

# CALLIO key project details: UPHS

## The first large scale energy storage in Finland



Pöyry Energy GmbH, Austria  
Feasibility study available of the world's highest hydraulic head in the underground energy storage plant - UPHS Pyhäjärvi, Finland.

depth 1400 meters

## An Underground Pumped Hydro Energy Storage in Mine

Need: Increased use of renewable energy supply requires more sophisticated load balancing in the electricity supply

### Wind & Solar power

24 TWh 6.3 GW new wind power by 2030 (SITRA)

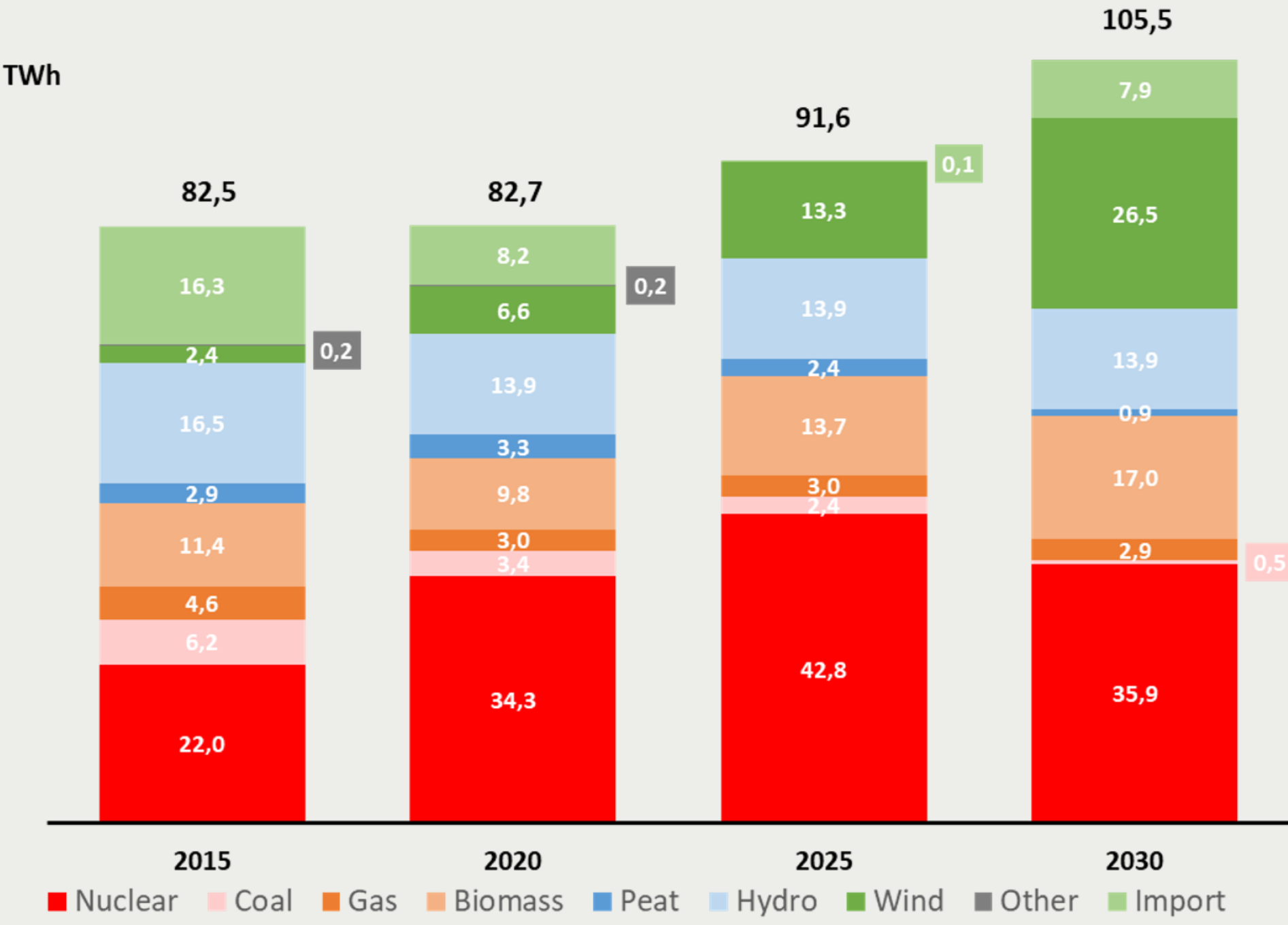
Balance peak load have to offer up to 2 – 2.5 GW of flexibility to deal with the intermittent nature of wind power production.

### Increasing amount of intermittent wind and solar power production will increase also need for flexible balancing capacity. Price level and volatility in the Nordic and Finnish power markets will increase in the future increasing need for balancing services (SKM Market Predictor AS)

### Battery storages

Capex and Opex 18 times higher than PHES (VOITH)

Pumped hydro energy storage is more cost-effective at storing and releasing larger amounts of stored energy.



### Expected electricity generation development in Finland

Power sector changes affect the integrated energy system, additional intermittent wind power creating a need for storage and/or other types of flexibility especially during cold winter and no wind.

New wind power will replace fossil fuel electricity generation, but there is also new capacity coming online to generate the electricity needed to cover the increased power demand from space heating, transport and industry electrification. (SITRA)

## Solution: An Underground Pumped Hydro Energy Storage (UPHS)

### Power cavern 40 m x 25 m

### Lower reservoir

400 m

200 m

### 3D Model of the Pyhäsalmi Mine

Upper reservoir

160 000 m³ of water

1400 meter depth

### 40 - 400 MW studied

Pumped hydro is widely used and based on proven and robust technology with lifetime between 50 - 80 years.

### Low CO2 footprint

Pumped hydro operates in closed water circulation = no impact to environment.

## Benefits, Key Advantages and Next steps

### 75 MW 7 hours 530 MWh

Reliable green technology used in 96% of all energy storage's in the world.

### 77 % vs. 68 %

Higher round-trip efficiency over lifetime compared to Li-Ion battery storage's.

### IRR 7,8% - 11,1% ROE 9,9% - 22,3%

Total budget of 103 M€ (75MW) and construction time 35 months.

### Investments costs

### 194 € kWh

Low investments costs compared to battery storages (~500 - 1000€/kWh) where attention has turned to the sources of materials.

### UPHS Next steps

Zero technical blocking points. Looking for investors and main partner or group of companies to take over and realize the project.

If you have any question, kindly contact us via [www.callio.info](http://www.callio.info)

#CallioPyhajarvi #PyhasalmiPHES #EnergyStorage