (by design). The Zired motor in pump mode does not have to be in the medium to pump (no danger of running dry). The pump can namely suck the medium (water) up to a certain height. The tank 1 is connected to the inlet of the lower Zired engine (water engine operation) with a valve and a second pipe. The axis of the Zired engine (water engine **4**) is coupled to the axle by a 1MW ordinary generator **7**, which drives it at stable revolutions.

This constellation with four Zired engines (the Zired engines are identical, but differently dimensioned) ensures only the independent operation of potential energy storage and power production. The first two Zired engines are only for hydraulic power transmission from a rotating axle on the water pump. So the water pump is independent of the water engine. The water pump runs at variable revolutions (depending on how the wind blows) and pumps the water from tank 8 to tank 1. All this is only possible because the Zired engine 5 can pump from the first revolution and not just from a certain point Speed like all commercially available pumps. The water engine 4 also supplies the torque from the first revolution.

So when the wind blows, the rotor blades rotate at variable revolutions forcing the water pump to pump. As a result, it pumps up staggering amounts of water. The water engine 4 is powered by the pressure that the water exerts (potential energy) (10m water column ≈ 1 bar, the water volume does not matter, only the difference in height), which also works as a check valve (if the Zired engine does not turns, then the water stops to flow). That is, when the water from tank 1 flows down to tank 8 through the water motor, it drives the engine and this results in a generator with stable revolutions and all this only when that is wanted (tank 1 has a valve: open and close).

1. Registered for utility model

2. Power optimization features

Power optimization is achieved either with the “Electricity on Demand” function or with the “Recursive Pump” function or both.

Electricity on demand

Simply put, if there is no demand for electricity, then power production is at a standstill. This function only makes sense for small power grids with up to four households. This saves water resources.

Recursive pump

With this function, the power production runs continuously. In the event that the power grid is not fully loaded, with the remaining energy, an additional Zired engine in water pump operation is driven by an electric motor, which pumps the water back into the storage tank. For example, when electricity is produced at night, but is not or is little used. The electricity is then not lost, but is used to pump up and store the used water again.