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Detail information regarding the ELSEA project is published on the project's website: www.elsea.sk
Further information regarding the projects of common interest is published on the website of the European Commission: ec.europa.eu/energy/en/topics/infrastructure/projects-common-interest
Further information regarding the projects admitted in the TYNDP 2020 is published on the website of ENTSO-E: https://tyndp2020-project-platform.azurewebsites.net/projectsheets

CENTRAL EUROPE ENERGY STORAGE FACILITY

ELSEA

European Large Scale Energy Accumulation

The ELSEA project is enlisted on preliminary ENTSO-E's TYNDP 2020
The ELSEA project is a candidate for the 2021 PCI list.

ELSEA
European Large Scale Energy Accumulation

GENERAL DESCRIPTION

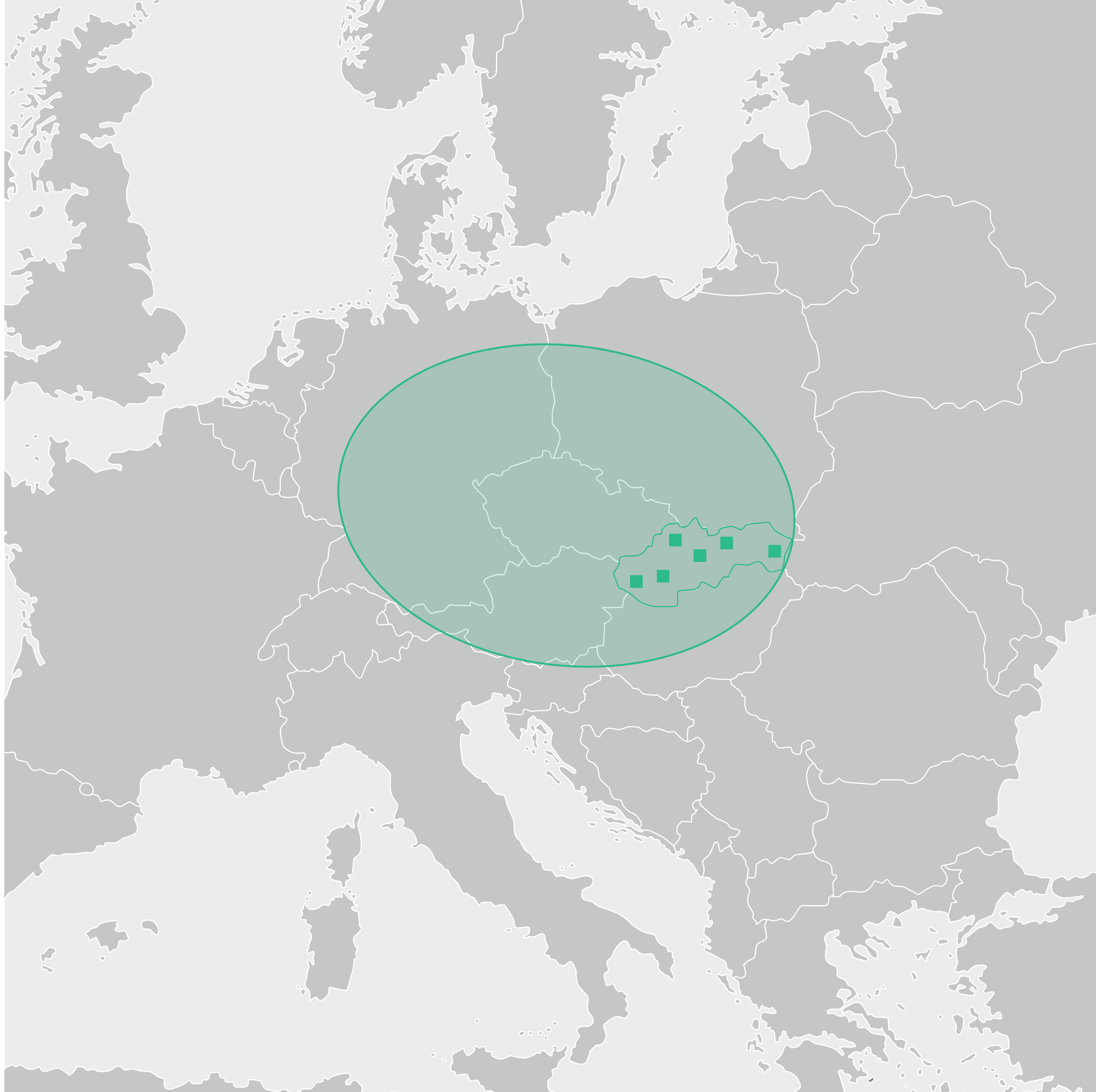
Project ELSEA aims to create a battery type energy storage installation with maximal installed capacity of 384 MW which will allow a net annual electricity generation of 252 GWh/year. Upon completion, ELSEA will be the largest battery installation in the Europe. ELSEA consists of mutually interconnected system of 12 sites located in Slovakia. This approach, as opposed to one single unit installation, will be used to reflect the circumstances of the regional energy market and will maximise Project's value for the electricity network.

Implemented storage system will accumulate energy during RES generation peak, hence increasing the potential for RES integration. ELSEA will strongly contribute to system operation regarding grid congestion reduction, balancing electricity supply and increasing reliability of electricity supply. Furthermore, the Project will support flexibility and efficiency within electricity system and serve as a potential back up during the black-out.

As an emission free solution ELSEA fosters the EU´s climate change mitigation strategy and carbon neutrality through increasing RES, reduction of carbon emissions, and deployment of energy efficient technologies.

WHY ZSE ENERGIA?

Project ELSEA will be realised by ZSE Energia, Slovakia based energy company, which has 95+ years of experience from the electricity market in Central Europe. The company is one of the most innovative power and gas suppliers in the region. In 2019, ZSE Energia serves more than 1 million customers and delivers annually 9 TWh of energy.



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WHY A LARGE ENERGY STORAGE IN CENTRAL EUROPE?

- **Energy transition requires massive investments** into transmission and distribution infrastructure.
- Intermittent generation (wind, solar) causes difficulties for its dispatching as well as increases the complexity of network management. Currently there are **no sufficient capacities to store excess energy** even for short-time periods, what leads to increased demand for ancillary services and triggers inefficiency in energy utilisation.
- High volatility on energy markets makes power cost prediction very difficult. Currently consumers have **no relevant measures to manage peak consumption**.
- **A negative impact on environment** is caused by CO_2 intensive power generation that aims to provide ancillary services for the grid.
- **Decentralised generation units in EU citizens' homes** would be more effective if they could accumulate the surplus power and supply it when needed.

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CONTRIBUTION TO EU ENERGY TARGETS

- Energy storage technologies allow us to **store excess energy** and discharge it when there is too little generation or too much demand.
- Energy storage provides **flexibility** at different time-scales - seconds/minutes, hours, weeks and even months.
- Storage can help consumers increase **self-consumption** of solar electricity, or to generate value by providing flexibility to the system.
- Industrial consumers can install storage facilities to **reduce consumption peaks**, and to provide back-up power if there is a black-out.
- Storage at any level offers **system services**, safeguarding the secure and efficient operation of the electricity system.
- Storage can help **defer costly investments in transmission and distribution infrastructure**, extending the lifetime of existing assets and supporting more efficient functioning of grids.
- Energy storage deployment could facilitate the electrification heating, and cooling sectors and **support the roll-out of very fast charging infrastructure** for electric vehicles, particularly in areas with weak grids.

WHY IS BATTERY ENERGY STORAGE SYSTEM (BESS) BETTER THAN PUMPED HYDROELECTRIC ENERGY STORAGE (PHES)?

- **Location**
  PHES are very location sensitive and it is problematic to find placements fulfilling required attributes. BESS are very flexible in terms of placement and can be built wherever it is most efficient and beneficial. Local placement of BESS leads to lower energy losses, lower energy price and better utilisation of ancillary services.

- **Permitting and construction**
  Permitting process of PHES is very time-consuming mainly due to great environmental impact of their construction. Overall, permitting, construction and commissioning can take up to 10 years.

  In case of BESS, the permitting and construction process is usually swift and completed within a year.

- **Environmental impact**
  PHES have significant negative impact on the environment and permanently change the landscape of the impacted area. This is accompanied with negative public opinion of PHES construction.

  BESS due to their smaller size and construction requirements affect environment to an incomparable lower degree.

- **Efficiency and response-time**
  While PHES have average response time in minutes and efficiency of 85 %, BESS can respond in miliseconds, while having efficiency of up to 98 %.

BATTERY STORAGES - WHY IS LOW NUMBER OF MID-CAPACITY BETTER THAN HIGH NUMBER OF LOW-CAPACITY STORAGES?

- **Grid stability**
  Mid-capacity battery storages can be directly used for grid stabilisation through (local) ancillary services. However, low-capacity batteries are individually unable to benefit the overall grid. Therefore, for low-capacity batteries to be able to be used for ancillary services, it is essential they are grouped and managed as a single entity – introduction of new market subjects, such as aggregator, is required.

- **Operation requirements**
  Deployment of mid-capacity batteries is mostly dependent on market and grid needs. However, installation of low-capacity residential batteries is based on the decision of individual households. For a household, the installation of a battery is logical only if it is already utilising RES generation (i.e. solar panels). Therefore, in order to properly function, low-capacity batteries require additional installation of devices utilising RES, what causes higher costs for end-users.

- **Energy price**
  Wide-spread implementation of residential batteries will lead to lower utilisation of the grid, but the need for its existence will still be present. Therefore, end users will be affected by increased energy price, because the volume of distributed energy will decrease, but fixed costs for grid construction and operation will remain the same, or even higher as the grid will need to be prepared for immediate power requirements in case of joint failure of both the generator and battery.

European Large Scale Energy Accumulation

Lower number of mid-capacity battery storages	
Pros	**Cons**
contributing to future energy market development (renewables, decentralisation, aggregators, flexibility)	life cycle (10-15 years)
local level ancillary services, storing excess energy	effectiveness dependent on IT and other installations
decreased need for ancillary services	
construction time	
expansion flexibility	
local placement – lower losses and costs	
grid management and operation	
grid stability (mainly in relation to unstable renewables generation)	
operation	
very fast response-time (msec)	
lower energy prices	
low environmental impact	
higher efficiency	
no need to install new energy sources	
installation price (€1 mil./1 MW)	

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High number of residential low-capacity battery storages	
Pros	**Cons**
can be used for ancillary services if aggregated	only effective for households having RES generation installations (additional costs)
contributing to future energy market development (RES and decentralisation)	cannot be used for ancillary services individually
	higher energy price (lower volume of distributed energy, but same/higher fixed costs)
	effectiveness dependent on IT and other installations
	cannot be used without energy source

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Pumped hydroelectric energy storage	
Pros	**Cons**
cheap energy source	very long permitting process
high capacity (hundreds of MW)	environmental impact
charging flexibility	long construction period (up to 10 years)
life cycle (up to 100 years if properly operated and maintained)	problem to find sufficient location
	negative public opinion
	operation (failure of one turbine can cause significant decrease in capacity)
	response-time (mins)
	installation price
	lower efficiency
	higher energy losses