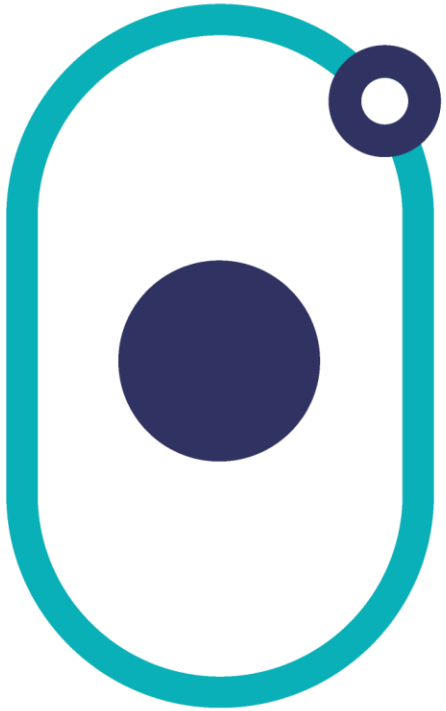


MSR: Hydrogen Region

Daniel Minarik, Ph.D.

Chairman of Moravian-Silesian Hydrogen Cluster

daniel.minarik@msk.cz

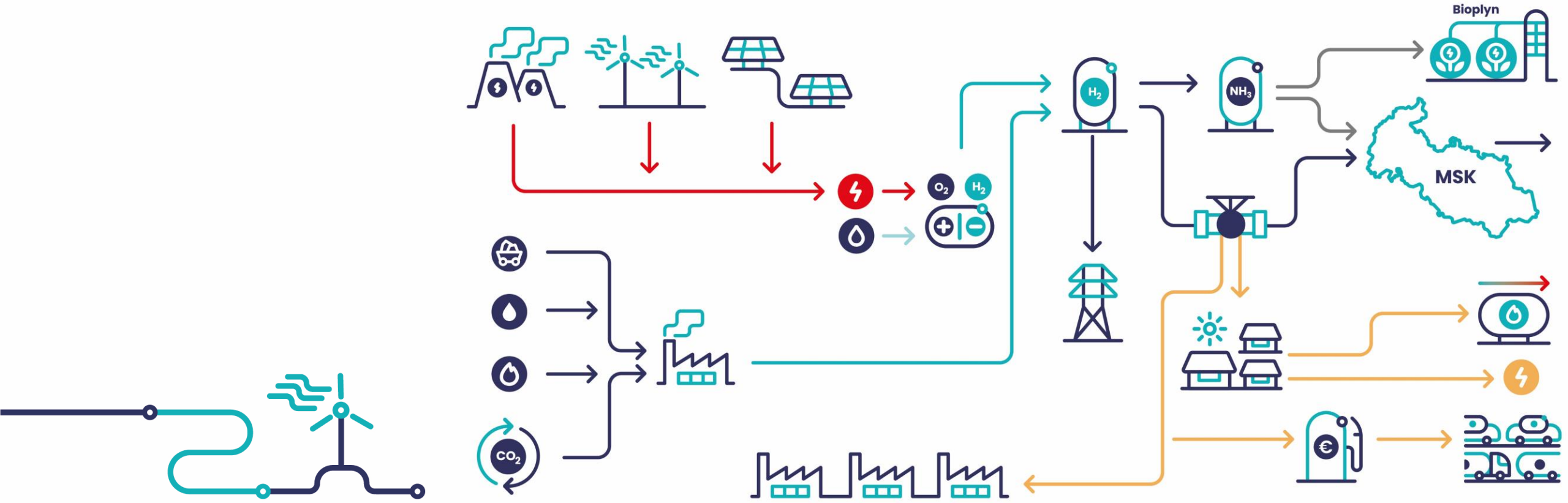
Moravian-Silesian Hydrogen Valley

Vision, Tools, Dimension

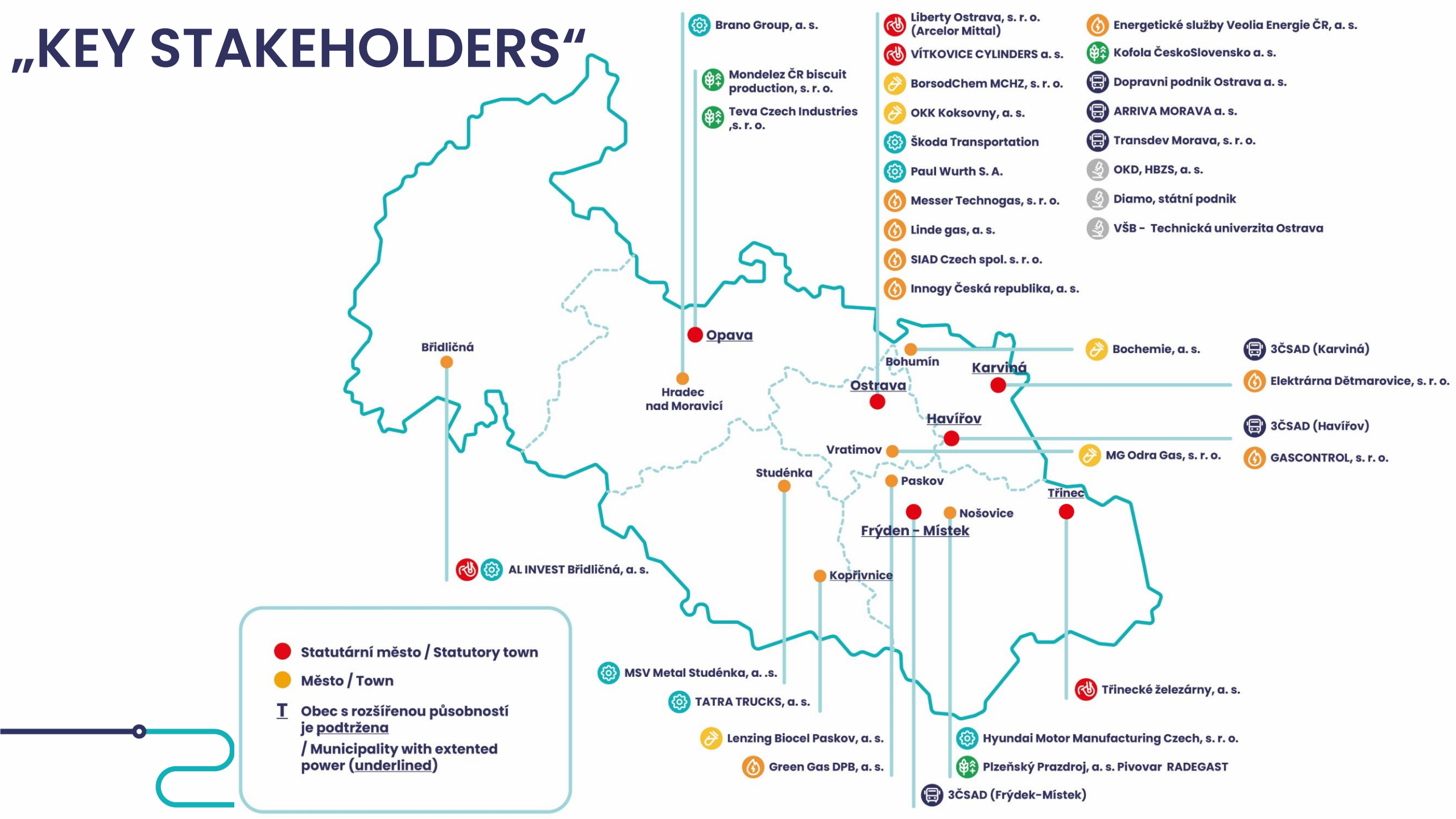
Hydrogen region?? Together!!! UNITY & UNIQUENESS!!

Hydrogen region: our idea, principles

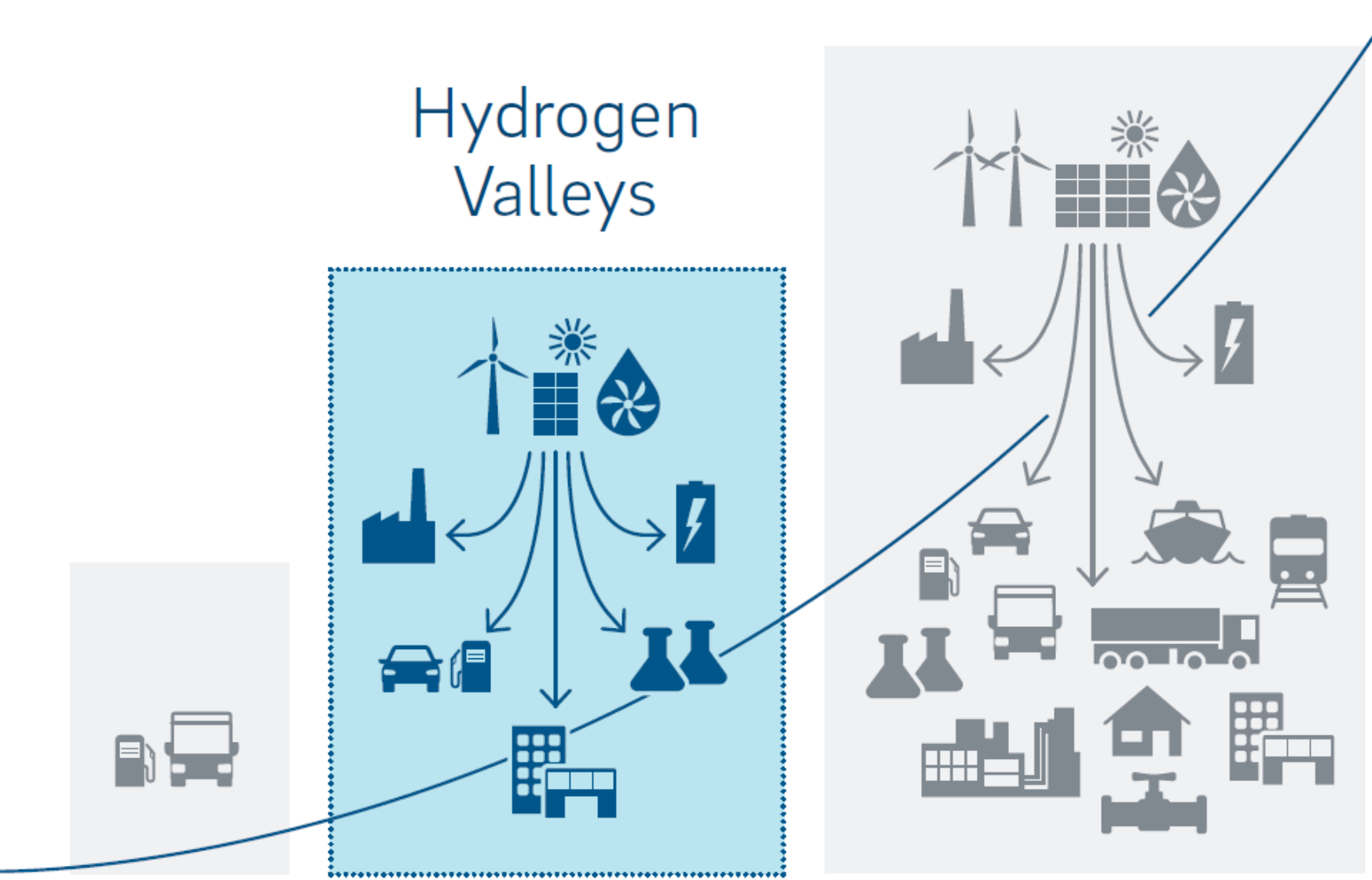
1. Covering the entire value chain
2. Demonstration of sectoral linkages
3. Different use cases of H2T
4. Integrated approach



„KEY STAKEHOLDERS“



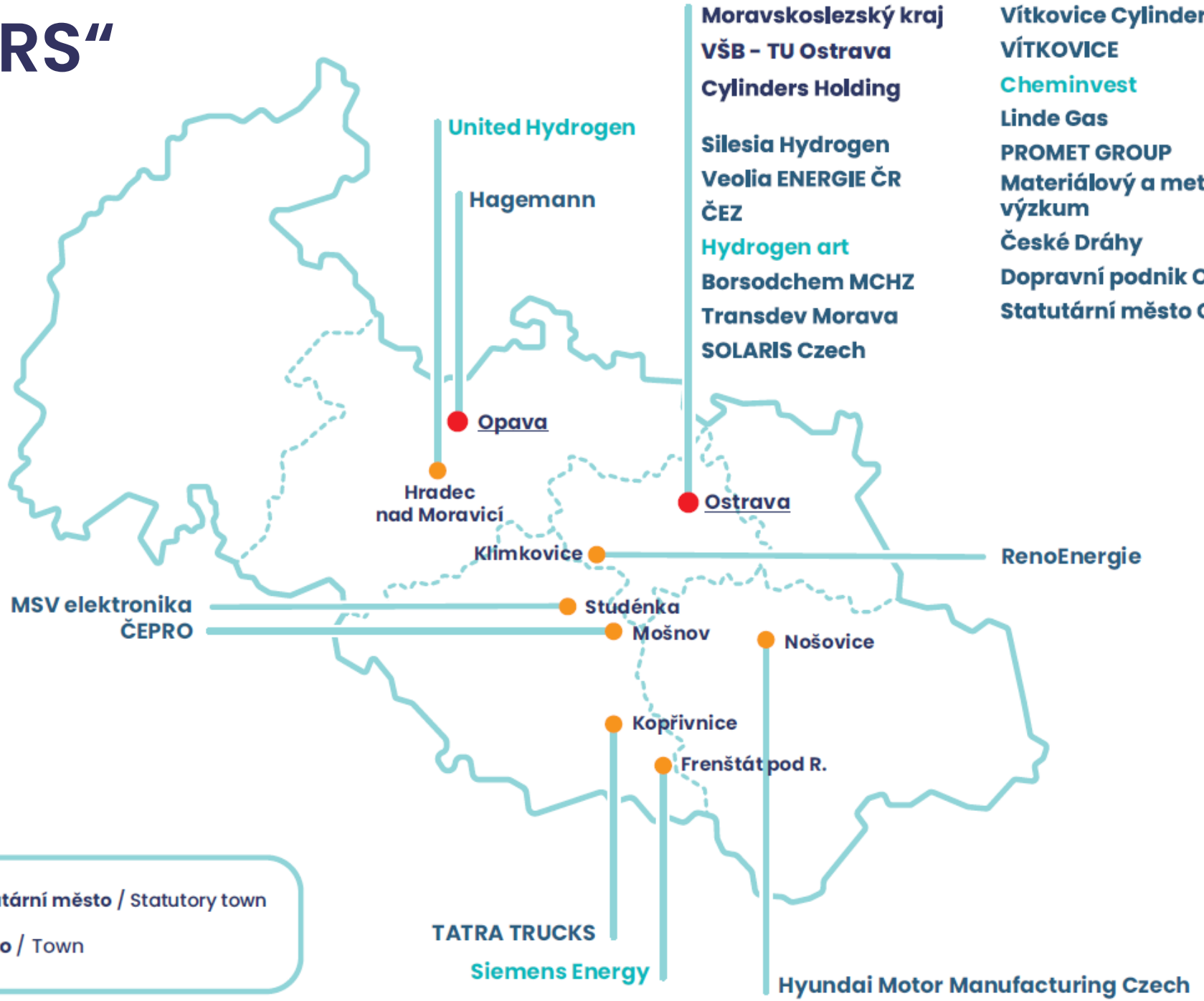
MSR HYDROGEN CLASTER



European Clean
Hydrogen Alliance

Moravskoslezský
kraj

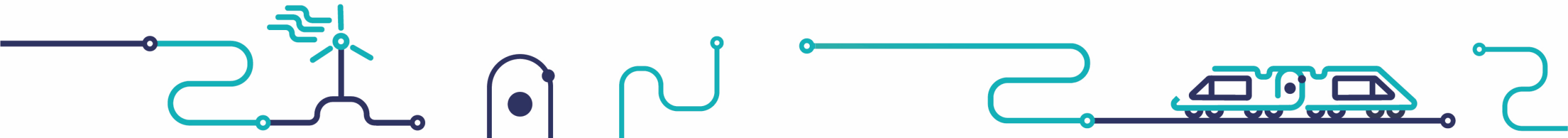
„MSHC MEMBERS“



Hydrogen cluster: the "mission"

The mission of the MSK Hydrogen Cluster is to create a regional innovation and discussion **"arena"** through which stakeholders and companies:

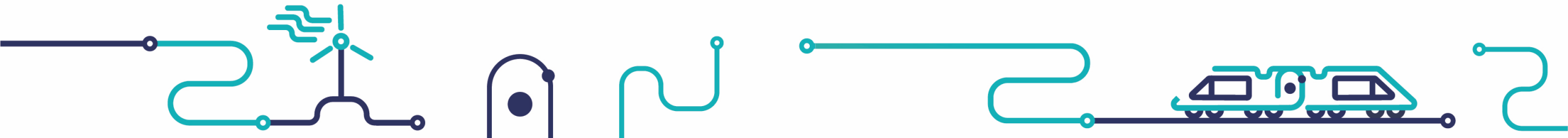
- **collaborate to bring hydrogen technologies to real life** in the region - future regional energy system, clean mobility, Industry 4.0.
- **collaborate on innovations** in future produced or integrated hydrogen technologies
- purposefully **build new competences** of the required workforce
- actively **coordinate the development of the local market** for hydrogen as commodity
- **communicate** the successes and **benefits of applied hydrogen technologies**, whether as part of the component base or ideally as final products
- **capitalise their „know-how“** by providing expert services to help export proven ideas of modern energy approaches and technologies beyond the region



Hydrogen cluster: the "activities"

The cluster will be responsible for providing support in the creation of completely **new business mechanisms and value generation** through business relations between the companies involved in the hydrogen cluster by:

- **clear articulation of specific themes** in applied research
- **creating new business models** to develop the local hydrogen market
- **searching for and transferring good practices** of new potentially successful business activities in the field of hydrogen technologies for medium-sized manufacturing and development companies located in the region - new production capacities, acquisition of the ability to integrate hydrogen technologies, ability to provide logistics, etc.
- **linking local hydrogen valley development activities to the international context** and to the context of European funding for regional energy transformation, which is always conditional on the declaration of a clear regional policy and tangible and demonstrable cooperation of local stakeholders in the hydrogen technology area.

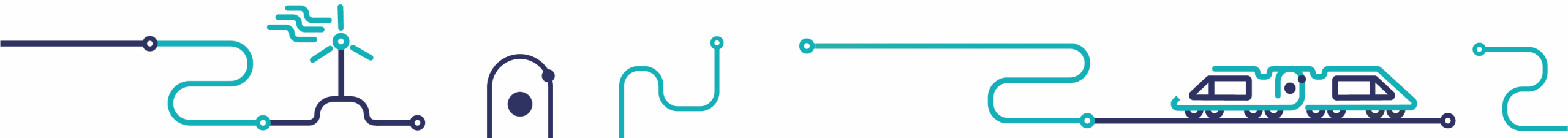


Hydrogen cluster: funding tools

A specific case of targeted investment support that MSK has decided to implement is the **„grid solution",** which includes, the following areas of application of hydrogen technologies:

- **hydrogen production, storage and distribution** = commercial projects without the need to own the entire closed chain
- **hydrogen in industrial processes** = hydrogen as raw material, fertiliser, ammonia, reducing agent in smelters, etc.
- **hydrogen for electromobility** = air transport (only solution), HMD, TIR
- **stationary energy applications of hydrogen technologies** = local energy sources, storage, building applications, critical infrastructure
- **hydrogen and hydrogen technologies as part of distributed energy systems** = cooperation with RES, grid balancing, seasonal storage, "power to gas"

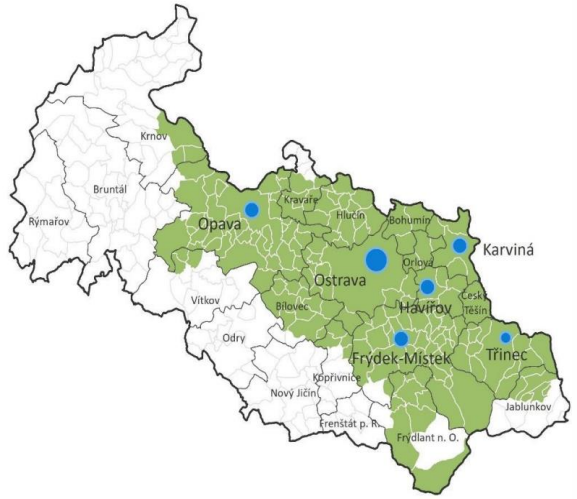
H2 BUDGET: 1 000 mil. CZK ~ 40 mil. €



Hydrogen cluster: funding tools

Another investment support is the metropolitan area support instrument "ITI Ostrava", which supports the creation of **strategic integrated solutions** that are largely oriented towards hydrogen technologies - REFRESH platform

- City of Ostrava owned Strategy Document „ITI Ostrava Metropolitan Area Strategy for the period 2021-2027“; approved by Government Resolution No. 259 of 8 March 2021.
- Multi-source strategy
- Action plan, consisting of the programming frameworks for each operational programme **(IROP, OPD3, OP ENV, OP TAK, OP JAK)**
- **zero emmision buses + infrastructure**
- **REFRESH + infrastructure services, sector-coupling tools**



H2 BUDGET: 1 500 mil. CZK ~ 60 mil. €

Projects: R&D


216
SIEMENS


Shell Eco-marathon
Circuit de NOGARO
20 et 21 mai 2006
25
HYDROGENIX 2

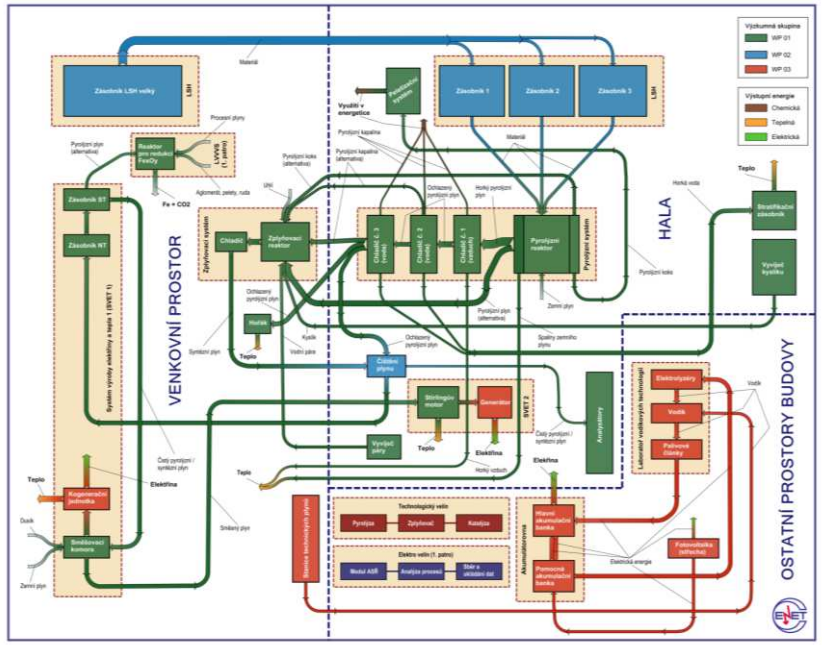

Shell Eco-mara
SIEMENS


STOP


APT


APT

VÝZKUMNÉ TECHNOLOGICKÉ CENTRUM OSTRAVA




CEETe


HVÁLEK
ATELIÉR


e
CHVÁLEK
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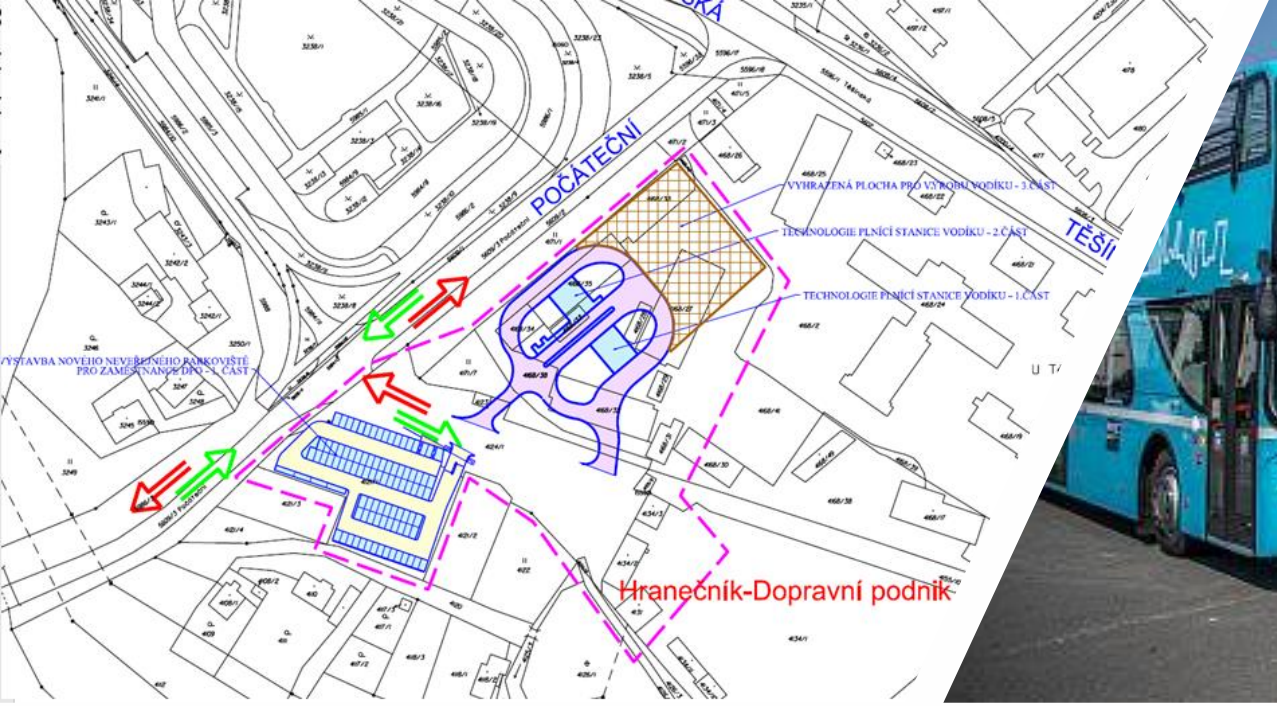
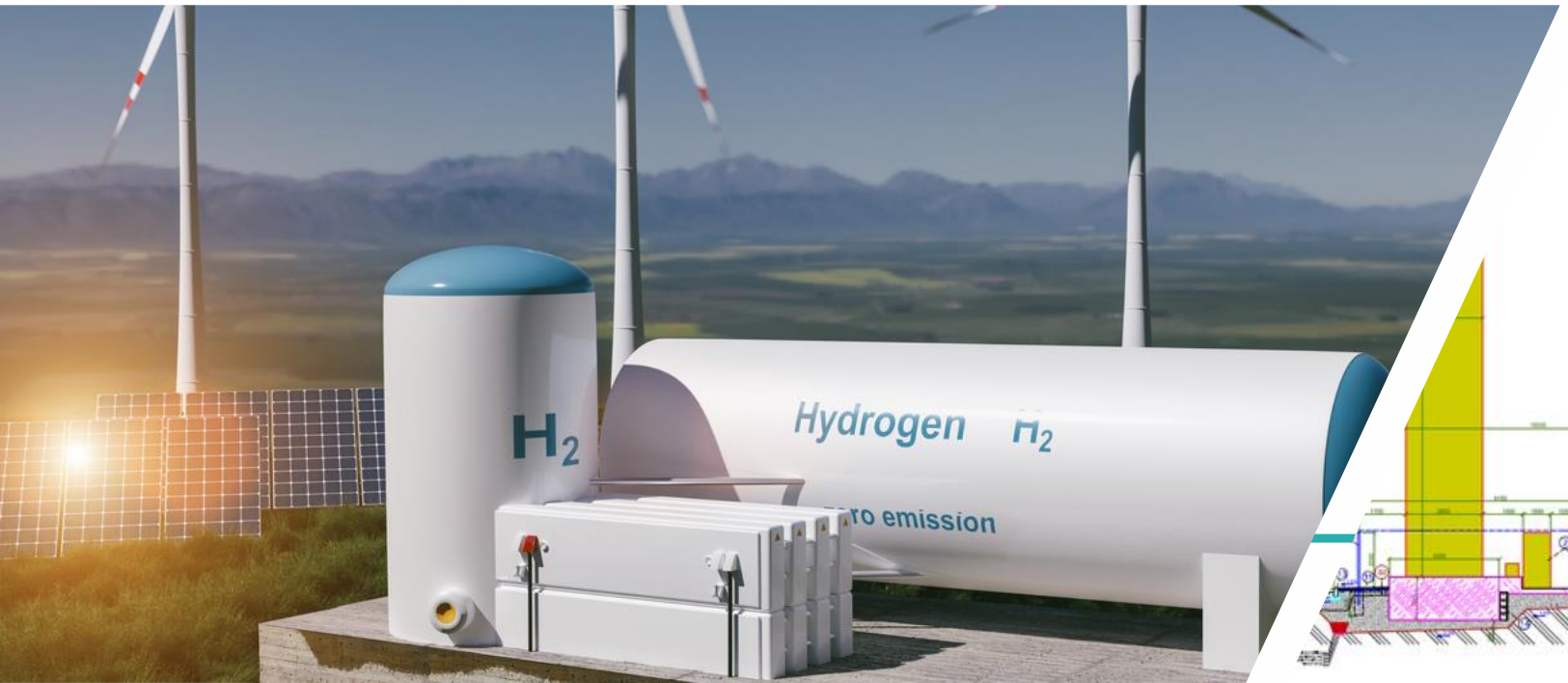
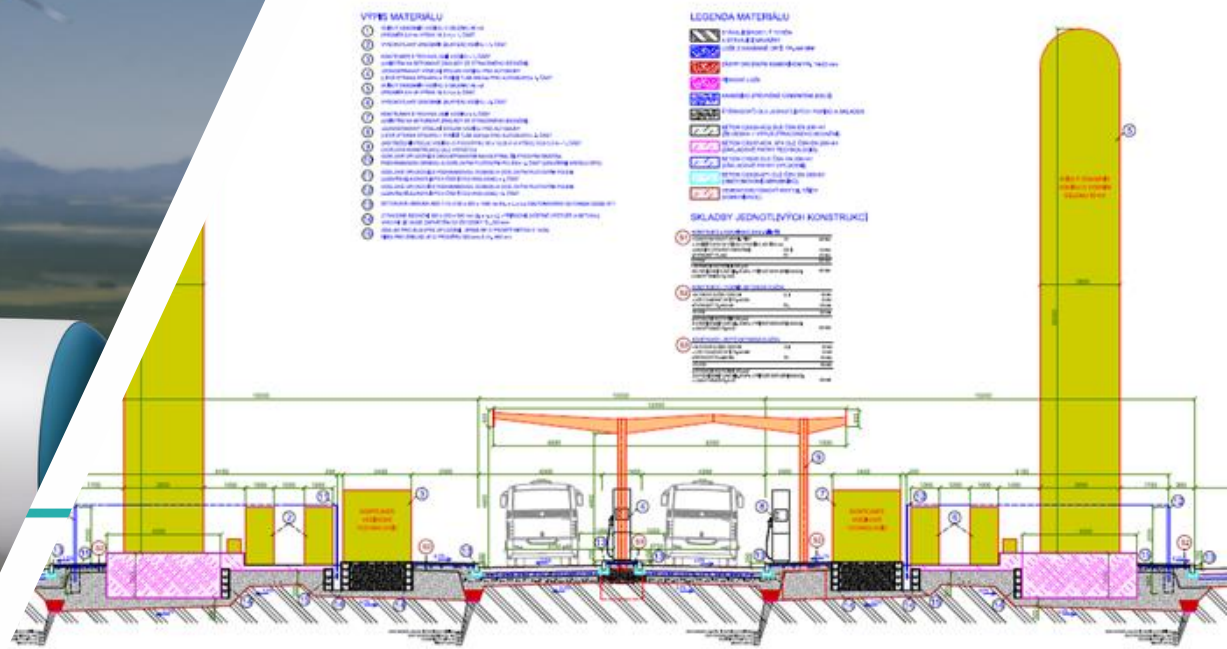
CEETe

Projects: Infrastructure


POČÁTEČNÍ
TĚŠÍN
VYHRAZENÁ PLOCHA PRO VÝROBU VODÍKU - 3.ČÁST
TECHNOLOGIE PLNÍCÍ STANICE VODÍKU - 2.ČÁST
TECHNOLOGIE PLNÍCÍ STANICE VODÍKU - 1.ČÁST
VÝSTAVBA NOVÉHO NEVEŘEJNÉHO RAKOVIŠTĚ PRO ZAMĚSTNANCE DPO - 1. ČÁST
Hranečník-Dopravní podnik


dpo


H2
Hydrogen H2
zero emission


VÝPIS MATERIÁLU
LEGENDA MATERIÁLU
SKLADBY JEDNOTLIVÝCH KONSTRUKCÍ

Hydrogen in mobility project

PUBLIC HYDROGEN FILLING STATION (FS)

The project part of the FILLING STATION is solved within 3 technological phases:

- **construction of a filling station with a capacity of 500kg/day (2023)**
- expansion of the filling station to the target capacity of 1000kg/day (2026)
- construction of green hydrogen production capacity at the filling station site (2028) *(water electrolysis in combination with a variant hydrogen production by steam reforming from natural gas)*

Hydrogen in mobility project

ACQUISITION OF HYDROGEN POWERED BUSES (H2B)

The project part of the acquisition of hydrogen powered buses (H2B) deployed in DPO & MSR lines is divided into two phases:

- **DPO acquisition of 10 H2Bs (5 acquisitions + 5 options) (2023)**
- **MSR ordering 10 H2Bs (2024)**
- Common acquisition of up to 20 additional H2Bs (2025/2026)
- MSR TARGET: more than 500 H2 buses to 2032

DOPRAVNÍ PODNIK OSTRAVA

OSTRAVA!!!

Moravskoslezský kraj

Ministerstvo dopravy

Operační program Doprava

Evropská unie – Investice do vaší budoucnosti

Hydrogen in mobility project

ORDERING HYDROGEN TRAINS (H2Tr)

In 2019, a fesibility study of „train operation“ in MSK was prepared

line 292: Opava - Krnov - GLucholazy (PL) - Jeseník - Šumperk - Zábřeh na Moravě

line 310: Opava - Krnov - Bruntál - Moravský Beroun - Olomouc

České dráhy

SPRÁVA ŽELEZNIC

Moravskoslezský kraj

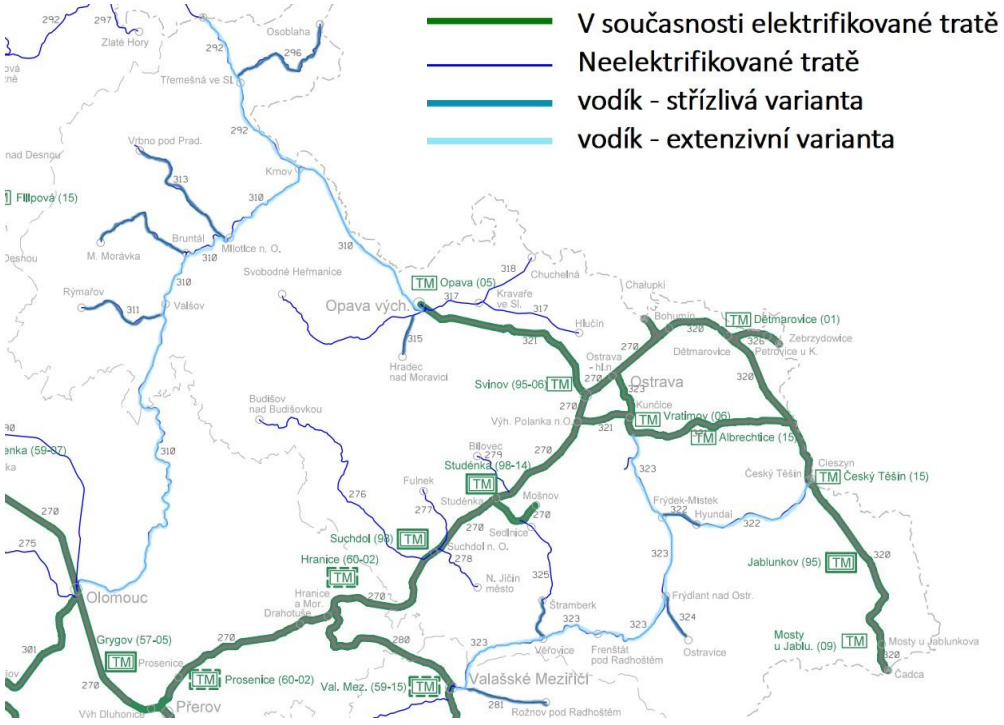
ALSTOM

SIEMENS

ŠKODA TRANSPORTATION

Hydrogen in mobility project

VAR (tracks)	Track lenght [km]	Connections [per day]	Carriage - km	H2 Consumtion [kg / day]
no. 324	7	2 x 20 (40)	280	56 - 84
no. 311, 312, 313	15+17+20 (52)	18+10+18 (46)	800	160 - 240
no. 322, 324, 325	27+7+27 (61)	40+40+44 (124)	2548	510 - 765
no. +292, +310, +323	+123 +116 +72 (424)	various tracks	8804	1760 - 2640



Hydrogen in industrial project

GREENERING OF HYDROGEN PRODUCTION FOR HYDROGENATION PROCESSES

- Anilin PRODUCTION Capacity in MSR: 165.000 tons/y
- **Hydrogen PRODUCTION Capacity: up to 42.000 kg/d**
- Electricity DEMAND: up to 2.300 MWh/d

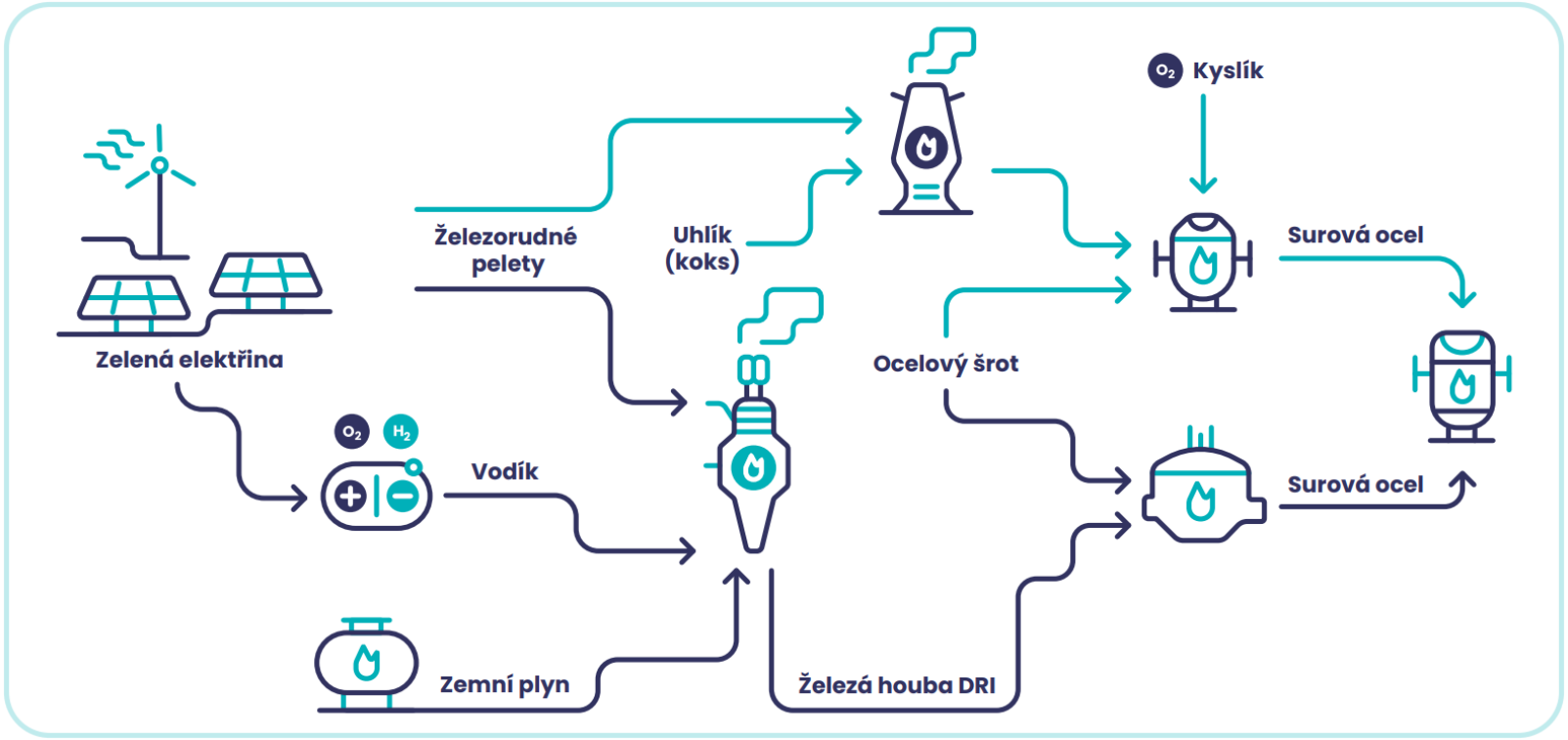
WANHUA

BorsodChem
Chemistry for generations

Hydrogen in industrial project

PRODUCTION OF IRON BY HYDROGEN DIRECT REDUCTION

- Steel PRODUCTION Capacity in MSR: 4.700.000 tons/y
- **Hydrogen DEMAND: up to 330.000 tons/y**
- Electricity DEMAND: 18.100 TWh/y



Hydrogen in industrial project

PRODUCTION OF IRON BY HYDROGEN DIRECT REDUCTION

- Steel PRODUCTION Capacity in MSR: 4.700.000 tons/y
- **Hydrogen DEMAND: up to 330.000 tons/y**
- Electricity DEMAND: 18.100 TWh/y (49.500.000 MWh/d)

LIBERTY

TŘINECKÉ ŽELEZÁRNY

SKUPINA ČEZ

čeps, a.s.

… and MORE, and MORE, and MORE!!!

DECARBONISING INDUSTRY MATCH-

THANK YOU!!!

QUESTIONS???
ANSWERS...

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