# SNS COLLEGE OF TECHNOLOGY

**(An Autonomous Institution)**

**COIMBATORE-35**

## DEPARTMENT OF AGRICULTURAL ENGINEERING

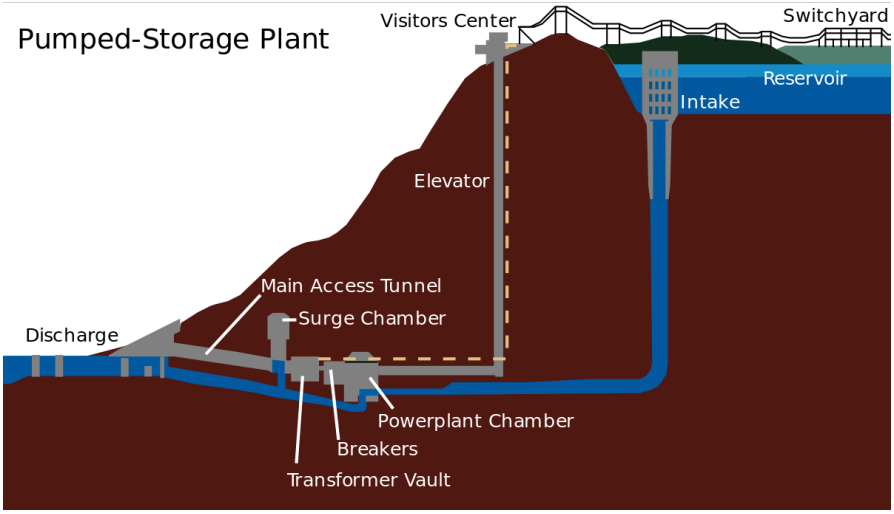
Pumped hydro energy storage is a method of storing energy by using two water reservoirs at different elevations. During periods of low electricity demand or when there is excess electricity on the grid, surplus energy is used to pump water from the lower reservoir to the upper reservoir. When electricity demand is high and additional power is needed on the grid, the stored water is released from the upper reservoir to the lower reservoir, passing through turbines to generate electricity.

Here's a brief overview of how pumped hydro energy storage works:

1. **Two Reservoirs:** A pumped hydro storage system consists of two reservoirs situated at different elevations. The height difference between the two reservoirs determines the potential energy that can be stored.
2. **Pumping:** During times of excess electricity on the grid (for example, when renewable sources like wind or solar are producing more power than needed), surplus electricity is used to pump water from the lower reservoir to the upper reservoir. This process converts electrical energy into gravitational potential energy.
3. **Energy Storage:** The stored energy is held as gravitational potential energy. The system essentially acts as a large-scale battery, storing energy for later use.
4. **Generation:** When electricity demand is high, and additional power is required on the grid, the stored water is released from the upper reservoir to the lower reservoir. As the water descends, it passes through turbines, which generate electricity. This process converts the stored gravitational potential energy back into electrical energy.

Pumped hydro energy storage is considered a mature and proven technology. It has been widely used for several decades and is known for its efficiency and reliability. One of the key advantages of pumped hydro storage is its ability to provide large-scale, grid-level energy storage, helping to balance supply and demand and stabilize the electrical grid.

However, the implementation of pumped hydro storage requires specific geographic conditions, such as suitable topography and access to large water bodies. Additionally, the construction of pumped hydro facilities can involve significant upfront costs and environmental considerations, as it may impact local ecosystems and communities. Despite these challenges, pumped hydro remains an important and widely used technology for grid energy storage.




underground pumped hydro storage (UPHS) is a form of energy storage that utilizes the potential energy of water stored in an underground reservoir. It is a variation of traditional pumped hydro storage, which typically involves two reservoirs at different elevations. In UPHS, one reservoir is located underground.

Here's how underground pumped hydro storage generally works:

1. **Upper and Lower Reservoirs:** Similar to conventional pumped hydro, UPHS consists of two reservoirs. However, in UPHS, one reservoir is underground. The upper reservoir is usually at a higher elevation than the lower reservoir.
2. **Pumping Phase:** During periods of excess electricity generation, when the energy demand is low, surplus electricity is used to pump water from the lower reservoir to the upper reservoir. This process stores the energy as gravitational potential energy.
3. **Generating Phase:** When electricity demand is high, the stored water is released from the upper reservoir to the lower reservoir, passing through turbines as it descends. The turbines generate electricity as the water flows downhill.
4. **Advantages:**
   - **Space Efficiency:** UPHS can be more space-efficient compared to traditional pumped hydro storage, as the underground reservoir eliminates the need for large surface areas.
   - **Environmental Impact:** Underground facilities may have a lower environmental impact and can be more aesthetically pleasing than large, visible surface reservoirs.
5. **Challenges:**
   - **Geological Considerations:** The success of UPHS depends on suitable geological conditions for constructing and maintaining the underground reservoir.
   - **Construction Costs:** Building underground facilities can be more expensive than conventional pumped hydro storage.