North Adriatic cross-border Hydrogen Valley (NAHV)

Holding Slovenske elektrarne

Košice, SK, 23.2.2023

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NAHV – Lessons learned (till now)

Holding Slovenske elektrarne

Marko Bahor, M.Sc.
Executive director for development and investments

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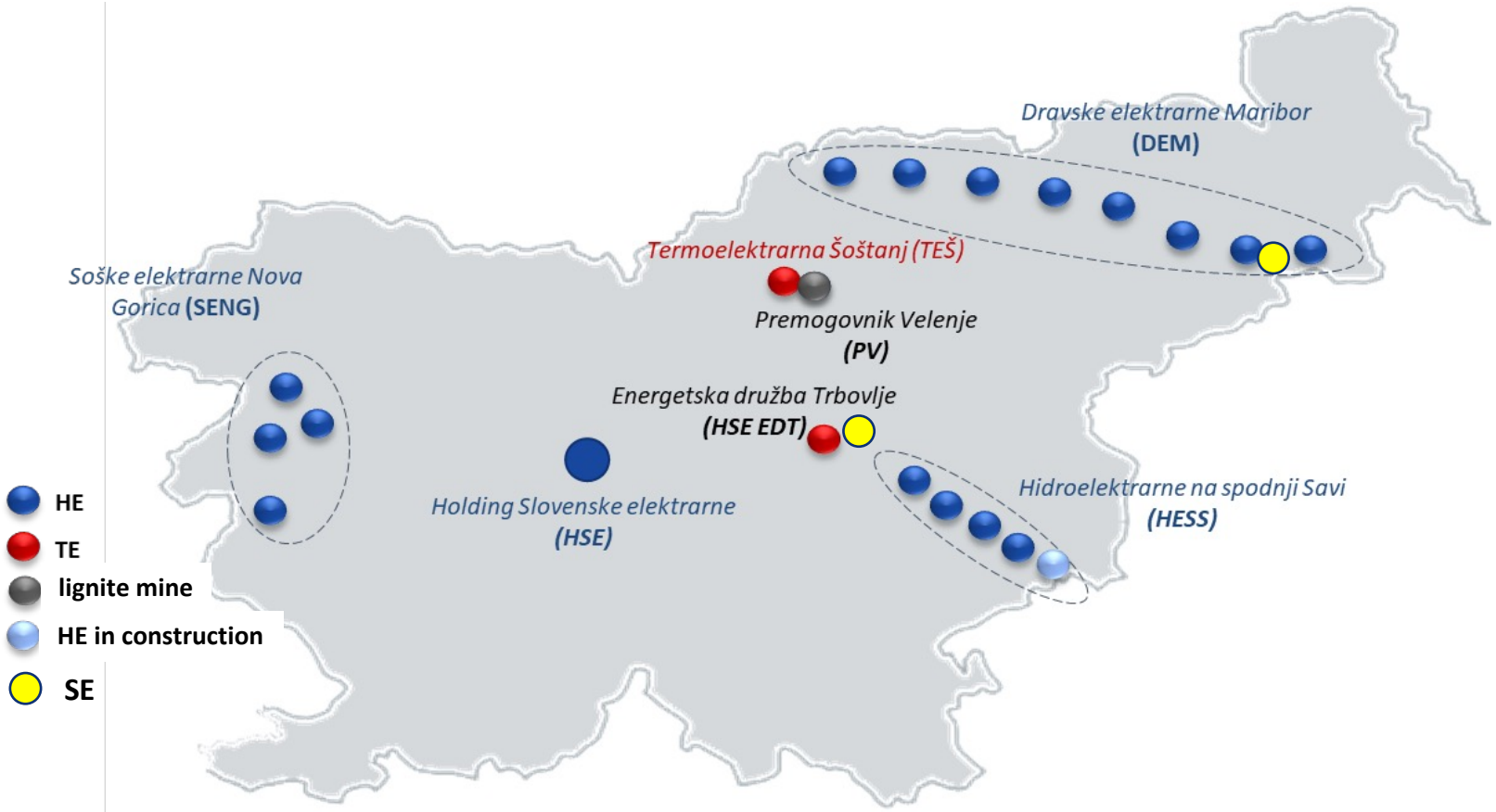
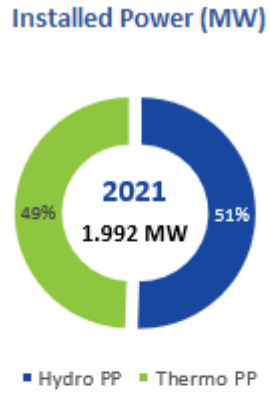
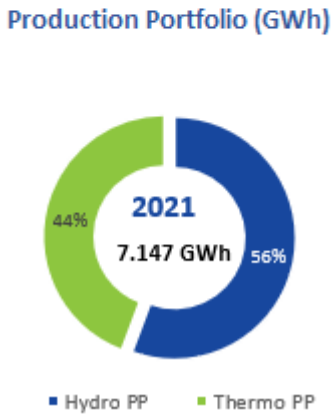
HSE – Production portfolio







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HSE – Main data

Key Financials - Consolidated HSE Group

mill EUR	2017	2018	2019	2020	2021
Operating revenues	**1.619**	**1.505**	**1.743**	**1.873**	**2.931**
Net sales revenue	**1.588**	**1.472**	**1.711**	**1.837**	**2.538**
EBITDA	**138**	**128**	**161**	**188**	**330**
EBITDA margin	*8,71%*	*8,70%*	*9,39%*	*10,23%*	*13,01%*
Assets	**2.138**	**2.135**	**2.074**	**1.865**	**2.044**
Gross Debt	**851**	**784**	**738**	**671**	**642**
Net Debt	**790**	**701**	**695**	**593**	**546**
NFD/EBITDA	*5,7x*	*5,5x*	*4,3x*	*3,2x*	*1,7x*
Funds From Operations	**112**	**120**	**161**	**174**	**206**
FFO / NFD	*14,23%*	*17,07%*	*23,10%*	*29,41%*	*37,72%*
Workforce	**3.093**	**3.074**	**3.147**	**3.151**	**3.203**
Electricity produced (GWh)*	**7.259**	**7.609**	**7.421**	**7.884**	**7.147**

**including the 49 % of generated electricity of HESS*

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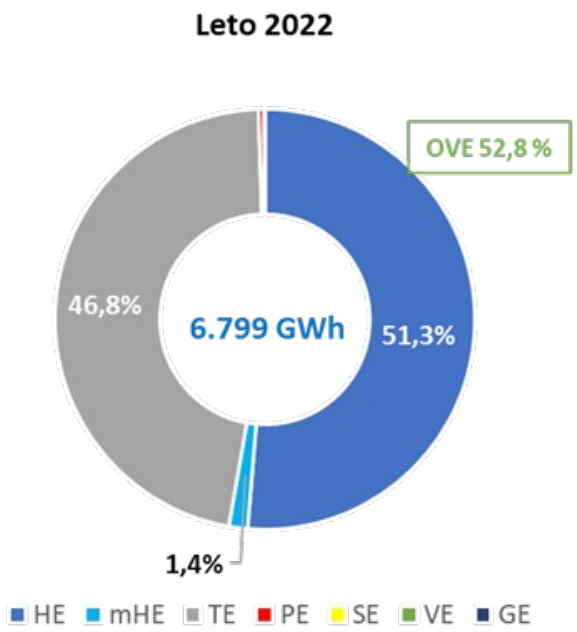
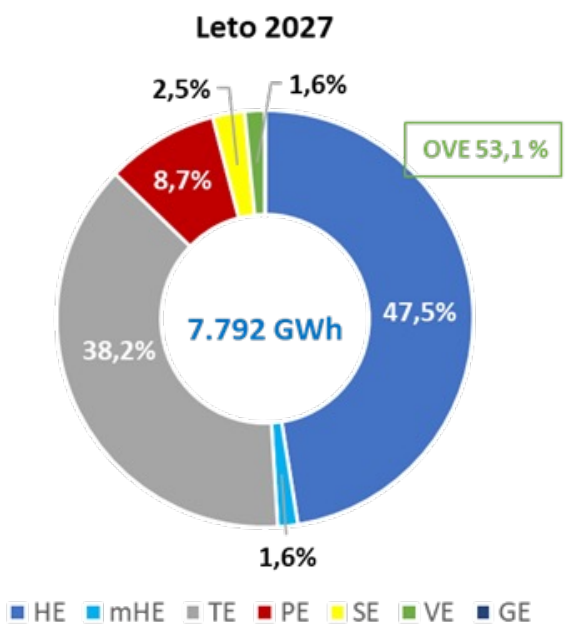
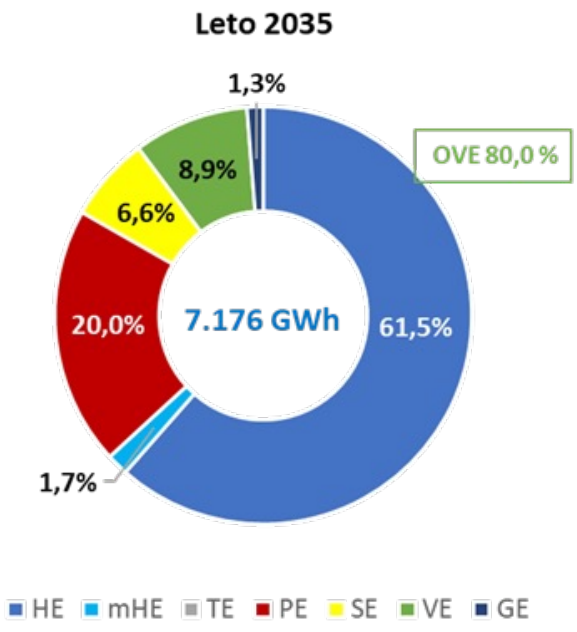
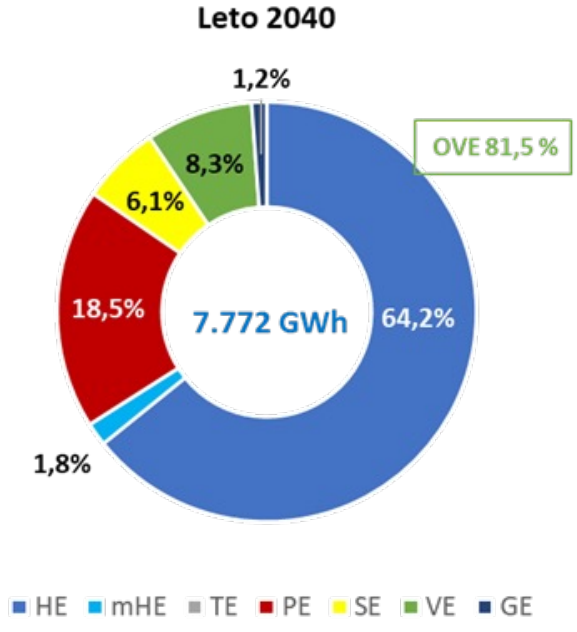
HSE‘s Development plan 2022 – 2040; Portfolio









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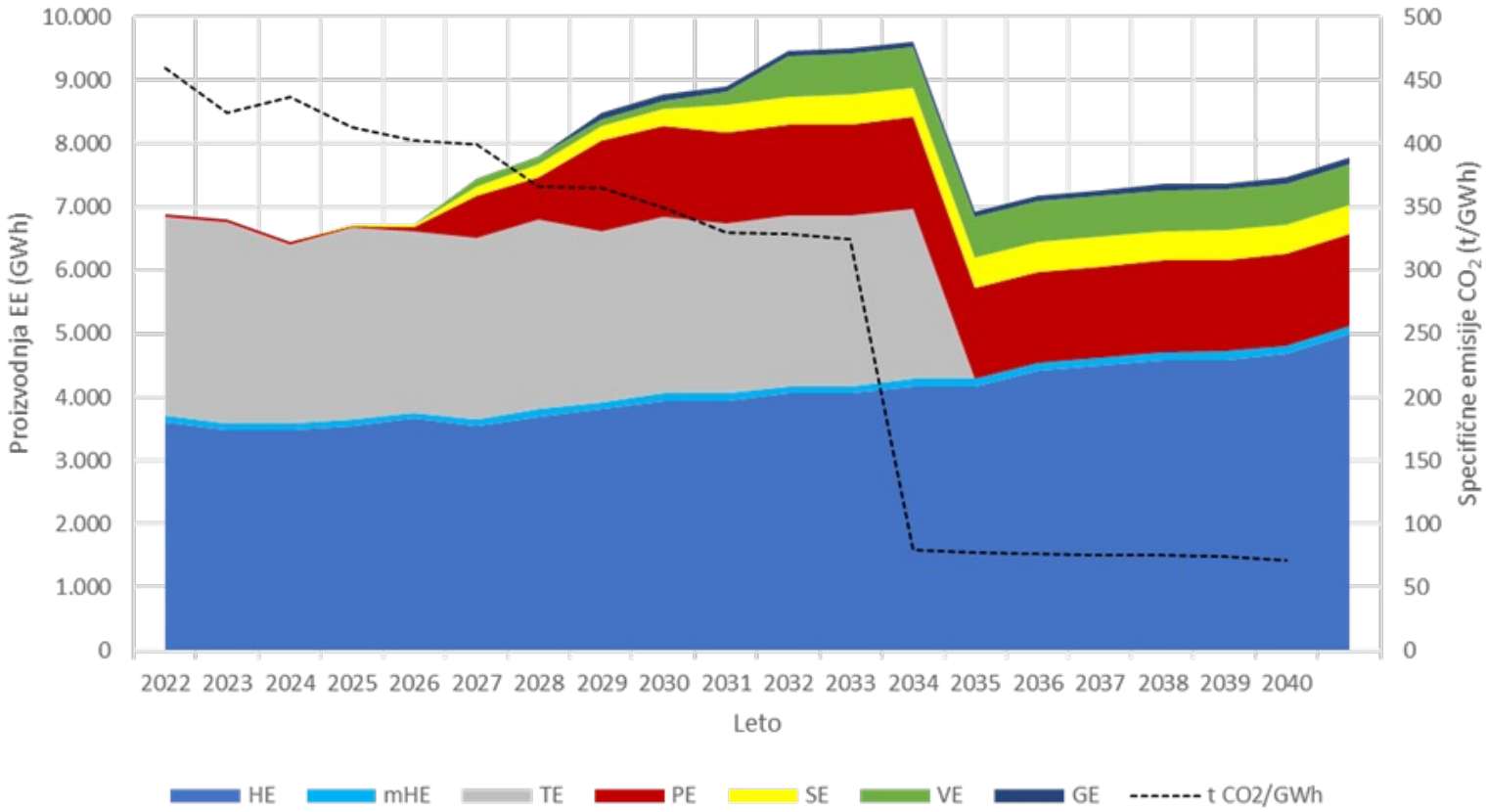
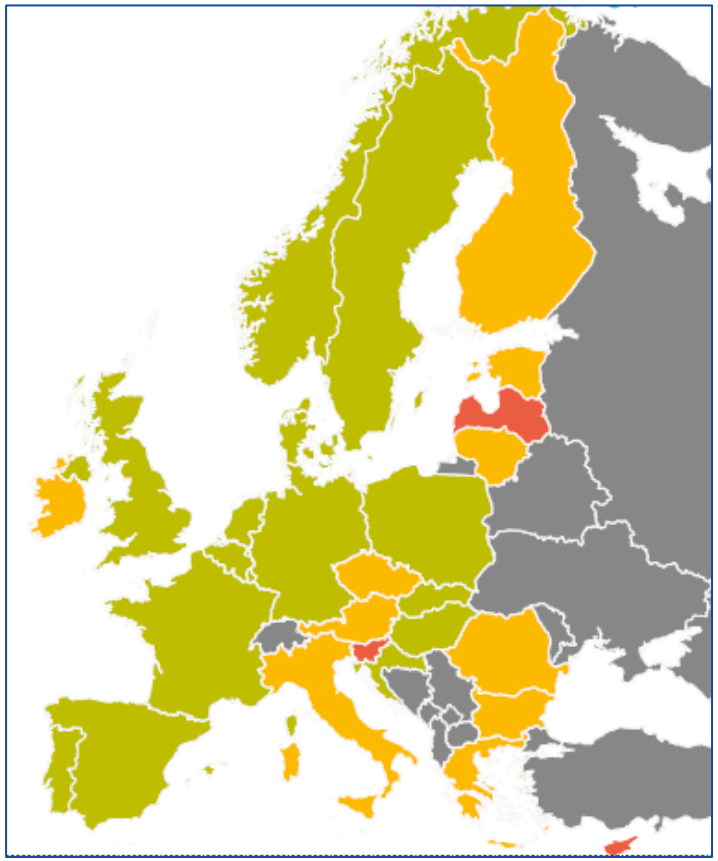
HSE‘s Development plan 2022 – 2040; CO_2 emissions



Hydrogen Strategies by EU Countries

THE FRONTRUNNERS	THE DEVELOPERS	THE LAGGARDS
BELGIUM	AUSTRIA	CYPRUS
CZECH REPUBLIC	BULGARIA	LATVIA
DENMARK	CROATIA	MALTA
FRANCE	ESTONIA	SLOVENIA
GERMANY	FINLAND	
HUNGARY	GREECE	
LUXEMBOURG	IRELAND	
NORWAY	ITALY	
THE NETHERLANDS	LITHUANIA	
POLAND	ROMANIA	
SLOVAKIA		
PORTUGAL		
SPAIN		
SWEDEN		
THE UNITED KINGDOM		



Source: *FleishmanHillard, National Hydrogen Strategies in the EU Member States, February 2022*

Hydrogen Strategy in Slovenia

- **No published Hydrogen strategy yet**
- **Integrated National Energy and Climate Plan (NECP),**
  February 2020
- **Resolution on Slovenia's Long-Term Climate Strategy until 2050 (ReDPS50)**,
  August 2021

Hydrogen Strategy in Slovenia – Main Targets

As per the NECP, it will be necessary to reduce the use of fossil energy sources and dependency on the import of fossil energy sources **by supporting the implementation of pilot projects** for the production of synthetic methane and hydrogen (indicative objective is a **10- per cent share** of methane or **hydrogen** from a renewable source in the transmission and distribution network **by 2030**).

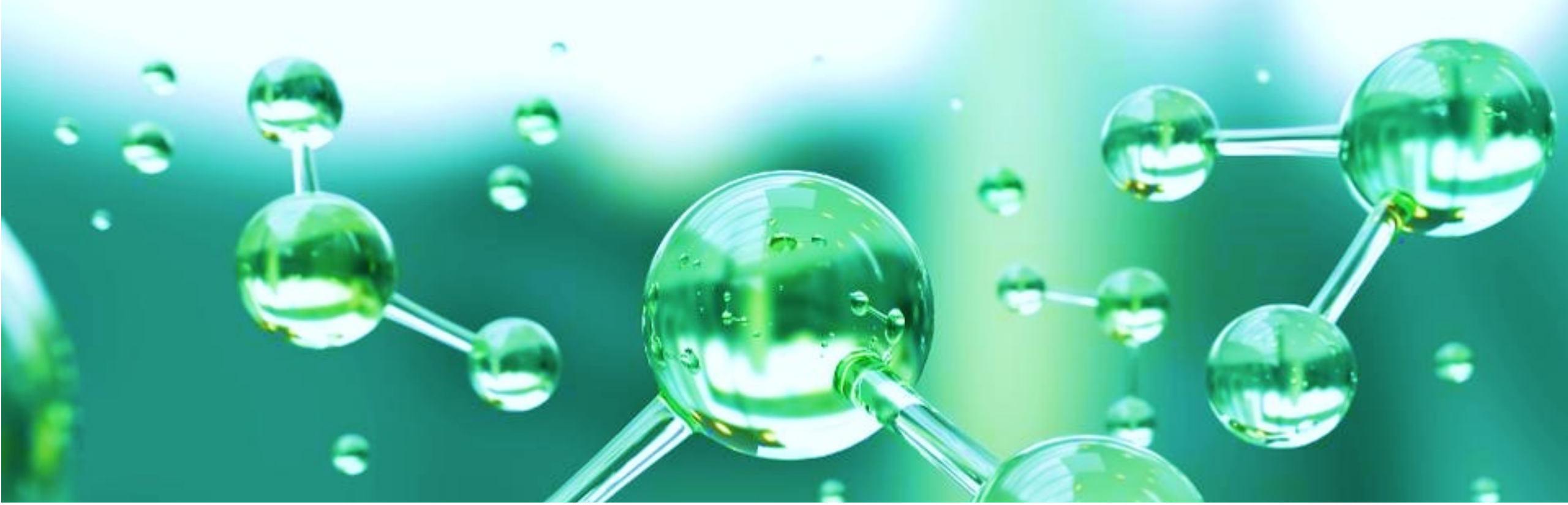
To **decarbonise the industry sector**, it is critical to increase the use of RES in the field of electricity and heat generation. Within the framework of development priorities, Slovenia will examine the use of synthetic gas or hydrogen as a substitute energy product for natural gas in pilot projects by 2040 or sooner in order to reduce emissions in the industry sector. A **10- per cent** substitution of natural gas with synthetic gas is anticipated **in 2030**, a **25-per cent** substitution is anticipated **in 2040**, and **replacement of the entire quantity of natural gas** with synthetic gas or **hydrogen** is anticipated **by 2050**.

Source: *Resolution on Slovenia's Long-term Climate strategy until 2050 (ReDPS50)*

Hydrogen Strategy in Slovenia – Main Targets

Slovenia will continue **to implement alternative fuels in transport**. Battery electric vehicles are becoming more popular, and the growing number of such vehicles must also be supported by an adequate charging infrastructure. By 2050, passenger transport will be electrified. A possible alternative to electrification, especially in freight transport, are bio- and synthetic fuels, which are in certain aspects of their production CO2 neutral, and also **hydrogen vehicles** based on suitable technological development. **By 2050, Slovenia will completely substitute fossil fuels in transport with low-carbon alternatives**. All technologies for the attainment of this objective, particularly in freight transport, have not yet been developed technologically to the extent that they are competitive with regard to price, but the EU commitment to reduce GHG emissions in transport serves as a stable framework for further intensive development of these technologies.

Source: *Resolution on Slovenia's Long-term Climate strategy until 2050 (ReDPS50)*



North Adriatic Hydrogen Valley

Source: *Presentation during conference, HYDROGEN ECOSYSTEM NORTH ADRIATIC 2022, Nova Gorica, Slovenia, 27.09.2022*

A Time for a history

Nova Gorica/Gorizia, Europa/Transaplina Square, **November 21st, 2021**,
Three nations to endors the support North Adriatic Transnational Hydrogen Valley

Early Announcement of the Project

North Adriatic Cross border Hydrogen Valley

ECUBES
Hydrogen & Flexibility

This is how we can accelerate the hydrogen economy

„If we are to meet our climate goals, we need to accelerate in the European hydrogen economy. Hydrogen valleys, are a perfect example of the hydrogen economy we want to build. For example, the Groningen area – in the Northern Netherlands, from the island of Mallorca to the border region between Italy, Slovenia and Croatia. This is how we can accelerate the hydrogen economy on a local scale, on our way towards a European hydrogen economy as a whole." (Brusseles, Hydrogen Week, November 29th, 2021)

November 29th, 2021

Source: *Opening keynote by President von der Leyen at the European Hydrogen Week 2021, https://ec.europa.eu/commission/presscorner/detail/en/speech_21_6421,*

Path passed till today and Current position

- **24.11.2021 - Hydrogen Ecosystem North Adriatic 2021,** 1st Conference

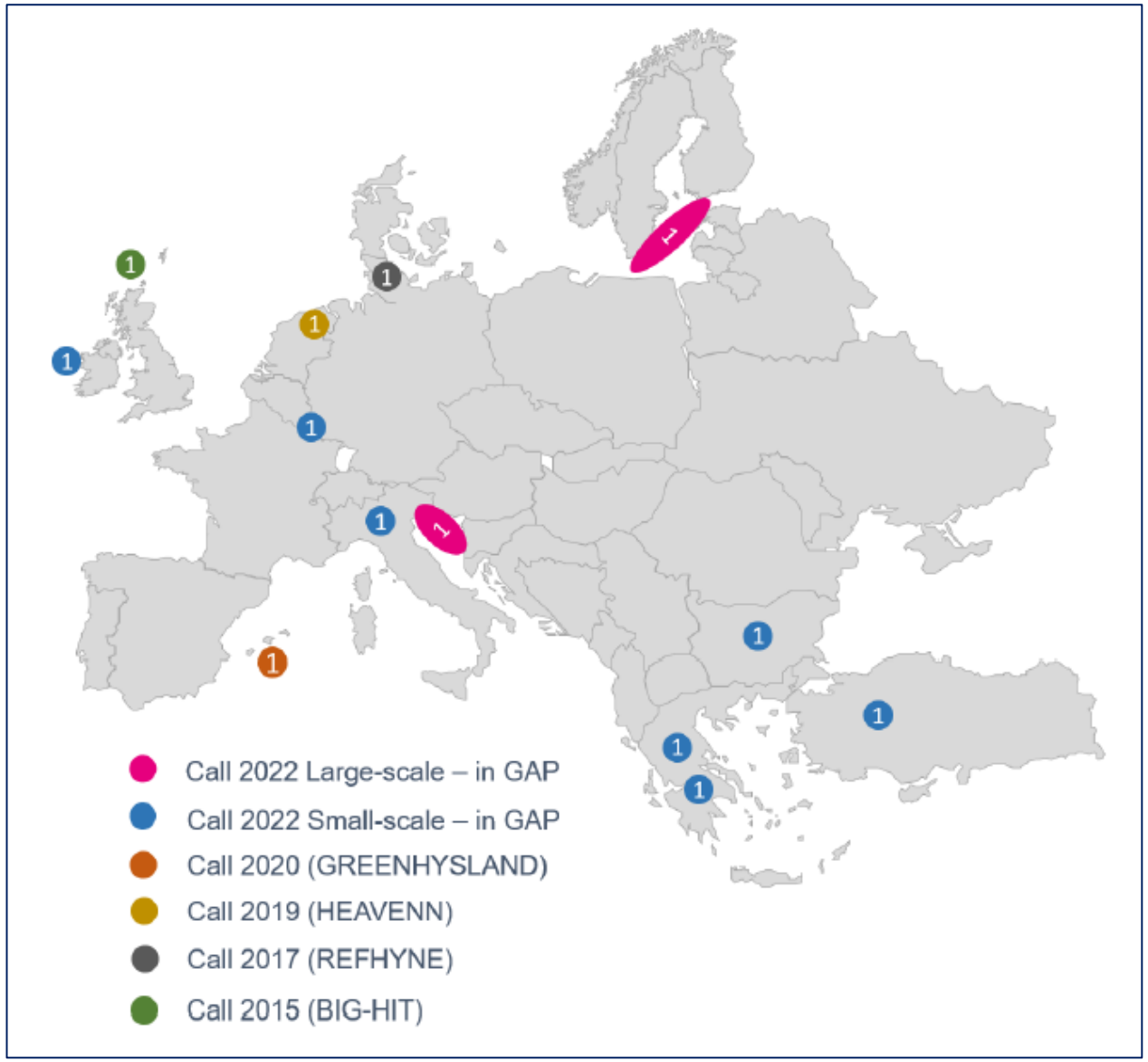
- **14.03.2022 - Letter of intent, MzI (SLO), MGiOR (CRO), Reg.Council (FVG) and formation of JWG**
- 31.03.2022 - Call HORIZON-JTI-CLEANH2-2022
- 11.04.2022 - Formation of JWGs in each of three regions
- 18.05.2022 - JWG has appointed AREA Science park as technical assistance
- **08.06.2022 - MoU, President of the Italian Government and the President of the Region Friuli Venezia Giulia, financing of the Hydrogen Valley**
- 04.08.2022 - JWG has appointed HSE as Lead partner
- 20.09.2022 - Application submission date
- **27.09.2022 - Hydrogen Ecosystem North Adriatic 2022,** 2nd Conference
- **13.01.2023 - Evaluation Summary**
- **Current - Grant Agreement / Consortium Agreement Preparation phase**
- 23.05.2023 - Grant Agreement signature

Hydrogen Valleys – 9 proposals invited for Grant Agreement preparation

Clean Hydrogen Partnership

9 Valleys selected for Grant Preparation

- Total funding requested EUR 105.4 mn, 2 large-scale and 7 small-scale
- North Adriatic, Baltic Sea Corridor, Bulgaria (Stara Zagora), Greece (Crete and Corinthia), Ireland (Galway), Italy (Lombardy), Turkey (South Marmara) and Luxembourg.
- Recent press-release by Clean Hydrogen JU



Source: Clean Hydrogen JU, 9.2.2023

North Adriatic Hydrogen Valley

- A **Hydrogen Valley** is a defined geographical area where hydrogen serves more than one end sector or application in **mobility, industry** and **energy**.
- Hydrogen Valleys are starting to form **first regional "hydrogen economies".**
- **Develop, deploy and demonstrate** a large-scale hydrogen valley with interlinkages to other places of hydrogen production and/or consumptions outside its boundaries.
- Showcase the ability of hydrogen and its associated technologies **to decarbonise different sectors** in EU through this renewable hydrogen flagship project;

North Adriatic Hydrogen Valley

- Demonstrate how hydrogen enables **sector coupling** and allows large integration of renewable energy on the selected territory;
- Include **clear plans** for transport, storage and distribution of hydrogen;
- Cover the complete **value chain of hydrogen** from production to distribution, storage and end-use in order to decarbonise regions by harnessing renewables with significant fluctuations in seasonal energy demand, while at the same time allowing matching supply and demand on a daily basis. The proposed solution should thus provide energy flexibility and improve the **Regions' system resilience** through the use of renewable hydrogen. Applicants are expected to consider the **environmental impact**, including water utilization;
- Foresee enough time for **monitoring and assessment and at least 2 years of operations**. The monitoring strategy should as a minimum allow to assess compliance with the KPIs of the Clean Hydrogen JU SRIA 2021-2027 for each of the technologies covered, as mentioned in the expected outcome section.

North Adriatic Hydrogen Valley

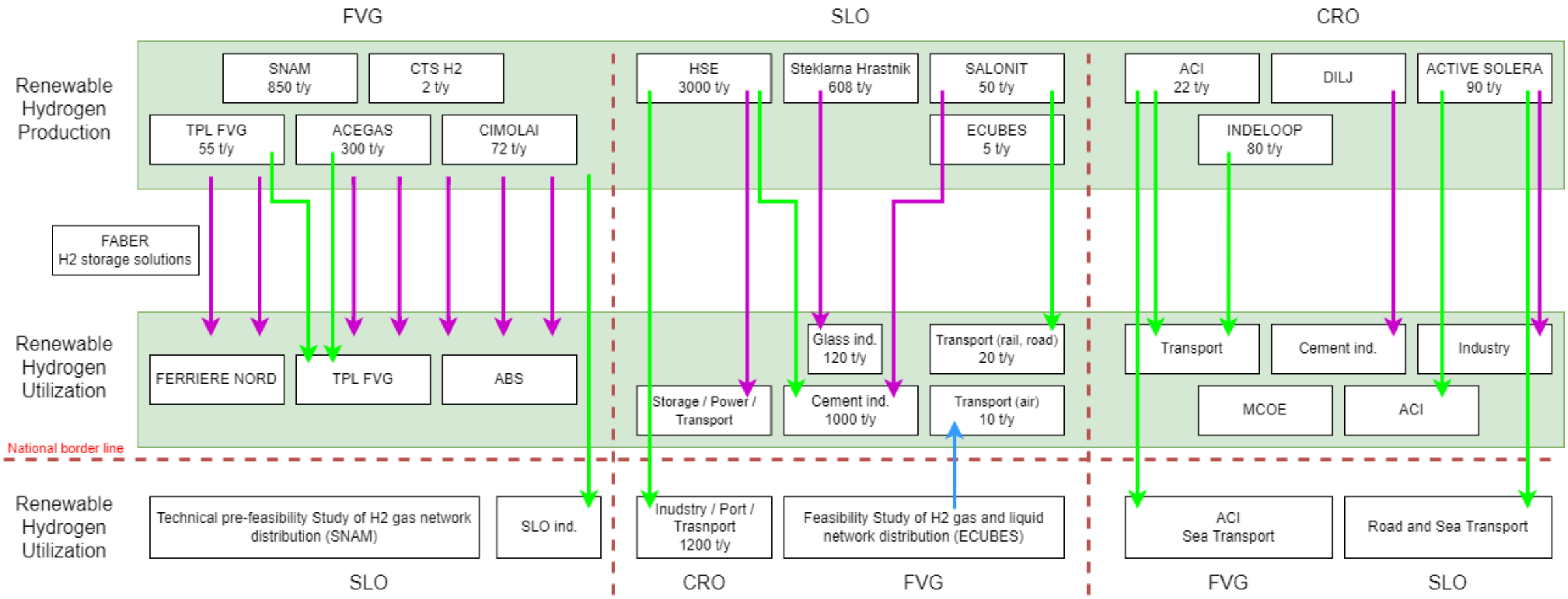
- Production of **at least 5.000 tones of renewable hydrogen per year** using **new hydrogen production capacity**
- It is expected that the majority of the produced hydrogen will be dedicated to **industrial applications**, yet at least 20% of the hydrogen produced should serve other applications.
- **Cross-regional exchange/distribution of hydrogen** is expected to be **at least 20% of the hydrogen produced** in the project and could be bidirectional depending on the location of storage.
- Demonstrate **existing and new markets for renewable hydrogen**, especially when applications are used in synergies;
- If applicable, **pilot implementation** of a transnational-regional/intra-EU renewable (certified via a relevant scheme) hydrogen market / trading of hydrogen across regions/borders.
- Demonstrate how all actors, public and private, at European national and regional level will work together, across the entire value chain, to build **a dynamic hydrogen ecosystem** in the Member States/Regions involved.
- **Demonstrate the replicability and scalability of the project** with the aim of facilitating further deployments of Hydrogen Valleys in other locations in Europe.

North Adriatic Hydrogen Valley - Consortium Partners

	SLOVENIA	CROATIA	ITALY Regione autonoma Friuli-Venezia Giulia
Territory			
Institutional Partners	Ministry of Infrastructure	Ministry of Economy and Sustainable Development	Regional Council of Friuli-Venezia Giulia
Research Community	University of Ljubljana	University of Rijeka	University of Trieste
Industrial Partners	Holding Slovenske elektrarne d.o.o. Termoelektrarna Šoštanj d.o.o. HSE Invest d.o.o Ecubes d.o.o. Steklarna Hrastnik d.o.o. Salonit Anhovo d.d.	ACI Marine Active Solera Dilj Indeloop MCoE Gitone Kvarner d.o.o.	AREA Science Park ABS /Danieli Centro Combustion Snam S.p.A Ferriere Nord, Pittini Group ACEGAS Faber Industrie Meta Group Fondazione Bruno Kessler CTS H2 TPL FVG
Partners Outside Territory	Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón		

North Adriatic Hydrogen Valley - Territory

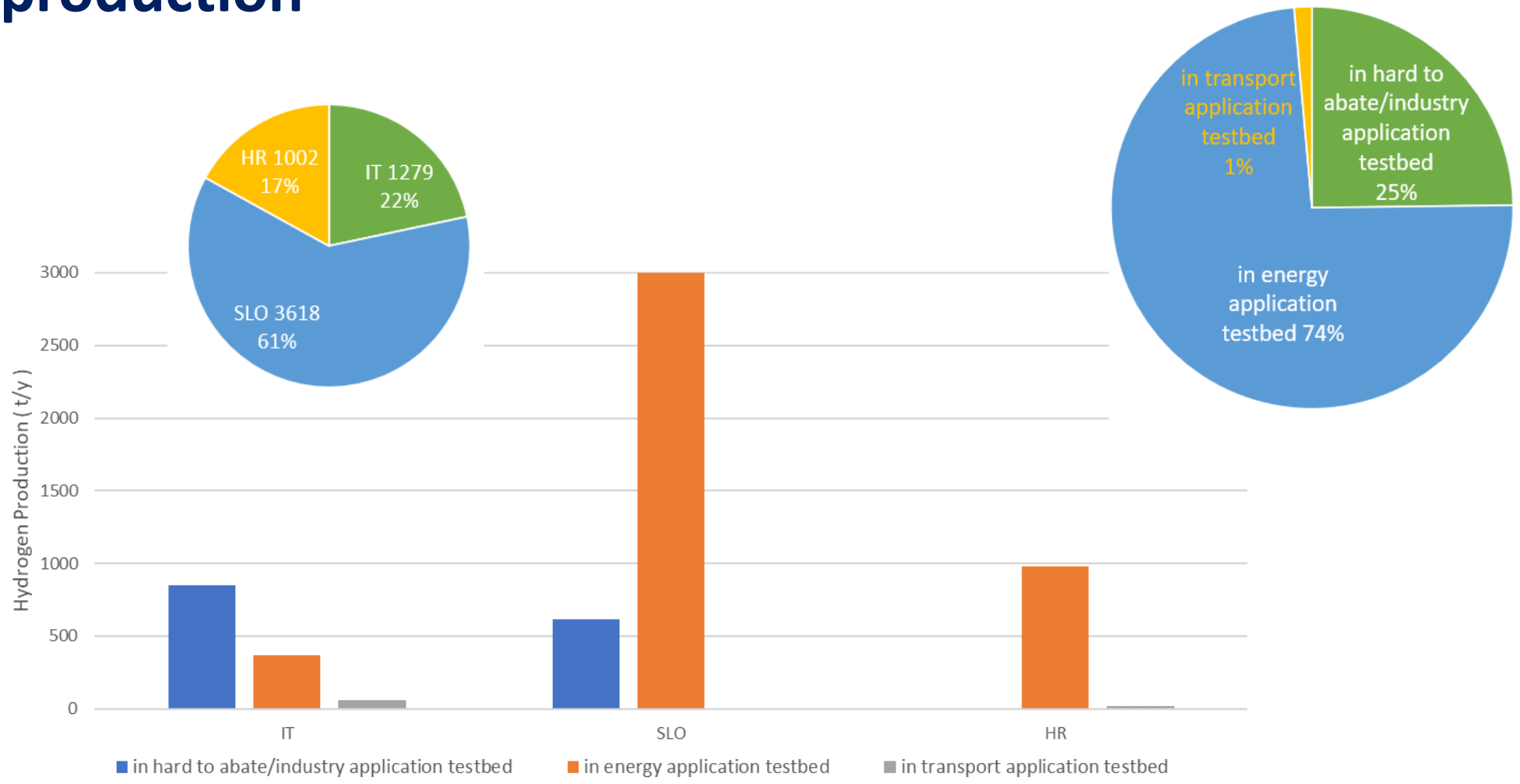
Hydrogen flow within Territory



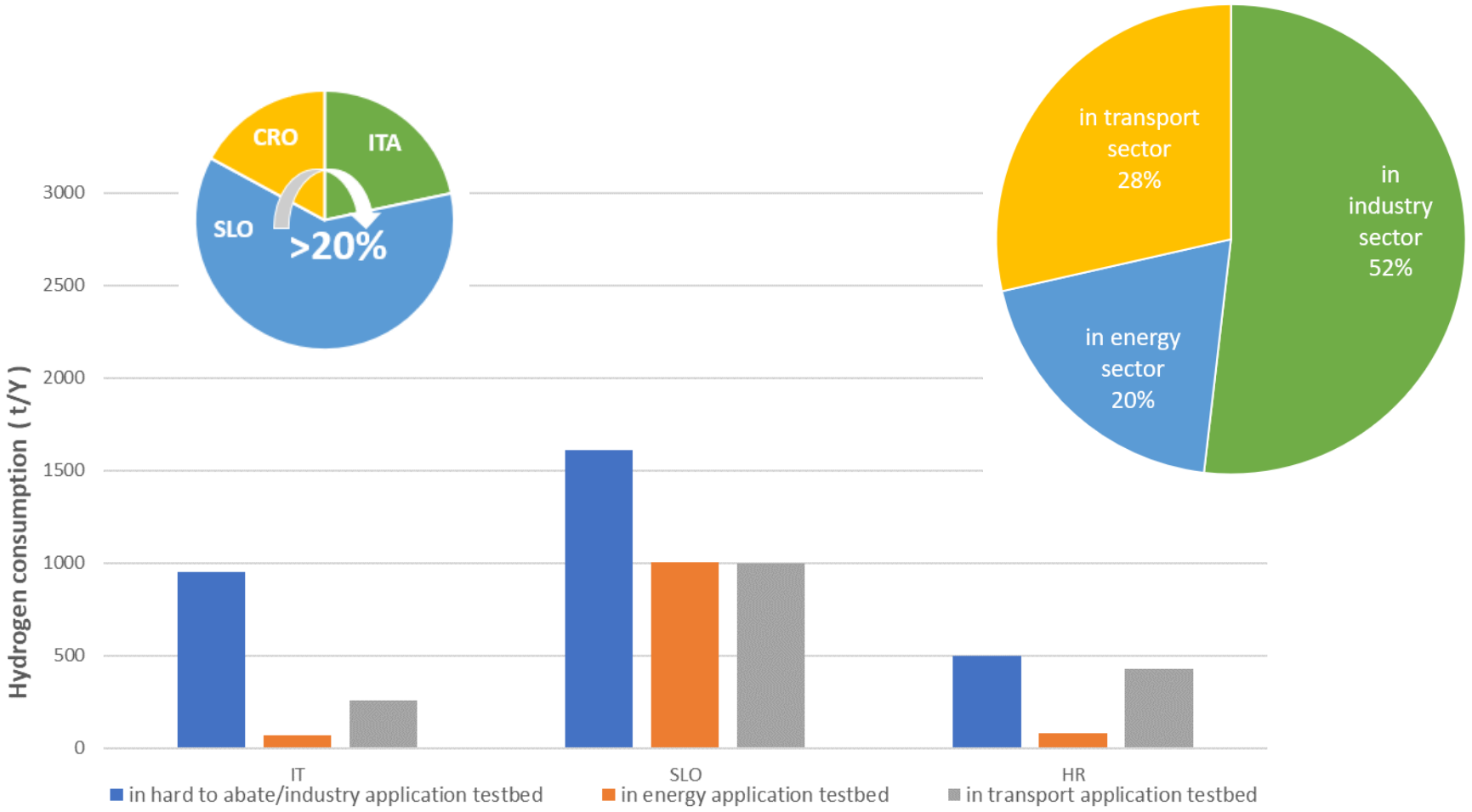
Production capacity established: **5.900 t/y**

Cross-border exchange: **1.200 t/y**

Hydrogen production



Hydrogen consumption



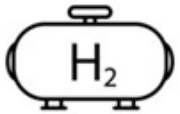
Hydrogen production and consumption

Territory	Company	Supply Chain position	Sector	H2 Production (t/a)	H2 Consumption (t/a)		
					Industry	Energy	Transport
SLOVENIA 	Holding Slovenske elektrarne	producer/end user/distribution	energy/transport/ grid balance	**3.000**	1.000	1.000	1.000
	Steklarna Hrastnik	producer/end user/distribution	hard to abate/ industry	**608**	608		
	Salonit Anhovo	end user/ producer	hard to abate/ industry	**50**	50		
CROATIA 	ACI Marine	end user/ producer/ distributor	transport	**22**			22
	Active Solera	producer	energy	**900**	500		400
	Dilj	end user	hard to abate/ industry	/			
	Indeloop	producer	hard to abate/ industry	**80**			80
	MCoE	end user	transport	/			
ITALY 	Danieli Centro Combustion	end user	hard to abate/ industry	/			
	SNAM/ Halo Industry SpA	end user/producer	hard to abate/industry	**850**	850		
	Ferriere Nord, Pittini Group	end user/producer	hard to abate/industry	/			
Regione autonoma Friuli-Venezia Giulia 	ACEGAS	producer/distributor	energy	**300**	100		200
	CTS H2	distributor	energy	**2**			2
	Cimolai	producer/end user	energy/transport	**72**		72	
	Faber Industrie	producer/distributor	energy				
	TPL FVG	distributor	transport	**55**			55
TOTAL				**5.939**	**3.108**	**1.072**	**1.759**

Financial Overview
(contribution Clean H2 JU and Institutional partners)

Territory	This Call	National Funds available	Initial investment	Investment at Operational level
SLOVENIA 	7,53 mill €	**80 mill €** (Cohesion: 44 mill €, RRF 20 mill €, JTF 16 mill €)	175.26 mill €	345.54 mill €
CROATIA 	7,08 mill €	**80 mill €** (RRF: 59 mill €, ERDF Programme 21 mill €)	38.3 mill €	337.9 mill €
ITALY  Regione autonoma Friuli-Venezia Giulia 	10,18 mill €	**43,5 mill €** (FVG: 23.5 mill €, Italy: 20 mill €)	36.5 mill €	106.9 mill €
Outside Territory	0,21 mill €	/	/	/
Total	25 mill €	203,5 mill €	246 mill €	790 mill €

North Adriatic Hydrogen Valley - HSE‘s Project

Location: TEŠ, Šoštanj, Slovenia						
Project stage	**H2 type**	**H2 production capacity**	**H2 available**	**H2 storage**	**HRS**	**RES source**
Current facility on site	grey H2	200 kW, 32 kg/d	20 kg/d, 8 t/a residual H2	48 kg	/	/
1. phase “mini ZEMC-S”	grey H2 / green H2	200 kW, 32 kg/d	20 +2 kg/d 8 t/a residual H2	48 kg	30 kg/d 1 dispenser	PV: 35 kW
2. phase “ZEMC-S SAŠA”	green H2	500 kW, 213 kg/d	120 kg/d 50 t/a	700 kg	75 kW, 11,7 kg/h 2 dispensers	PV: 4 MWp Hydro PP
3. phase “Industrial scale”	green H2	20 to 30 MW	3.000 t/a	30 t	to be defined	PV: 250 MWp

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Lessons learned (till now)

- Start-up company as a partner might be an issue (resources)
- Small companies or companies with questionable financial sources might be an issue
- Important is introduction and role of institutional partners
- Limit time needed for formation of JWG at institutional level to 3 months max
- Limit number of partners
- GA and CA agreement preparation phase → take into consideration approval process at every partner

Thank you !

„Alle sagten das geht nicht. Dann kam einer, der wusste das nicht und hat es einfach gemacht“

~ Autor unbekannt ~

[Everyone said it wouldn’t work. Then somebody came along who didn’t know that, and just did it.]