EPV Energy's heat storage in Vaskiluoto

Contents

EMISSION FREE PRODUCTION BY 2030

5%

OF FINLANDS ENERGY PRODUCTION

ONE OF FINLANDS LARGEST WIND ENERGY PRODUCER

Our 6th wind farm is under construction and another 10 under planning

ONE OF FINLANDS LARGEST ELECTRICITY TRANSFER COMPANIES

YEAR 2022

INVESTMENTS MEUR 145

BALANCE SHEET MEUR 1127

NET SALES MEUR 678

70 YEARS OF EXPERIENCE OF ENERGY PRODUCTION

And the work continues...
At the moment ~1000MEUR investments under planning for renewables

ENERGY STORAGES

Electrical and heat storage projects ongoing.
In 2020 the heat storage in Vasklot was commissioned

EPV ENERGIA

NUCLEAR OWNERSHIP

Ownership of Olkiluoto 1–3 n. 10 %.

EXPERIENCED AND COMPETENT PERSONNEL

WIDE PARTNERSHIP NETWOR

More than 500 companies (domestic and international) supporting both daily operations and project implementations.

SOLAR POWER

Industrial scale solar power farms on the drawing board

OC

Our own Operations Center focusing on energy management enables the development of smart and cost effective services

HYDROGEN

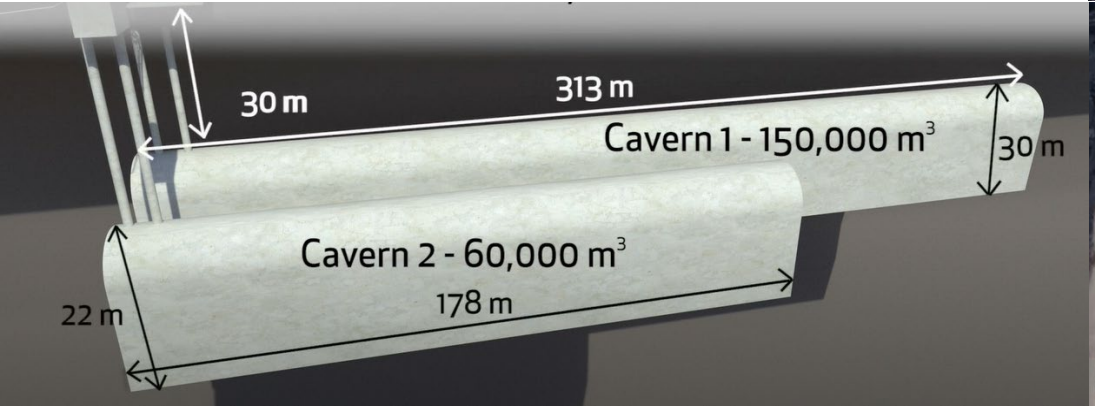
EPV is part of planning the first P2X2P-hydrogenproject to Vasa

NEW ELECTRICITY

EPV has an important role to play in energy production, today and in the future.
We have the tools to help other become emission free.

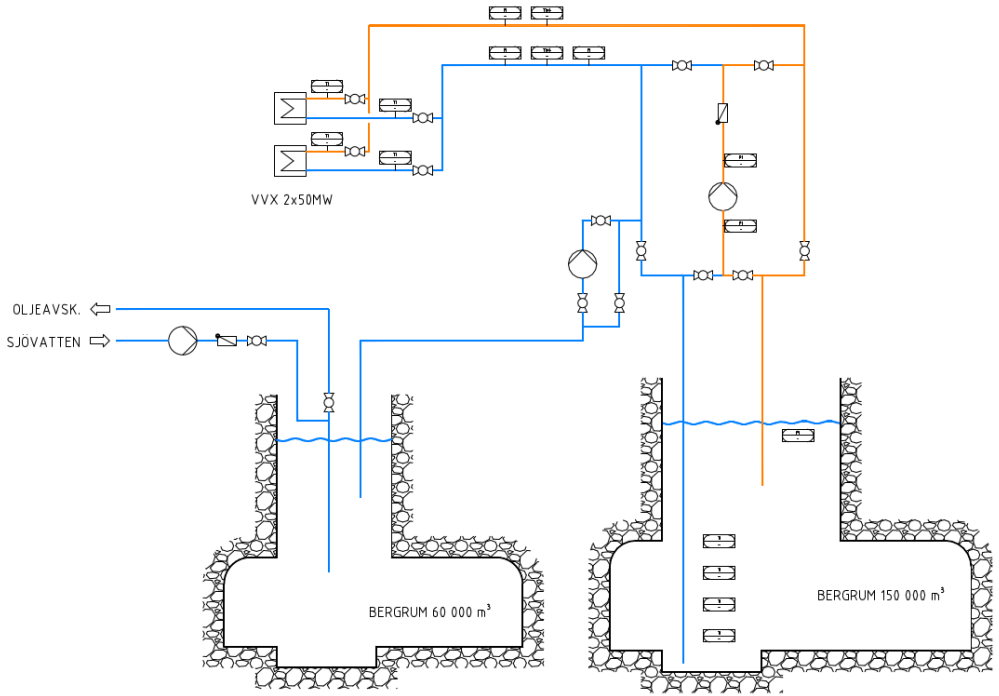
Location

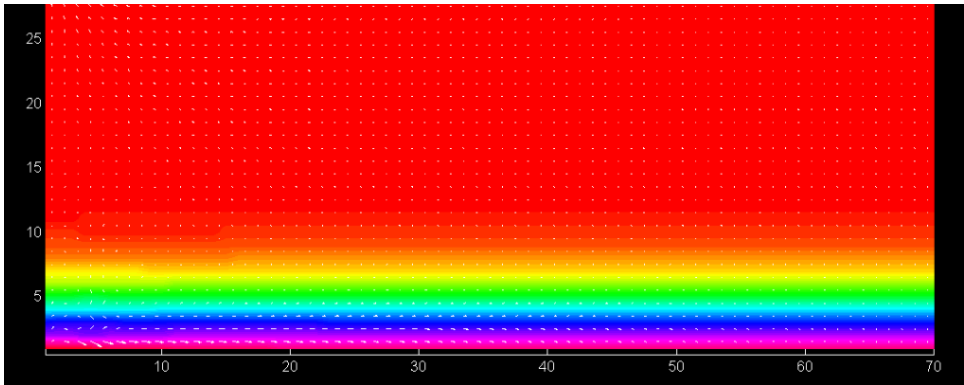
- Vaskiluoto CHP plant
  - Biomass, peat and coal fired plant
  - DH output: 175MW with coal or 80MW with biomass (or peat)
- Oil storage caverns built in 1970s
  - Cavern 1: 313m long, 150.000m3
  - Cavern 2: 178m long, 60.000m3
  - Decommissioned and cleaned in the 1990s
  - Filled with brackish sea water
  - Storage capacity 7-9GWh
  - Charge/discharge capacity 8(2)-100MW



Planning the storage

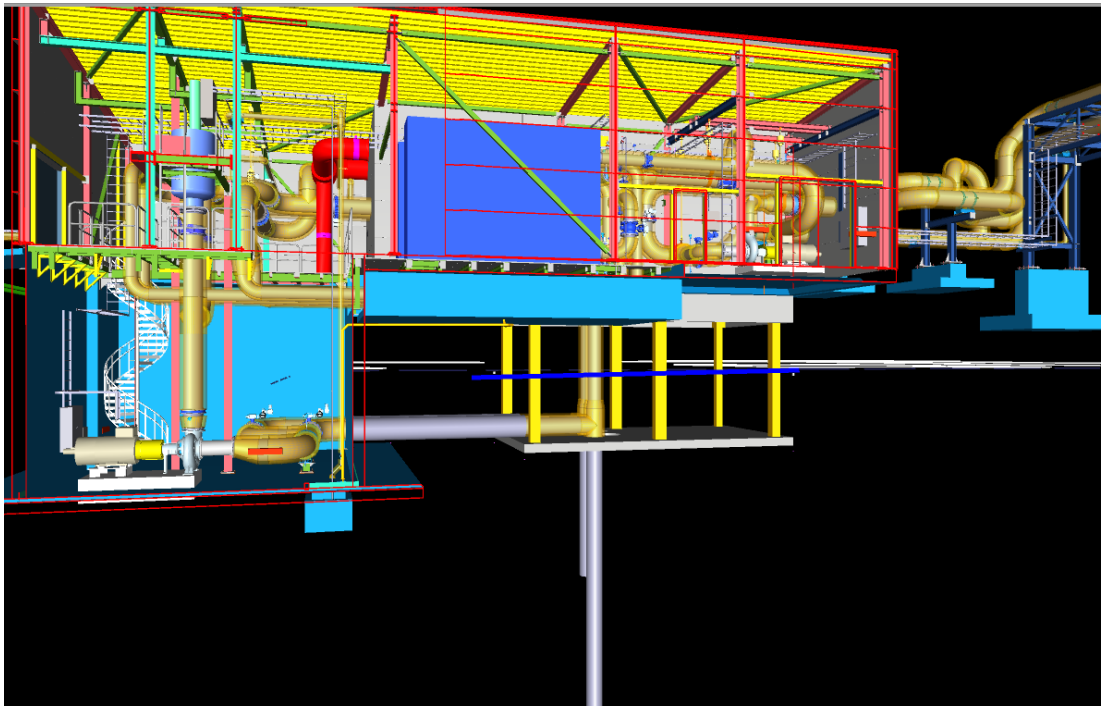
- Basics
  - Storage temperature interval
  - Power of charge/discharge
  - Storage duration
  - Storage volume
  - Distribution network capacity
- Details
  - Flow speeds and layering (Diffusors)
  - Pumps and pressure levels
  - Material selection
- Auxiliaries
  - Electrical supply
  - Piping
  - Civil structures
  - Automation system





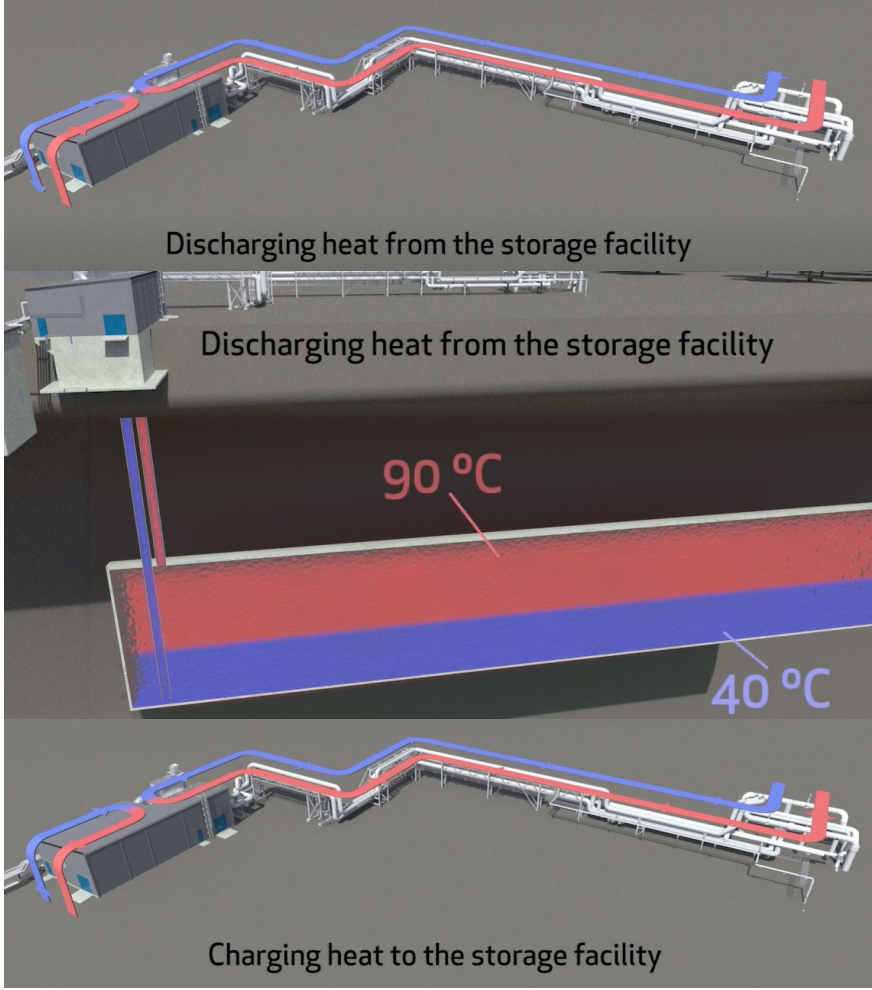
Building the storage

- Timeschedule
  - Start of planning: August 19
  - Ground breaking: October 19
  - Commissioning: April 20
  - Operational: May 20
  - Project duration: 9 months
- Challenges
  - Connection to existing DH system
  - Pump pit (room) for the storage pump
  - Cold water pipe to bottom of the storage
  - Residual oil?



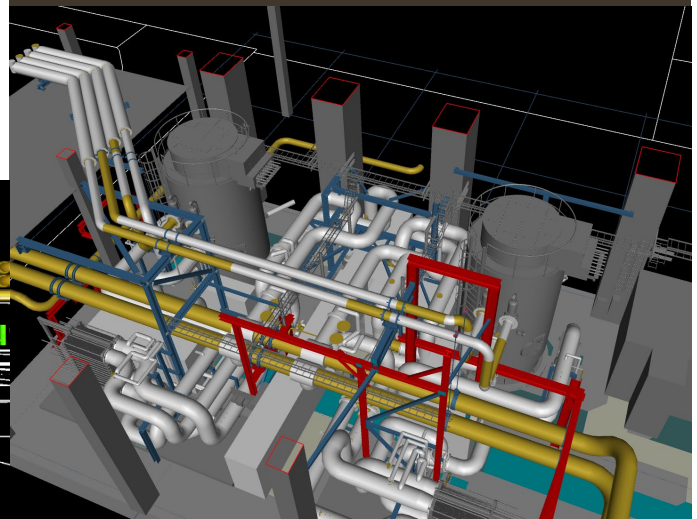
Operation

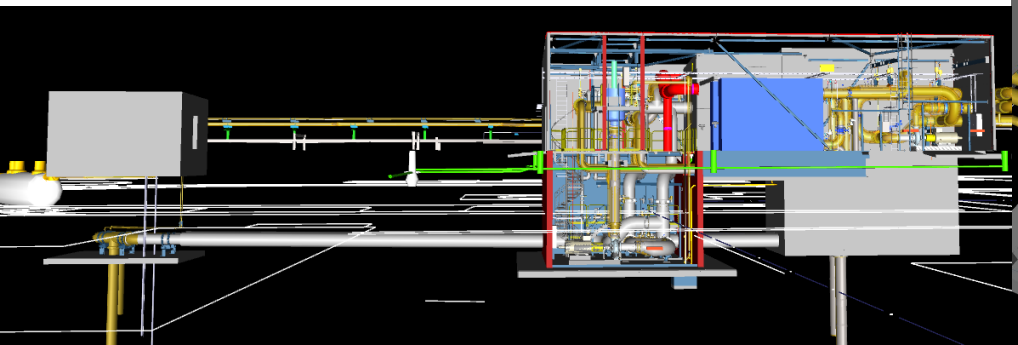
- Operation modes
  - Charging, 100%
  - Charging, partial
  - Discharge, 100%
  - Discharge, partial
  - Sector coupling charging
- Challenges
  - DH network requirements vary over the year
  - Storage temperature



Ongoing developements

- Electrification of heat production
  - 40MW electrical boiler commissioned 22.11.2021
  - 2x 60MW electrical boilers coming online summer 2023
  - Enables heat production without CO_2 emissions
- Storage increase
  - Second cavern onlineuse during summer of 2023
  - ~3 GWh additional storage
- Future sector coupling possibilities
  - Wärtsilä Smart Technology Hub
  - Wind power
  - Solar power
  - Other industries





Benefits

- District Heating supply to Vaasa buffered
- Optimised running of power plant
  - Calculated possible reduction in coal use of more than 30%
- Reduced running of oil fired DH booster stations
- Sector coupling
  - Heat from Westenergy waste burning plant stored during summer and used during Autumn

Thank you!

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Heat storage video presentation
https://www.youtube.com/watch?v=OYGLmbG9tQE