

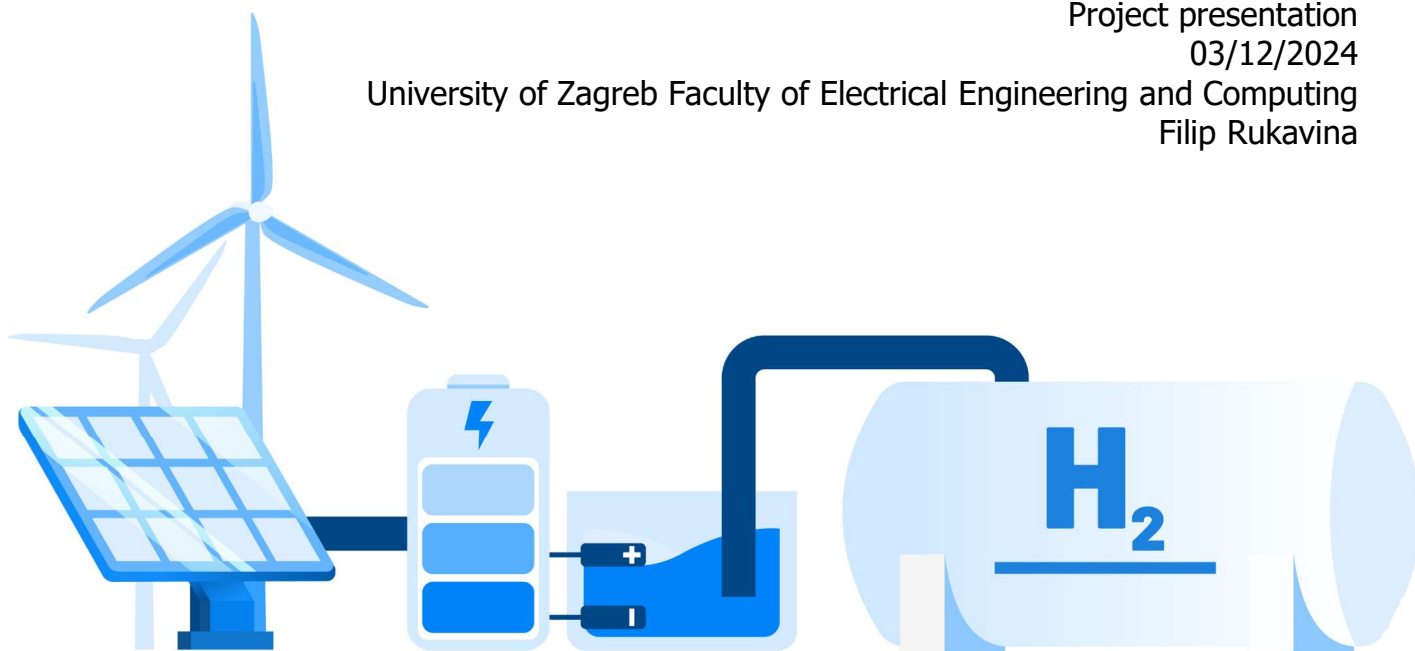


Danube Indeet

Integrated and decentralised concept rethinking
energy and transport systems based on renewable
energy in the Danube region

Project presentation
03/12/2024

University of Zagreb Faculty of Electrical Engineering and Computing
Filip Rukavina



Challenges

Interreg
Danube Region



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Waste of renewable energy → Energy Storage

Mostly because of grid congestions

Reduction of renewable electricity
production in Germany in 2022
– 8 TWh (~7.6%) of energy was lost

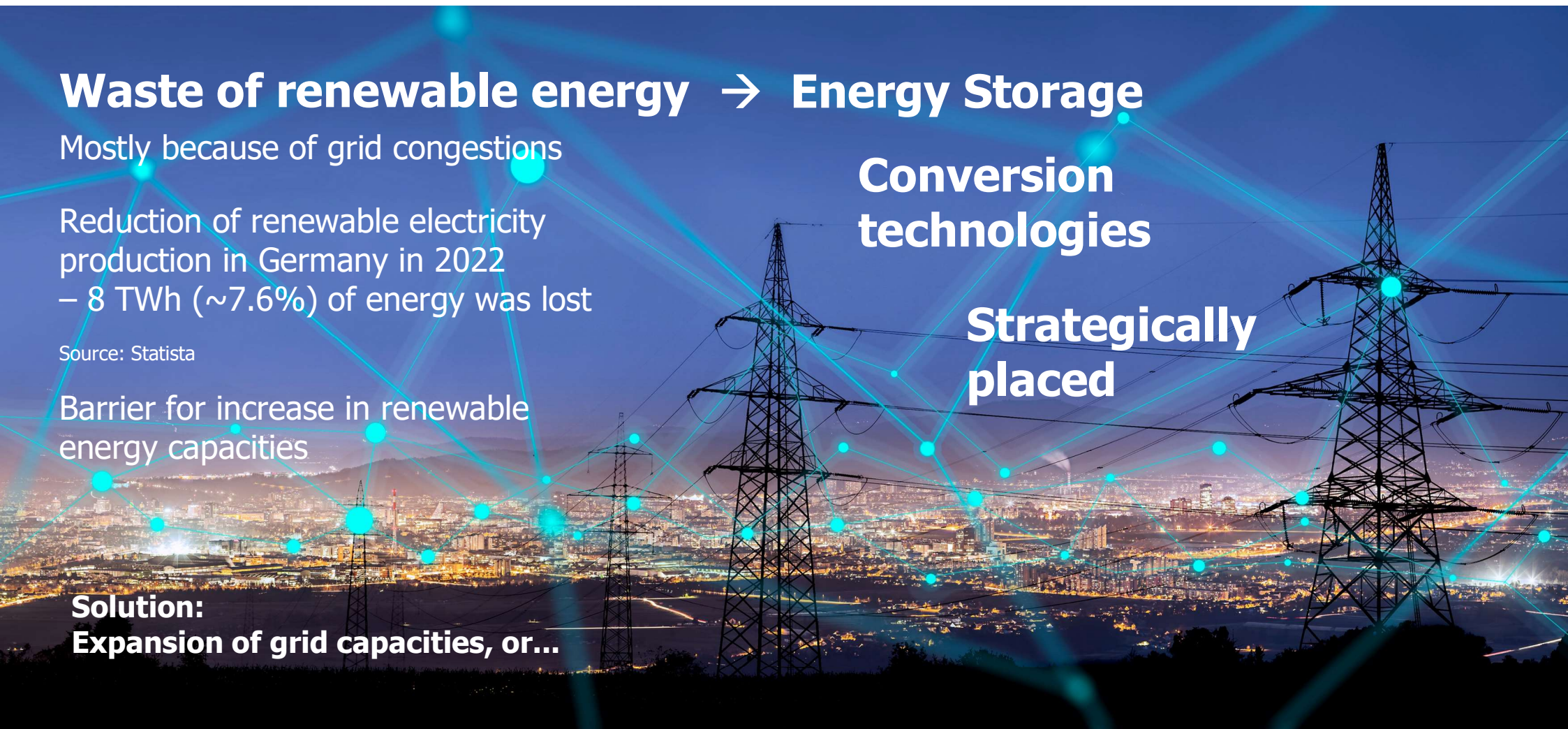
Source: Statista

Barrier for increase in renewable
energy capacities

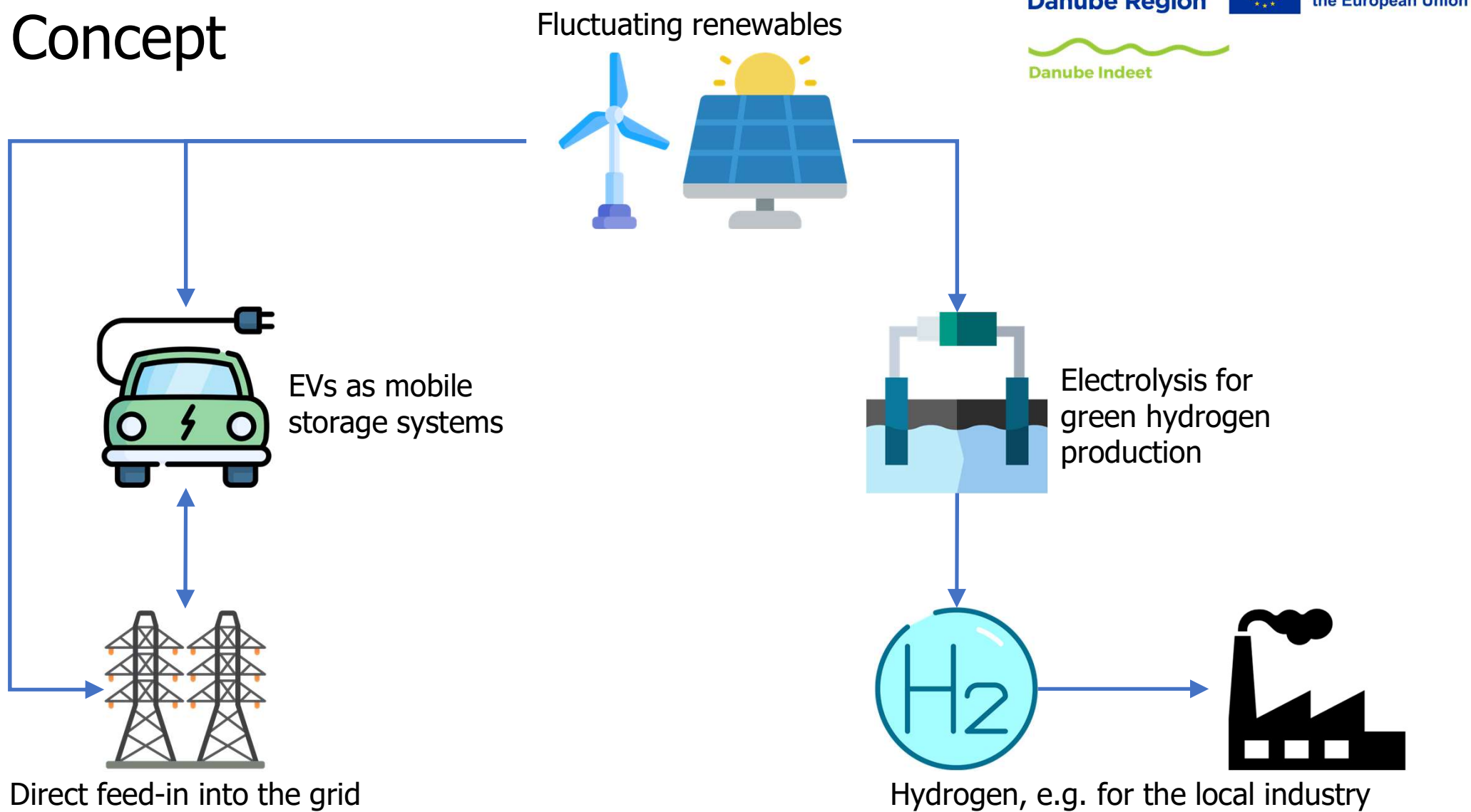
Solution:
Expansion of grid capacities, or...

**Conversion
technologies**

**Strategically
placed**



Concept



Electric mobility



- Normally, EV chargers are a burden for the grid
- Usage of EVs:
 - as mobile storage units while RES production is low
 - for grid stability
- Smart charging concepts
 - Optimization algorithms for grid stabilization
 - Vehicle-to-home (V2H)
 - Vehicle-to-grid (V2G)
 - Combination with stationary storage

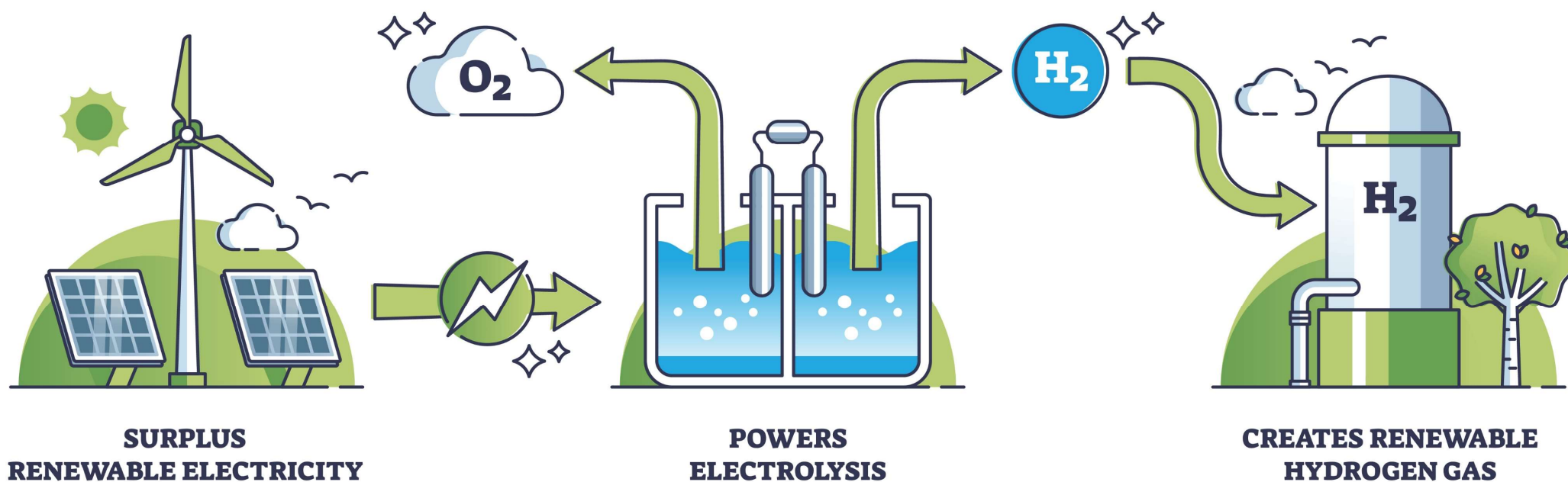
Green hydrogen production

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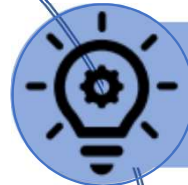
Project goals

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Optimization model for ideal sizing and operation of local infrastructure



Analysis of legal frameworks



Development of suitable business models



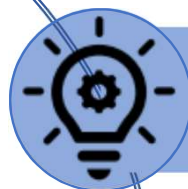
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Pilot municipalities

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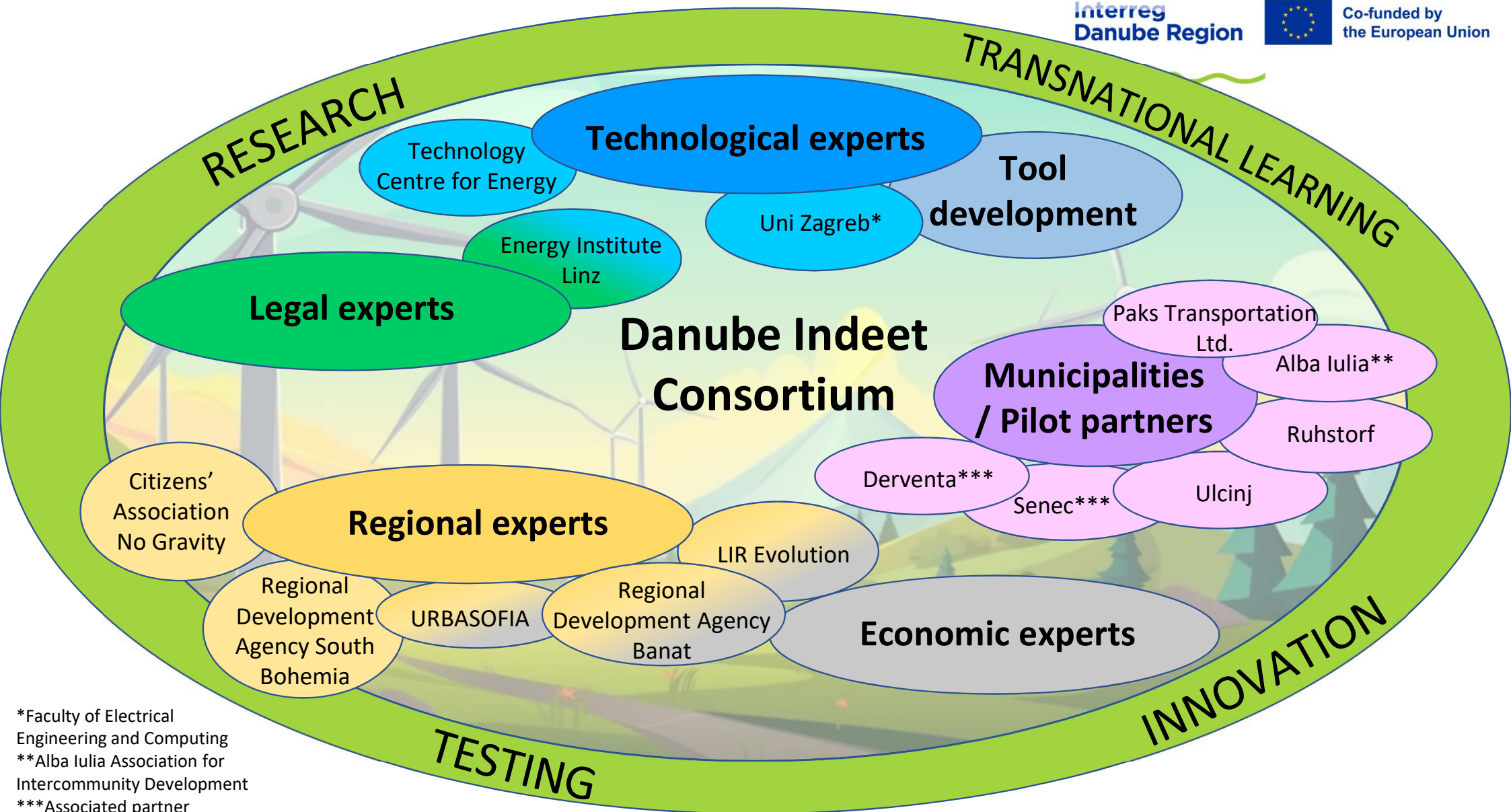
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Acceptance

- How to get the general public and decision makers on board?
- Individual level
 - Individuals as prosumers
 - Willingness to use and invest in an EV
 - Potential financial gain or savings
- General level
 - Electric mobility
 - Hydrogen and electrolysis
 - Smaller and larger technology projects
- Methods
 - Surveys
 - Expert interviews
 - Socio-technical analysis





*Faculty of Electrical
Engineering and Computing
**Alba Iulia Association for
Intercommunity Development
***Associated partner

Project in numbers



Budget: 2.6 million Euros



Duration: 01/2024 – 06/2026



> 40 super motivated people

Made so far – user interface

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Danube Indeet

Danube Indeet Model

File Edit Language Help

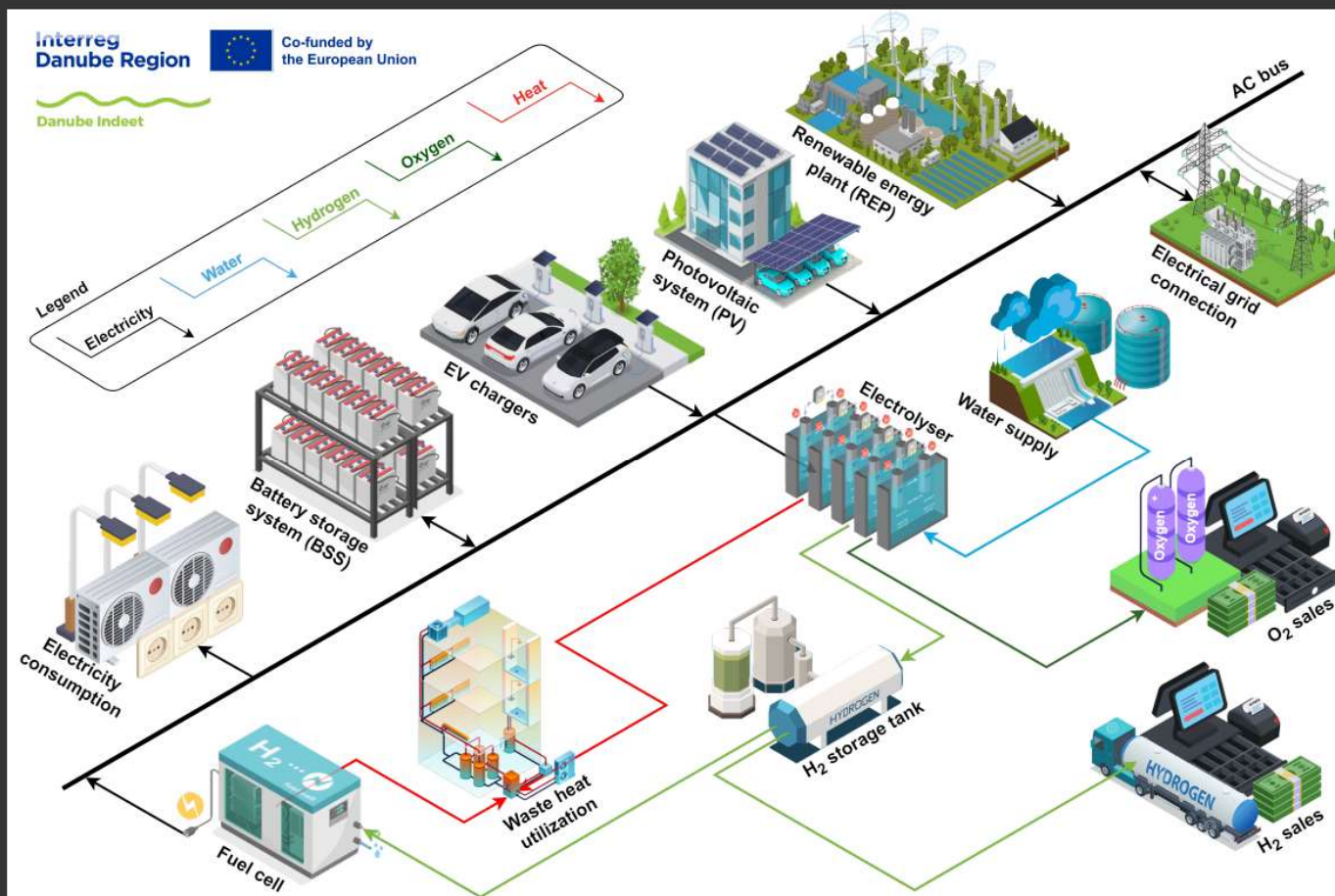
My project

▼ Optimization 1

System structure

Results

Add new optimization run



Step 1: Select your components

☒ EL grid ☒ REP ☒ PV ☒ EV chargers ☒ BSS ☒ EL cons. ☒ Electrolyser ☒ H2 sales ☒ O2 sales ☒ Fuel cell ☒ Waste heat

Made so far – user interface

Danube Indeet Model

File Edit Language Help

My project

▼ Optimization 1

System structure

Results

► Optimization 2

▼ **Optimization 3**

System structure

Results

► Optimization 4

► Optimization 5

Add new optimization run

☒ El. grid ☐ REP ☐ PV ☒ EV chargers ☒ BSS ☒ El. cons. ☒ Electrolyser ☒ H2 sales ☒ O2 sales ☒ Fuel cell ☒ Waste heat

Step 2: Enter your data

► Location

► Electrical grid connection

▼ EV chargers

This block contains parameters and data for both EV charging demand profiles, and for EV charger stations. You can either generate EV charging demand profile from an existing data with a few simple parameters, or you can import your own data if you have it. Whichever mode of data entry you choose, you need to simulate the demand profile in order to generate the required number of EV charger stations.

Typical daily number of charging sessions - Weekday	(?)	50	-	+
Opening time - Weekday	(?)	7		
Closing time - Weekday	(?)	17		
Typical daily number of charging sessions - Weekend	(?)	5	-	+
Opening time - Weekend	(?)	8		
Closing time - Weekend	(?)	13		

► Advanced parameters

Generate EV charging demand

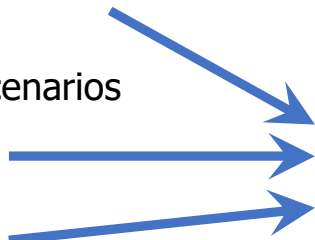
EV charging demand data successfully generated! Check generated data

Made so far – legal analysis

Country	National hydrogen strategy	Hydrogen specific targets (strategic and/or legal)	E-mobility strategy	Including alternative fuels	Definition of energy storage within legal provisions	Bi-directional recharging mentioned
Austria	Yes	Yes (both)	Yes	Yes	No	No
Bosnia and Herzegovina	No	No	No	No	No	No
Croatia	Yes	Yes	Yes (as part of other strategies and laws)	Yes	Yes	No
Czechia	Yes	Yes	Yes	Yes	No	No
Germany	Yes	Yes	No (but legal provisions)	Yes	Yes	Yes (no specific law)
Hungary	Yes	Yes	Yes	Yes	Yes	No
Montenegro	tbm	tbm	tbm	tbm	tbm	tbm
Romania	tbm	tbm	tbm	tbm	tbm	tbm
Serbia	No (draft exists)	No (only in the strategy draft)	No	No	Yes	No
Slovakia	Yes	Yes	No (targets exist in other strategies)	Yes	No	No

Future activities

- Optimization model for sizing and operation scheduling
 - Mathematical background
 - Testing on 6 pilot cases and different theoretical scenarios
- Policy recommendations for policy makers
- Business model development – 1 per PP



Strategy for an integrated
energy and mobility concept

- Action plan for increasing acceptance among policy makers, industry stakeholders and general public
- Scientific papers
 - On mathematical background of the optimization model
 - On social acceptance of e-mobility and hydrogen



Thank you for your attention!

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<https://interreg-danube.eu/projects/danube-indeet>

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