



# Strategy of Economic Restructuring of Usti, Moravian-Silesian and Karlovy Vary Regions

Working Group 2:  
Energy system transformation and clean air  
- Project Lab -

Priority projects in Coal Regions  
in Transition in Czech Republic

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Strategy of Economic Restructuring  
of Usti, Moravian-Silesian  
and Karlovy Vary Regions

# Geothermal Project Litoměřice a short overview & broader context

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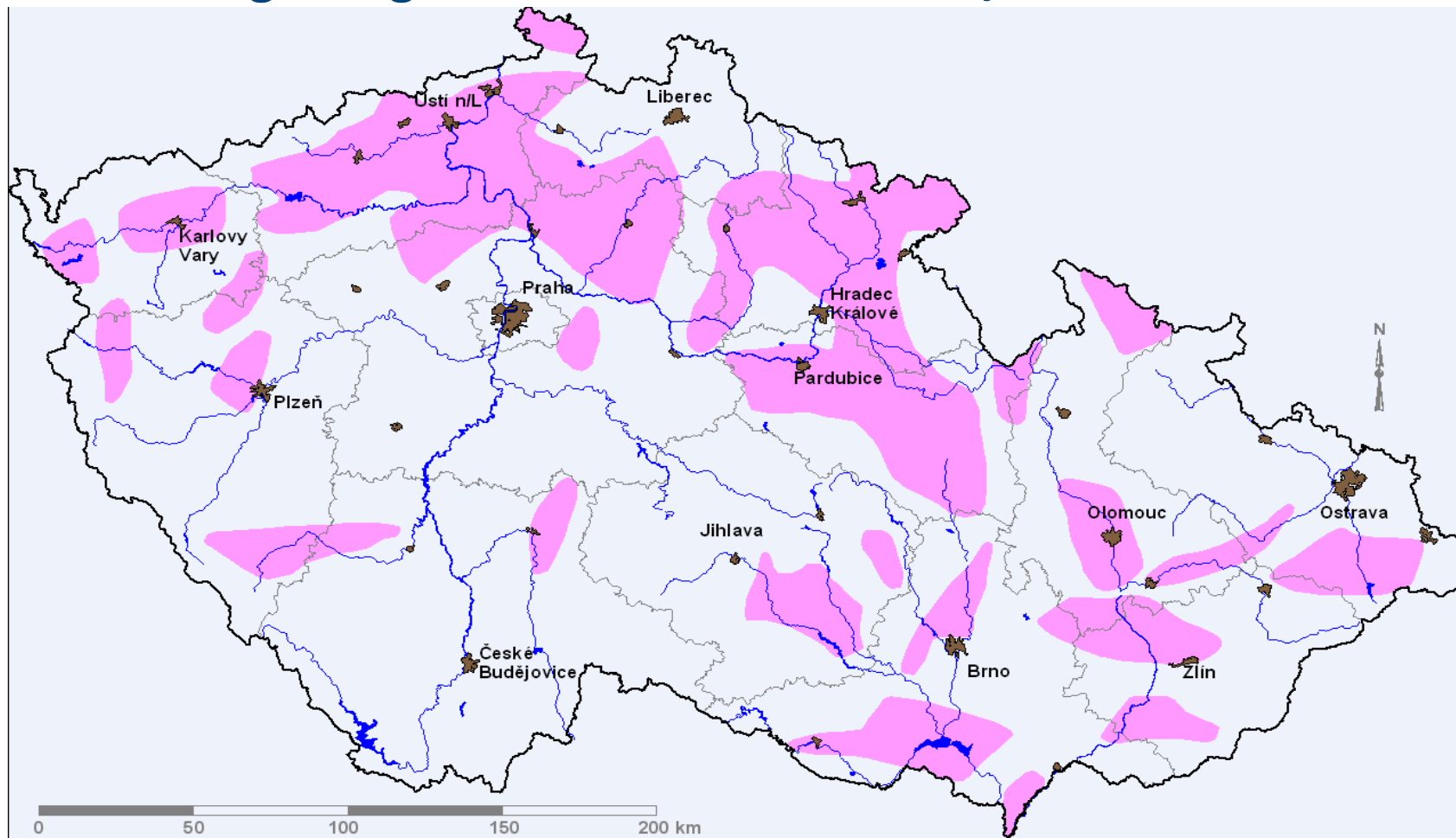
# Geothermal Project Litoměřice

## Location



# Geothermal Project Litoměřice

## Suitable geological conditions for EGS/HDR\* in Czechia

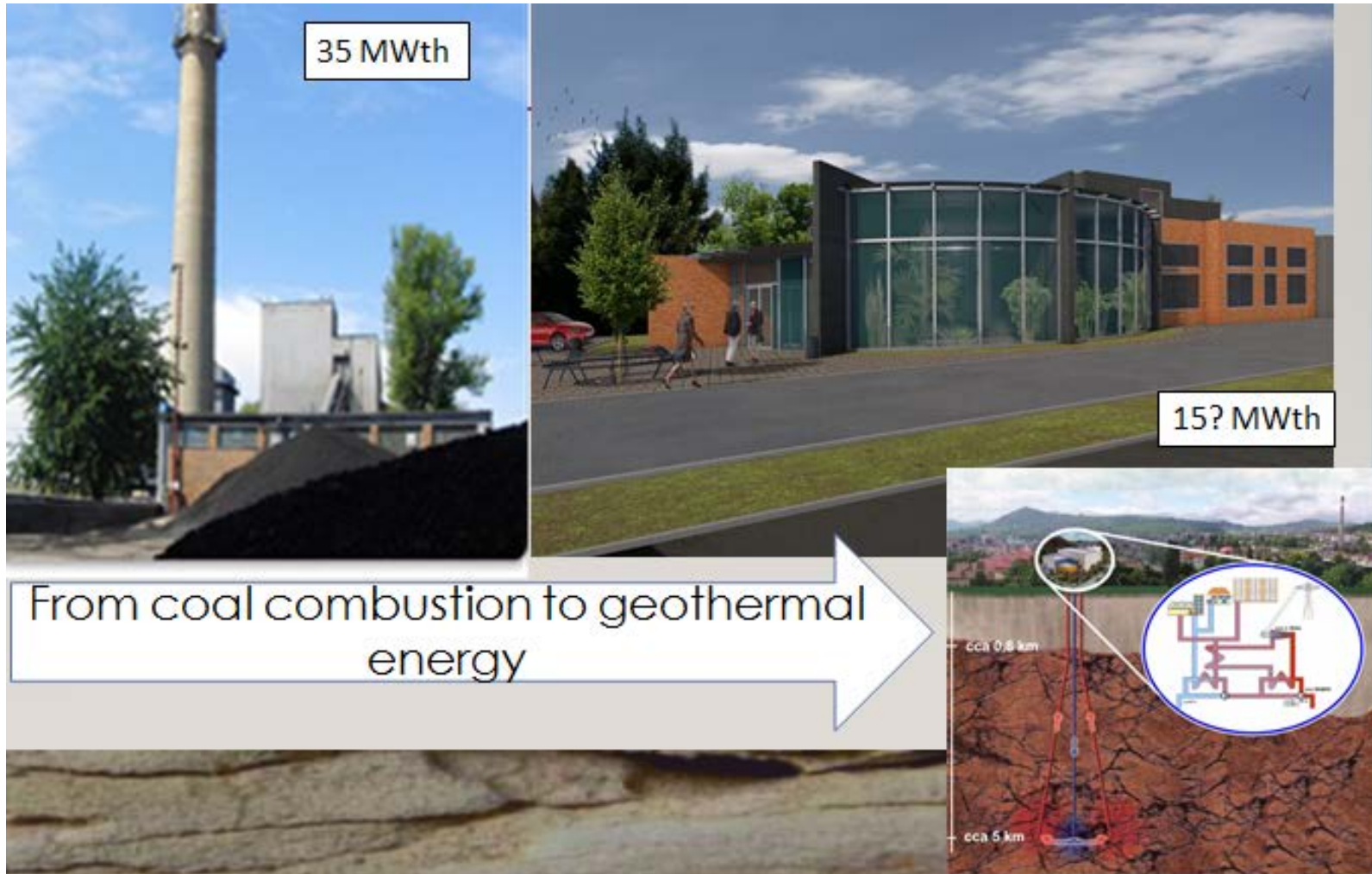


\* EGS - enhanced geothermal system; HDR - hot dry rock



# Geothermal Project Litoměřice

## Moving towards de-carbonisation





## Geothermal Project Litoměřice

### First steps – exploratory well 2,1 km (2007-8)

- confirmation of the heat gradient,
- clarification of the geological profile.



# Geothermal Project Litoměřice

## Phase I – geothermal research

### Research Infrastructure RINGEN (est. 2016)

Funding 1: **Operational Programme „OP VVV“ call „Research Infrastructures“**

Funding 2: **Ministry of Education, Youth and Sport (non-investment costs)**

Budget 2016-2019: **CZK 131 mil (€5 mil) – in realisation**

Budget 2020-2022: **CZK 110 mil (€ 4 mil) – expected** (approval by government before end 2018)

#### **Main goal:**

Create a unique and high-tech centre for research of geothermal energy utilisation in medium to deep (4km>) metamorphic rock formations for basic, applied and experimental research

#### **Objectives are to:**

- develop and improve technologies for EGS / HDR heat extraction
- develop and improve methods for seismic monitoring system
- support research and provide services in the area of geothermal energy exploitation and related areas to universities, scientific institutions and the industry
- raise safety and bankability of EGS/HDR geothermal resources by lowering investment risks
- serve as the Czech contribution to the European and worldwide geothermal energy R&D



# Geothermal Project Litoměřice

## Phase I – geothermal research (cont.)

- **Research team (9 universities and research institutions)**
  - Faculty of Science, Charles University, leader
  - 3 institutes of Czech Academy of Sciences
  - Czech Geological Survey
  
- **Key strategic partner** – City of Litoměřice
  
- **Core facilities**
  - Geothermal Research Centre in Litoměřice
  - Seismic monitoring network Litoměřice
  - Exploratory well PVGT-LT1 (2,1 km - turning into a monitoring well in 2018)
  - Underground laboratory Josef – Centre for Experimental Geotechnics at ČVUT



# Geothermal Project Litoměřice

**RINGEN research centre Litoměřice – constructed in 2018-2019**





# Geothermal Project Litoměřice

## RINGEN location

Former barracks Jiřího z Poděbrad





# Geothermal Project Litoměřice

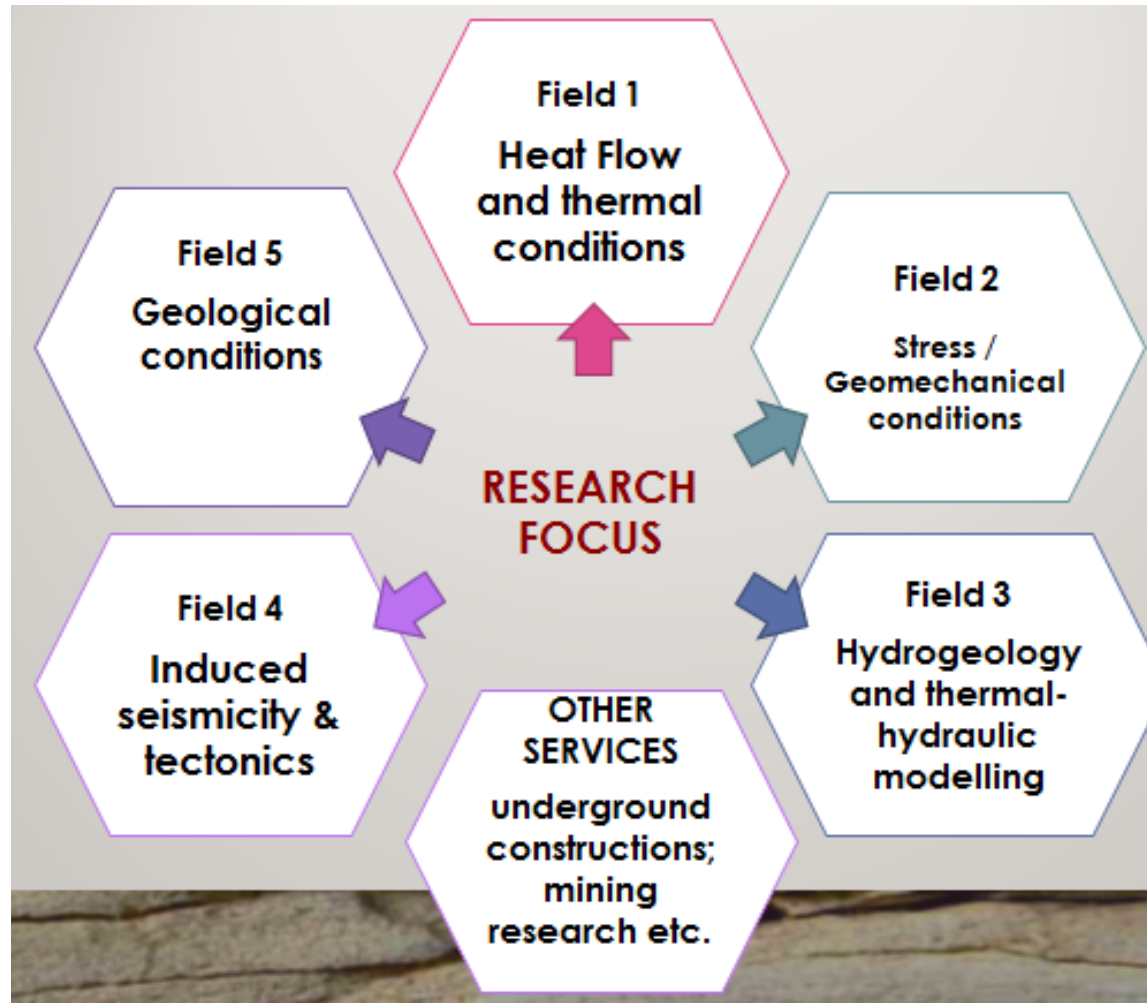
## RINGEN location





# Geothermal Project Litoměřice

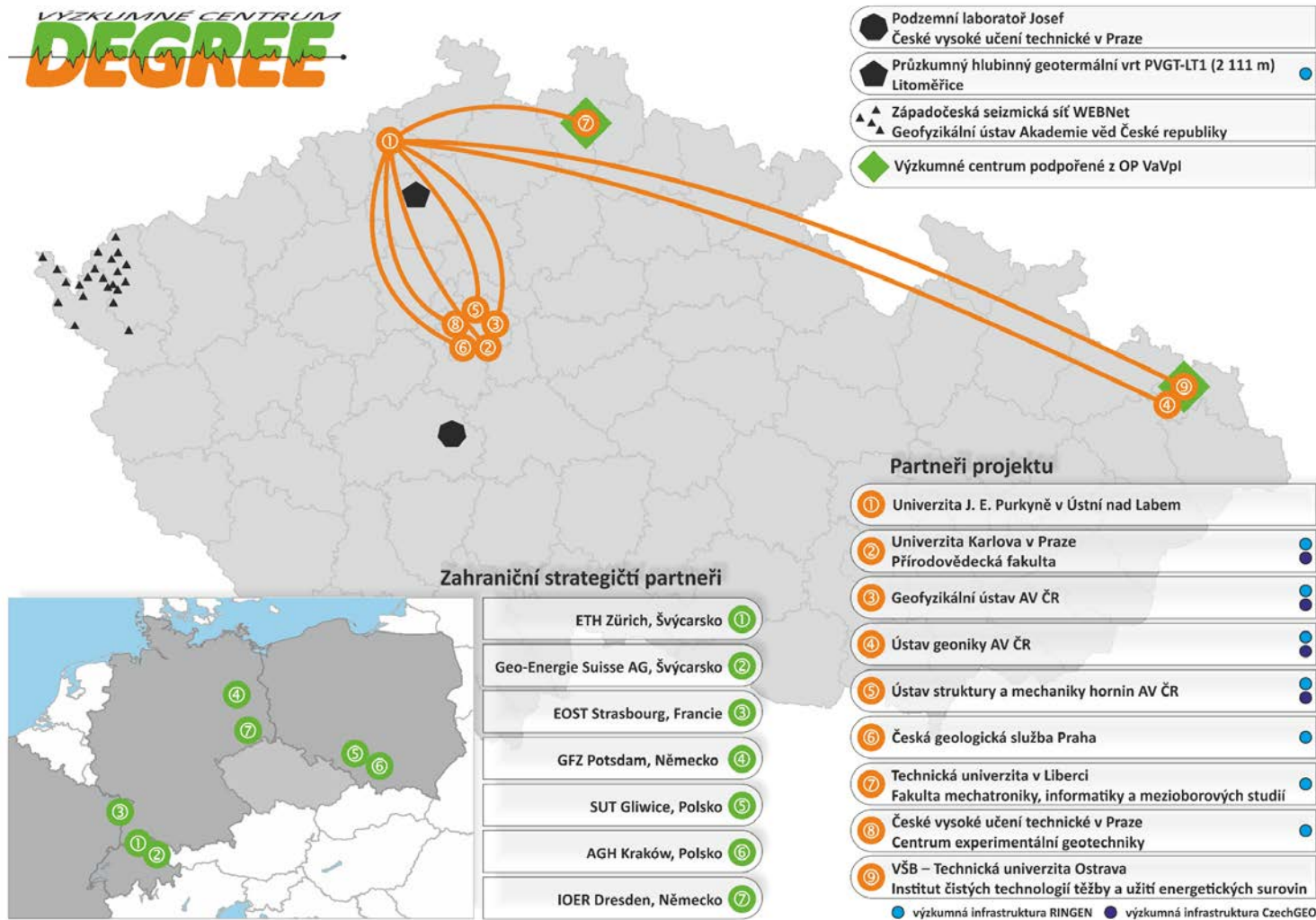
## RINGEN research fields





# Geothermal Project Litoměřice

## Local and international partners



# Geothermal Project Litoměřice

## Phase II – testing EGS/HDR in real conditions

### New project for:

- i. deep geothermal wells (two 4-5 km deep boreholes)
- ii. testing EGS/ HDR system for heat extraction
- iii. experimental operation of EGS geothermal source for heating
- iv. further research of other potential localities for EGS/HDR

### Timeline: 2019-2022

Estimated budget: CZK 1,1 bil. (€ 40 mil)

### Funding options:

- Czech resources: operational programmes, R&D, RE-START)
- EU resources: Horizon 2020



# Geothermal Project Litoměřice

## Phase III – operation of EGS heating plant

### New project for:

- i. financial & economic analysis of long-term operation; risk/legal due diligence
- ii. heating plant construction and connection to the city heating system
- iii. continuing monitoring of heating plant & EGS reservoir operation
- iv. further research of potential localities in Czechia (coal regions)
- v. broad international cooperation

### Timeline: 2022-2025

**Estimated budget: CZK 260 mil. (€ 10 mil )**

### Funding options:

- Czech resources: operational programmes, R&D, RE-START)
- EU resources: Horizon 2020
- Other public (city, region) or/and private investors

# Geothermal Project Litoměřice

## Project effects:

- **pilot EGS/ HDR heating plant** using deep reservoirs in metamorphic rocks,
- **new renewable energy source** with good replication potential,
- **new high added value jobs,**
- decreasing GHG emissions,
- **development and testing of new techniques and methods** for EGS reservoir stimulation and operation,
- **increasing safety and bankability** of projects using similar technologies,
- **new co-operation of academic & scientific and public & private sectors,**
- potential for **development of scientific & business park** in brownfield area,
- provision of a **wide range of highly specialized services** for firms and R&D institutions,
- provision of a **unique testing site** allowing testing in real conditions.



# Geothermal Project Litoměřice

## Estimated budget

- hundreds of millions of CZK / tens of millions of € (complex of individual projects)

## Project status

- ongoing,
- seeking for further financing,
- realization - 2017 – ? (ongoing).

## Financing the project

- mix of sources is assumed:
  - EU funds.
  - state budget,
  - municipality budget.

# Geothermal Project Litoměřice

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Clean mobility - use of hydrogen (fuel-  
cells) in urban public transport and  
other applications

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# Clean mobility

**Is there a market for Hydrogen as an alternative fuel in coal regions in Czech Republic?**

**The future of hydrogen in transport**



**Y**

**Existence of public support for hydrogen technologies**



**E**

**Production, transport and storage**



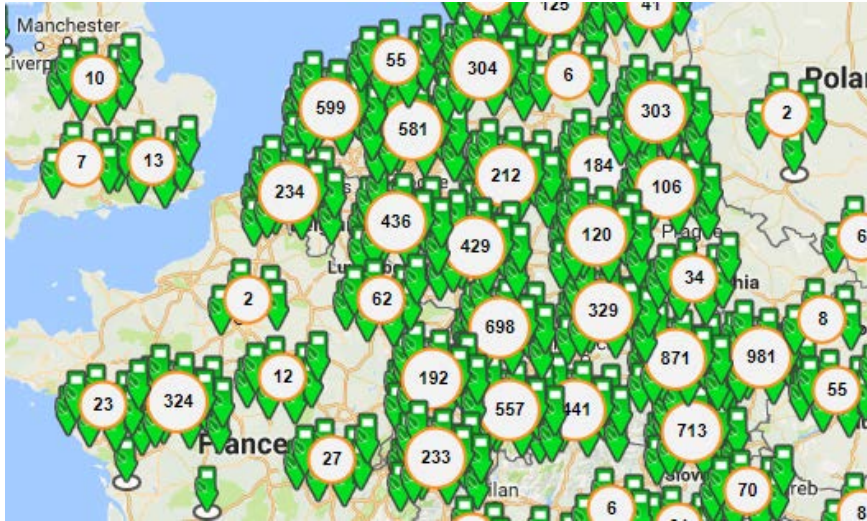
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**Availability of advanced hydrogen technologies**



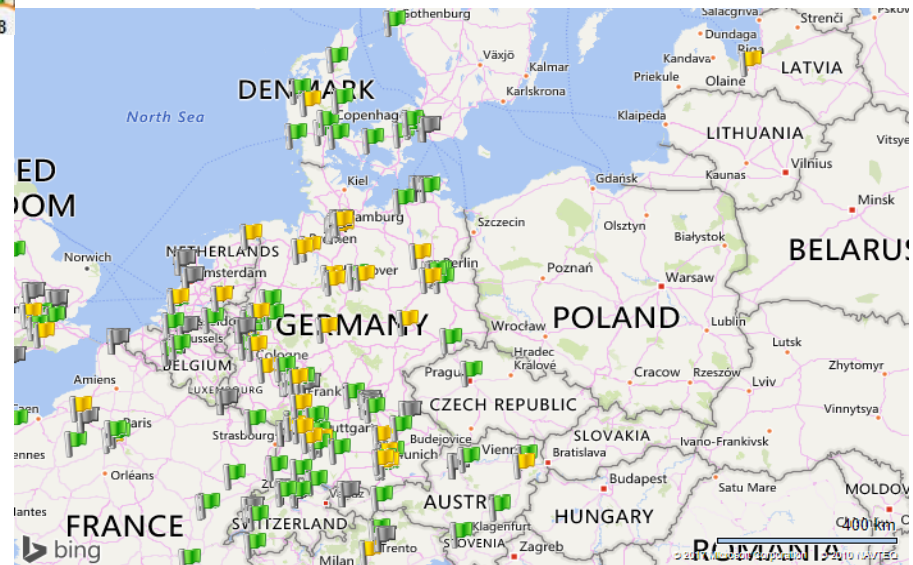


# Clean mobility



The actual network of public charging stations for electric cars...

...and the network of hydrogen filling station.



# Clean mobility

- the issue of air quality is historically among some of the most important topics connected with the territory of structurally lagging-behind regions,
- support of measures, that will contribute to the development of air quality is therefore a logical part of the restructuring process,
- significant potential for improving air quality is also generated by investment in clean mobility, especially in case of public transport,
- hydrogen (fuel-cells) drives create a unique potential in this area - also with respect of the fact, that there are available hydrogen supply capacity in the regions.





# Clean mobility

## Basic facts

- the development of „clean mobility“ is a part a broader measure of RE:START programme, which aims on improving the air quality in the structurally affected (lagging-behind) regions,
- Priority areas of interest in air quality / protection measure:
  - **replace the fleet** of old diesel trucks and passenger cars for low-emission cars,
  - **support for public transport and its greening** incl. the greening of fleets of municipalities / regions and cars used for the purpose of services of a technical nature (e.g. cleaning and delivery trucks) - linked to the reduction of individual transport in cities (construction of P+R parking spaces).
  - **Strengthening the role of new technologies** in capturing emissions, including **hydrogen**.

# Clean mobility

## Real conditions

- interest from towns and municipalities is confirmed (eco-buses),
- cities, municipalities will be the project owners,
- there is a strong interest to participate on greening of fleets of municipalities with using the potential of hydrogen from the level of various companies especially from chemical industry,

## Results of the survey of interest in this field from the level of municipalities in Usti Region

- min. 40 % of vehicles, which the municipalities intent to buy, would be CNG vehicles and 40 % would be driven by electricity,
- the municipalities confirmed also the interest in using the hydrogen vehicles, but there is a crucial condition - build up the related infrastructure such as the filling stations,
- another condition is obvious - the availability of subsidies for realization of such investments.



# Clean mobility

## Project goal

- using available EU funds to finance the purchase of hydrogen buses by the city / county urban transport operators in structurally lagging-behind regions, including the construction of a hydrogen filling stations linked to an existing hydrogen productions facilities (EU strategy for low carbon mobility).
- the project follows up also the goals of Czech clean mobility policy.

## Project effects:

- replacement the old esp. diesel passenger cars for low-emission vehicles,
- strengthening the role of new technologies in reducing emissions,
- strengthening the pro-ecological thinking of cities and municipalities,
- attracting interest of producers of environmentally-friendly vehicles,
- the development of the ecosystem of change.

# Clean mobility

## Financing the project:

- estimated budget – 1 500 mio. CZK / 60 mio. €
- mix of sources is assumed:
  - EU funds,
  - state budget,
  - municipalities budget.

## Project status:

- in preparation,
- seeking for financing,
- realization - 2020 - 2025.



# Clean mobility

## CONTACTS

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# Project Silvestr – ETI

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## Project Silvestr - ETI

### DESCRIPTION OF THE MEASURE

- Connection of the district heating system (DHS) in Sokolov to the Power-Plant Vřesová/cca 20 km
- Steam pipe-lines conversion/cca 30 km
- Shut-down of the coal (lignite) power-plant Tisová ETI
- Ash-dump site „Silvestr“ reclamation/cca 125 ha
- Preparation of an extended industrial zone

## Project Silvestr - ETI

### PROJECT EFFECTS

- Lignite power-plant ETI shut-down.
- Maintaining the district heating system in the region without the need of higher lignite consumption in the newly used source of energy for DHS.
- Utilization of the of the area of power plant Tisová EI and newly reclaimed area for new activities without the need for agricultural or forest land.



# Project Silvestr - ETI

## PROJECT EFFECTS

- Ecological impacts:
  - **Downturn of emissions and saving of consumption of cooling water**
  - **1 mio. t lignite/year reduction**
  - **1,5 mio. t material transport needs/year reduction**

# Project Silvestr - ETI

## PROJECT PARTNERS

- Sokolovská uhelná, p.n., a.s.
- common cooperating subject with participation of municipalities
- ETI, a.s.

## ESTIMATED PROJECT BUDGET

- Connection the DHS to Vřesová power plant – 900 mio. CZK / 35 mio. €
- Steam pipe-lines conversion – 600 mio. CZK / 23,5 mio. €
- Ash-dump site „Silvestr“ reclamation – 600 mio. CZK / 23,5 mio. €
- Shut-down of the coal (lignite) power-plant Tisová and industrial area development (extension) – 400 mio. CZK / 15,5 mio. €
- **Total estimated budget – 2 500 mio. CZK / 98 mio. €.**



# Project Silvestr - ETI

## FINANCING THE PROJECT

- mix of sources is assumed:
  - state budget,
  - private funding,
  - EU funds.

## PROJECT STATUS

- in preparation,
- seeking for financing,
- realization - 2019 – 2026 (DHS till 2022).

# Project Silvestr - ETI

## POWER-PLANT TISOVÁ





## Project Silvestr - ETI

# ASH-DUMP SITE „SILVESTR“



## Project Silvestr - ETI

# POWER-PLANT AND ASH-DUMP



# Project Silvestr - ETI

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Strategy of Economic Restructuring  
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# Optimization of Heat Stations

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# Optimization of Heat Stations

## Challenges of heating system for Ostrava-Karviná region

- Majority of residential districts are heated by central steam and water systems
- Population of about 300.00 inhabitants is fully dependent on 90 % coal fuelled heating plants
- Ownership of heat supplies varies
- Minimum of renewable energy resources is used – biogas, wood
- Minimum utilization of industrial heat – gas from coke plant
- **Decarbonisation will extremely raise heat cost for population and slowly eliminate heat supplies powered by coal**





## Optimization of Heat Stations

### Scope of the heating issues in Moravia – Silesia region North Bohemia issues are similar

#### 1. Ostrava city area

- 5 main supplies of heat fuelled by black coal, minority of coke plant gas and biogas, cogeneration (power/heat)
- **Population of about 200.000** inhabitants is connected to the system

#### 2. Karvina and Havirov districts

- 2 main supplies powered by black coal, cogeneration (power/heat)
- Possibility to extend heating based on mine gas
- Pilot project for utilization of municipal waste
- **Population of about 50.000** inhabitants is connected to the system

#### 3. Trinec, Cesky Tesin and Polish Tesin heat station districts

- Plants powered by coke gas and black coal, many minor supplies
- Distribution of electricity and heat for steelworks and the town

#### 4. Other areas

- Eliminate coal fuelled supplies and replace them with appropriate other systems



# Optimization of Heat Stations

## CONSIDERED SOLUTIONS

- Raising effectivity of distribution networks
  - Change from central heating to local renewable resources supplies for decentralized locations
  - Replace local individual small resources with central heat distribution
  - Connect to existing central networks where appropriate
- Raising effectivity of supplies,
  - Cogeneration – production of electricity and heat
  - Use of renewable resources (biomass, biogas, geothermal and solar energy, mine gas)
  - Use of secondary resources – waste, industrial gas
  - Change of fuel into gas and modern technology boilers
- Accessibility of modern technologies for newly built developments

# Optimization of Heat Stations

## PROJECT PROGRESS

- Owner of the projects – Region and municipalities
- Phase 1
  - Impact analysis, review of existing projects,
  - Pre-negotiation, best practice
  - Year 2019-2020
  - Cost 1,8 mil. EUR
- Phase 2
  - Proposals and negotiation with stakeholders and owners
  - Acceleration of immediate, prepared solutions
  - Year 2020-2023
  - Cost aprox. 80 mil. Eur
- Phase 3
  - Proceeding with proposed projects
  - 2023-2030

## Optimization of Heat Stations

# CONTACTS

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Research centre  
of excellence for energy

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# Research centre of excellence for energy

## Project context from MS region perspective (I)

- Strong industrial tradition and environmental problems frame the scope of crucial research need of the region
- Long-term energy sustainability is one of the most important agenda for Czech Republic (not only)





# Research centre of excellence for energy

## Project context from MS region perspective (II)

- Recent EU funding has supported mainly building the research infrastructure in the field of energy and supercomputing
- VŠB - Technical University of Ostrava is the main coordinator of National Research Centre for Energy – the project actually submitted to the Technology Agency of the Czech Republic and disposals by unique testbed for area of energy and environmental technologies.
- Research and innovation is considered to be a key for regional competitiveness by regional authorities





# Research centre of excellence for energy

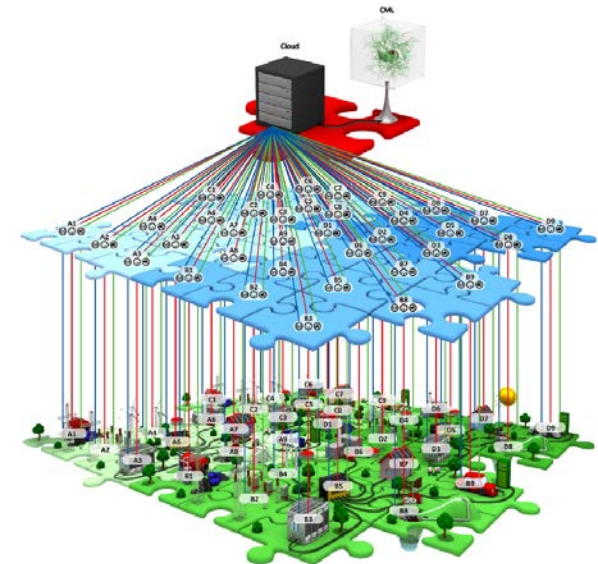
## The project objective

- through application oriented research and implementation of new methods and technologies –
- to ensuring reliable, safe and environmentally-friendly energy supplies
- making use of the existing central power grids in symbiosis with
- decentralized energy sources and facilities exploiting alternative fuels
- **to ensure raw material self-reliance and energy self-sufficiency**
- both for citizens and economy of the region as well as the Czech Republic.

# Research centre of excellence for energy

The strategic research agenda of the centre is divided into 4 basic application segments:

- I. Efficiency, reliability and safety of energy units (micro-regions)
- II. Alternative sources of energy and waste (waste-to-energy)
- III. Energy grids
- IV. Raw materials



# Research centre of excellence for energy

**Project consortium** consisting of above 20 relevant partners including research organisations: Academy of Science of CR; Technical University in Brno, Czech Technical University in Prague etc.  
companies: Veolia Energie; ČEZ; Doosan Škoda power etc.

**Project implementation plan:**

Small scale implementation: 2018 – 2022 (financed by national/regional sources)

Preparation for large scale implementation: 2019 - 2021

Large scale implementation: 2021 – 2026 (EU funding planned)

Preliminary **budget** for **large scale implementation** phase: 90-110 mil. EUR



# Research centre of excellence for energy

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PRO MÍSTNÍ  
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**Úřad vlády České republiky**



**MINISTERSTVO  
PRŮMYSLU A OBCHODU**



**Moravskoslezský  
kraj**



**Ústecký kraj**



**Úřad zmocněnce vlády pro MSK, ÚK a KVK**