



Welcome

Coal Plant repurposing

Platform for Coal Regions in Transition

#CoalRegionsEU

Energy

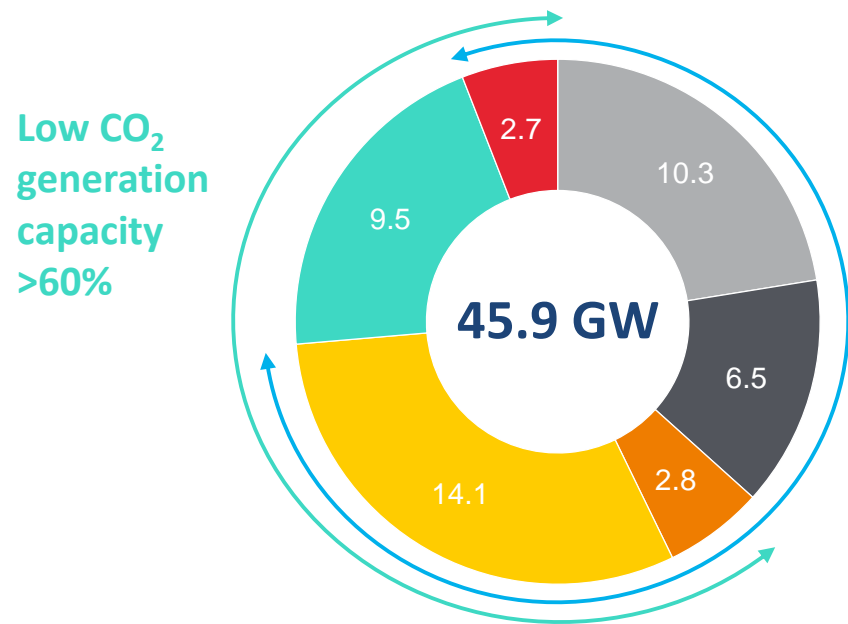


Structural change and plant repurposing in the Rhenish lignite mining area

Christoph-Peter Bartsch, Regional Initiatives and Projects

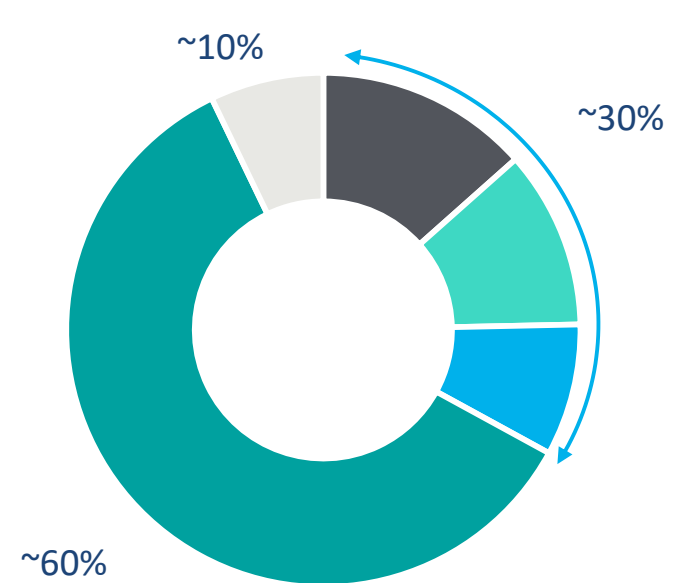
The new RWE - Unique renewables and conventional generation portfolio

RWE's net generation capacity¹



- Gas ■ Renewables ■ Other
- Lignite ■ Hard coal ■ Nuclear

Pro forma EBITDA²

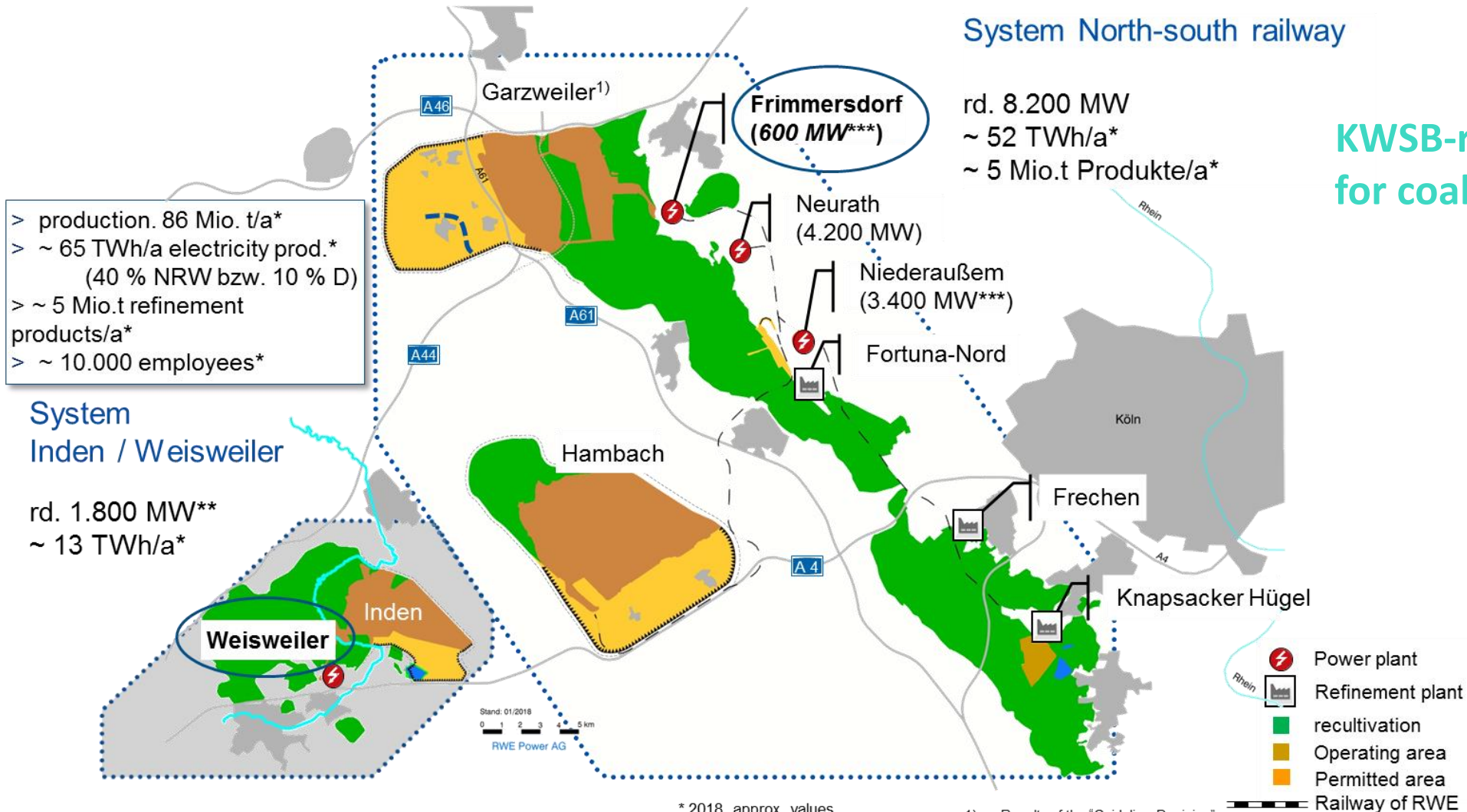


- Lignite & Nuclear ■ European Power ■ Supply & Trading
- Renewables ■ Dividends

¹ As of 31 Aug 2019, conventional portfolio as of 1 Jan 2019. Pro forma combined portfolio under the condition of full transaction completion; esp. closing II innogy Renewables. I

² Billion cubic meter.

The Rhenish lignite mining area



System North-south railway

rd. 8.200 MW
 ~ 52 TWh/a*
 ~ 5 Mio.t Produkte/a*

KWSB-recommendation
 for coal phase out: 2038

- > production. 86 Mio. t/a*
- > ~ 65 TWh/a electricity prod.*
 (40 % NRW bzw. 10 % D)
- > ~ 5 Mio.t refinement products/a*
- > ~ 10.000 employees*

System Inden / Weisweiler

rd. 1.800 MW**
 ~ 13 TWh/a*

* 2018, approx. values
 ** without VSG-turbines
 *** Security standby since 1.10.2017 and 600 MW in Nia since 1.10.2018

1) Results of the "Guideline Decision"

Project FrITZ - Frimmersdorf Innovation and Technology Center

General facts:

- The whole area is about 165 hectare (ha)
- Units P & Q are in security standby (600 MW) till 30.09.2021, the rest is shut down
- Power plants are legally approved under BImSchG
- Future goal: Building an innovation & technology centre in the next 25 years.

Project goals:

- Urban development to build an innovation & technology centre with industry, R&D and Science to Business centres
- Recycling of building materials

Two options to achieve the goals:

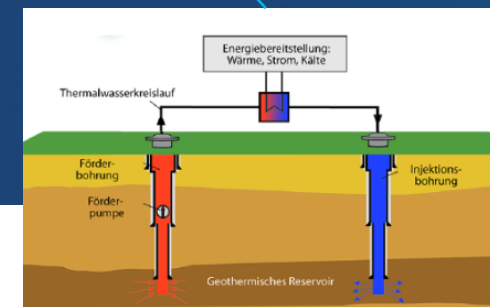
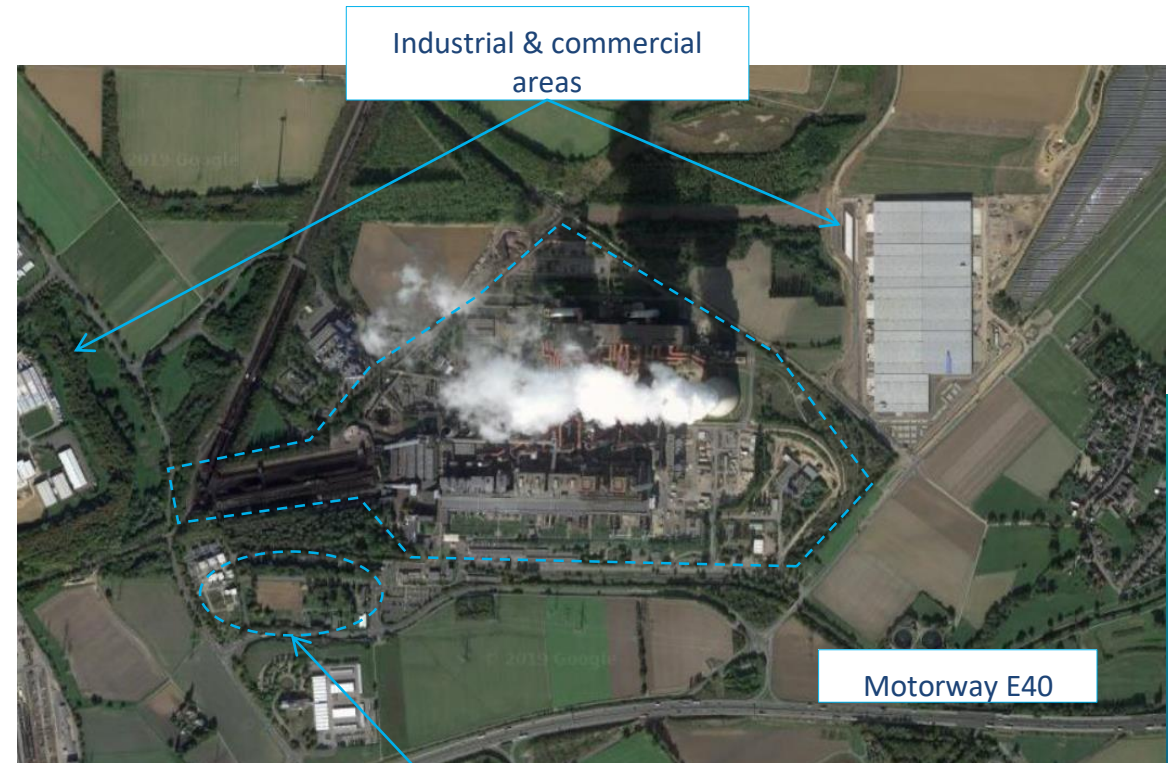
- Joint project with participation of municipalities
- Sell the plant to an investor



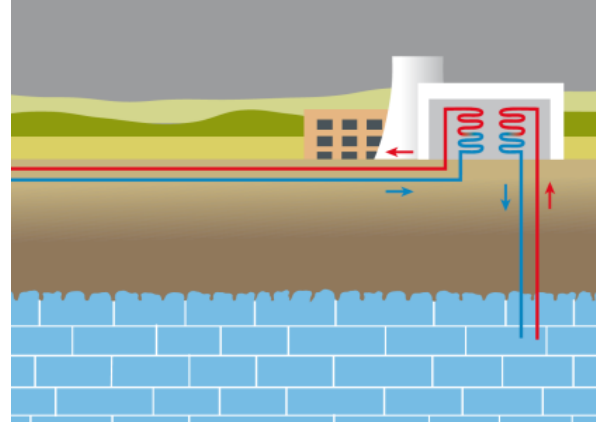
Site development Weisweiler

Perspectives:

- Weisweiler should remain as a site for energy production, even after the coal phase-out in 2030
- Different opportunities are currently investigated
- Areas which are not needed for operation are developed
- Example: Industry hub Weisweiler-Inden-Stollberg (WIS)



Deep Geothermal Energy

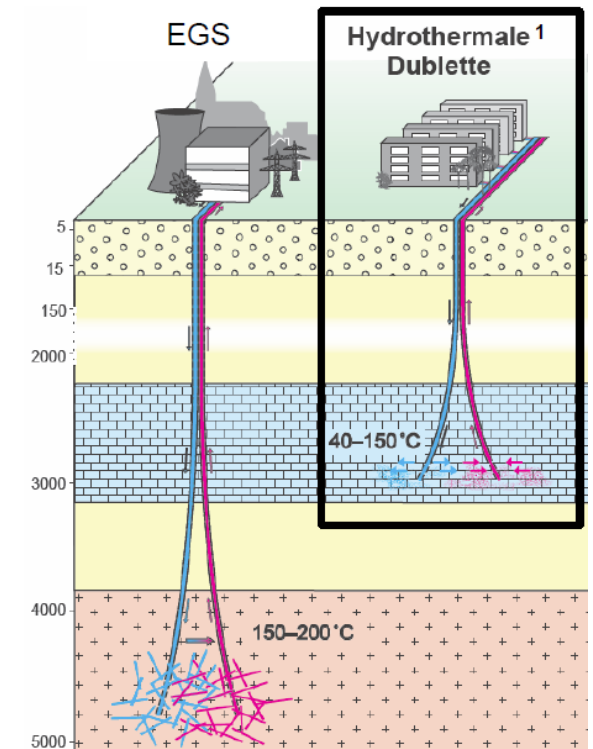


Functional Principle:

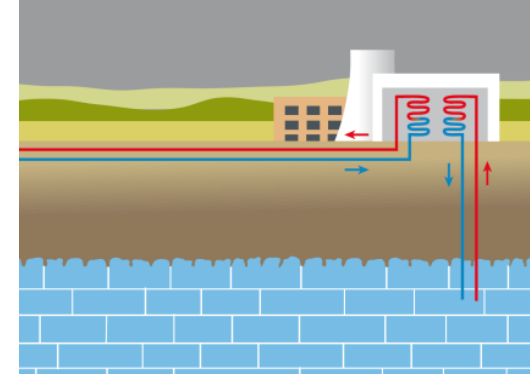
- Warm deep ground water is extracted via a borehole from a depth of about 3000m at an existing power plant site
- Heat is extracted from the water via heat exchanger at the surface
- Depending on water temperature, heat and/or electricity can be produced

Advantages:

- Existing power plant equipment and infrastructure can be used
- Base load production ensures security of supply



Deep Geothermal Energy – Current Status



EU-Project “Roll-out of Deep Geothermal Energy NEW (DGE Rollout) started (Interreg):

- Project will deliver underground mapping of geothermal formations in NWE
- Project comprises exploratory drillings at following locations: TRUDI (Ruhr area), Balmatt (Belgium), Californie (NL) and Weisweiler (North-Rhine Westphalia)
- Exploratory drilling at Weisweiler site (1500 m) planned for 2020

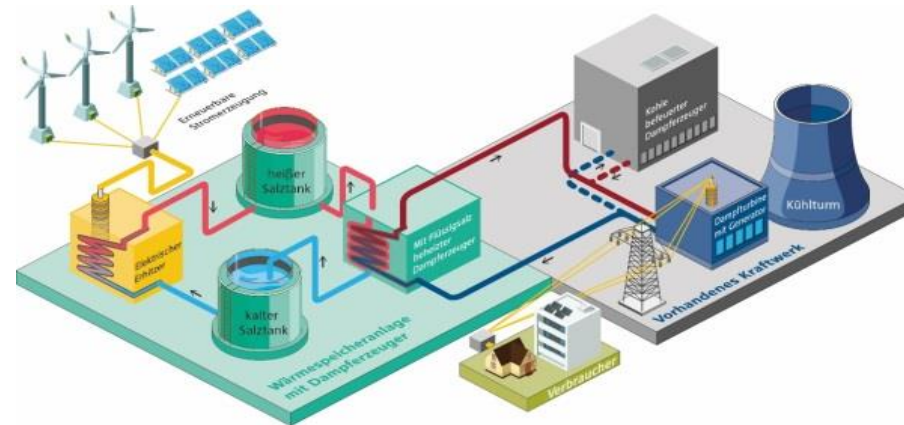
Preparations for establishment of Fraunhofer Institute for Geothermal Energy at Weisweiler site:

- Ideal Partnership for developing Geothermal energy to gain operational readiness in a “real life laboratory”

Next Step:

- Construction and operation of a pilot plant at Weisweiler (real life laboratory)
- Pilot project requires detailed investigations, e.g. 3D seismics and deep drillings
- Therefore, funding would be highly welcomed in form of a “big ticket project”

Thermal Energy Storage



Functional Principle:

- Coal-fired Power Plant is converted into thermal storage power plant
- Storage initially operated in parallel to existing steam fired generator
- After coal phase-out, switch to pure storage operation for buffering renewable energy

Advantages:

- Existing power plant equipment can be used
- Renewable energies can be integrated from day 1
- Plant is able to compensate for fluctuating renewable energy production

Thermal Energy Storage – Current Status

Feasibility Study in progress:

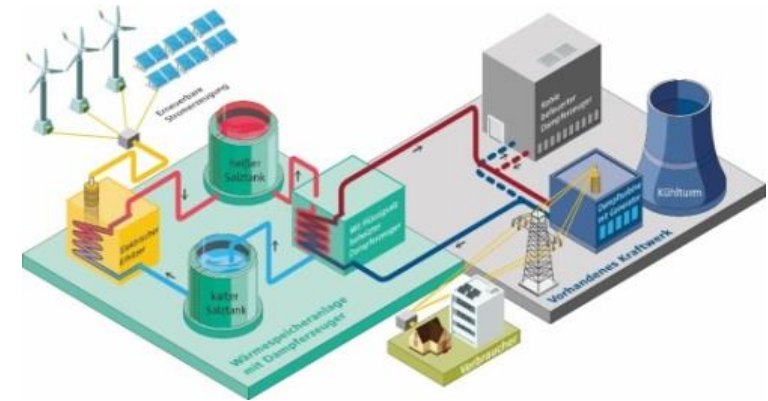
- Feasibility Study was funded by State of North-Rhine Westfalia
- Study has prepared the floor for upcoming pilot project

Pilot Plant being planned by RWE, DLR and FH Aachen (StoreToPower):

- Pilot plant planned for Rhenish lignite area
- Plant comprises storage unit in single-digit MWel scale integrated into existing coal-fired power plant.
- Project will show principle feasibility of the technology and demonstrate the interaction with the existing unit
- Outline for project selected by German Ministry of Economics to be a candidate within ideas competition “real life laboratory”

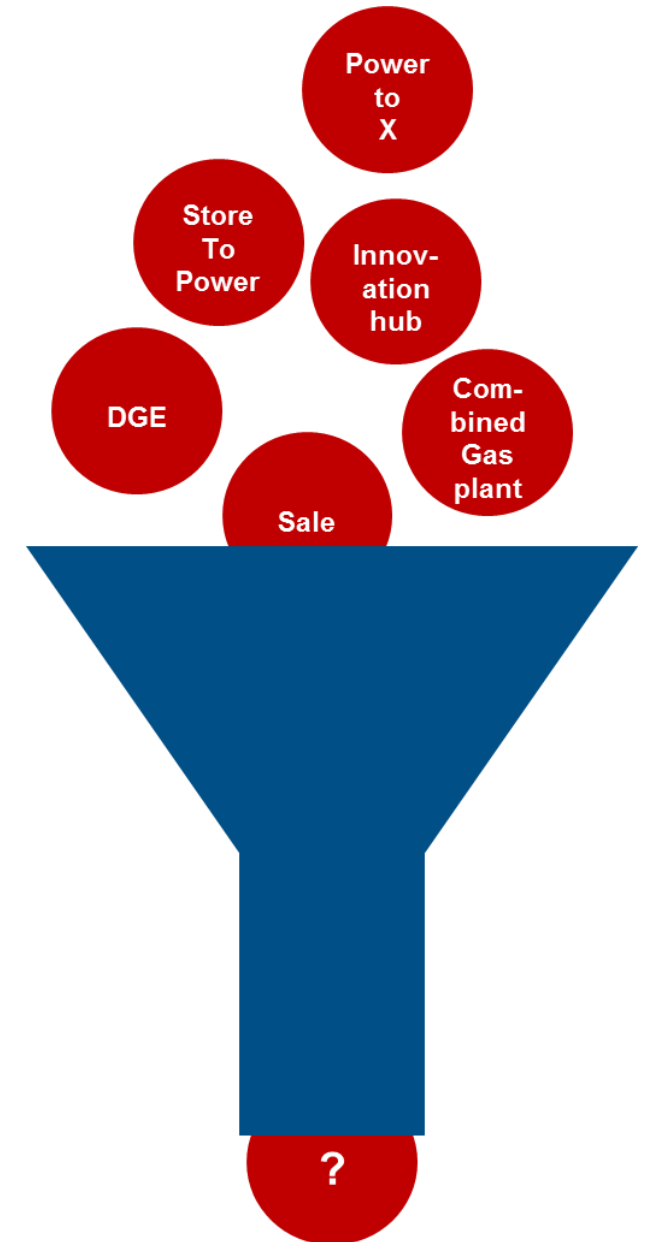
Next Step:

- Planning, construction and operation of a heat storage plant at demonstration size
- Support in form of funding would be highly welcomed



Conclusion

- There are several sites, with different options for future development
- The projects support sustainability and shape energy transition
- However, today's economic & legal conditions make large scale realization unlikely. Therefore, national or EU based funds can be a game changer for investment decision.



RWE

Thank you for your attention!



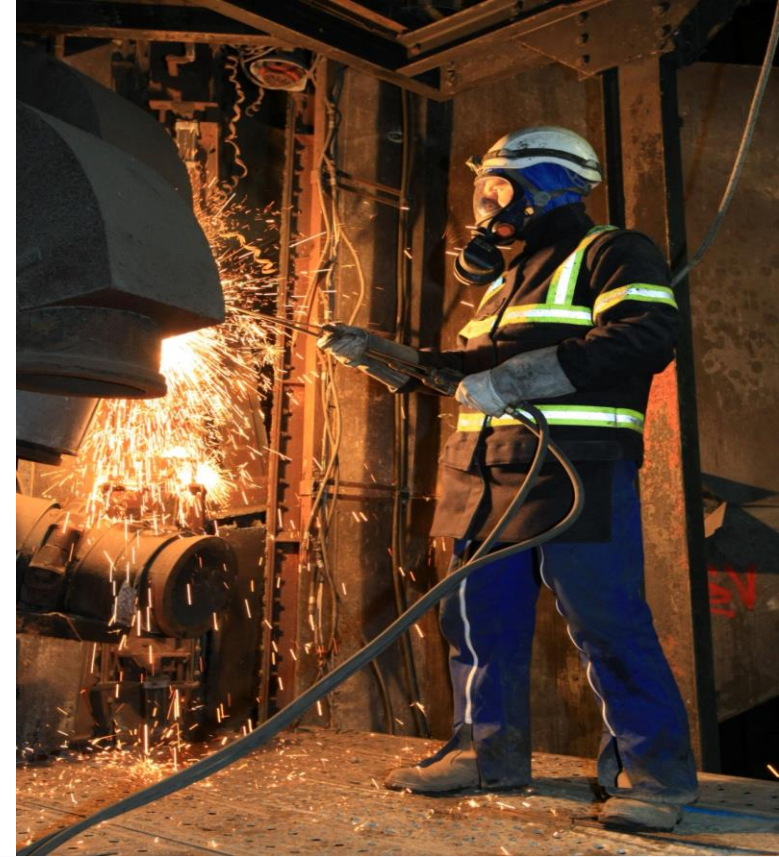


From power operation to new local dynamics

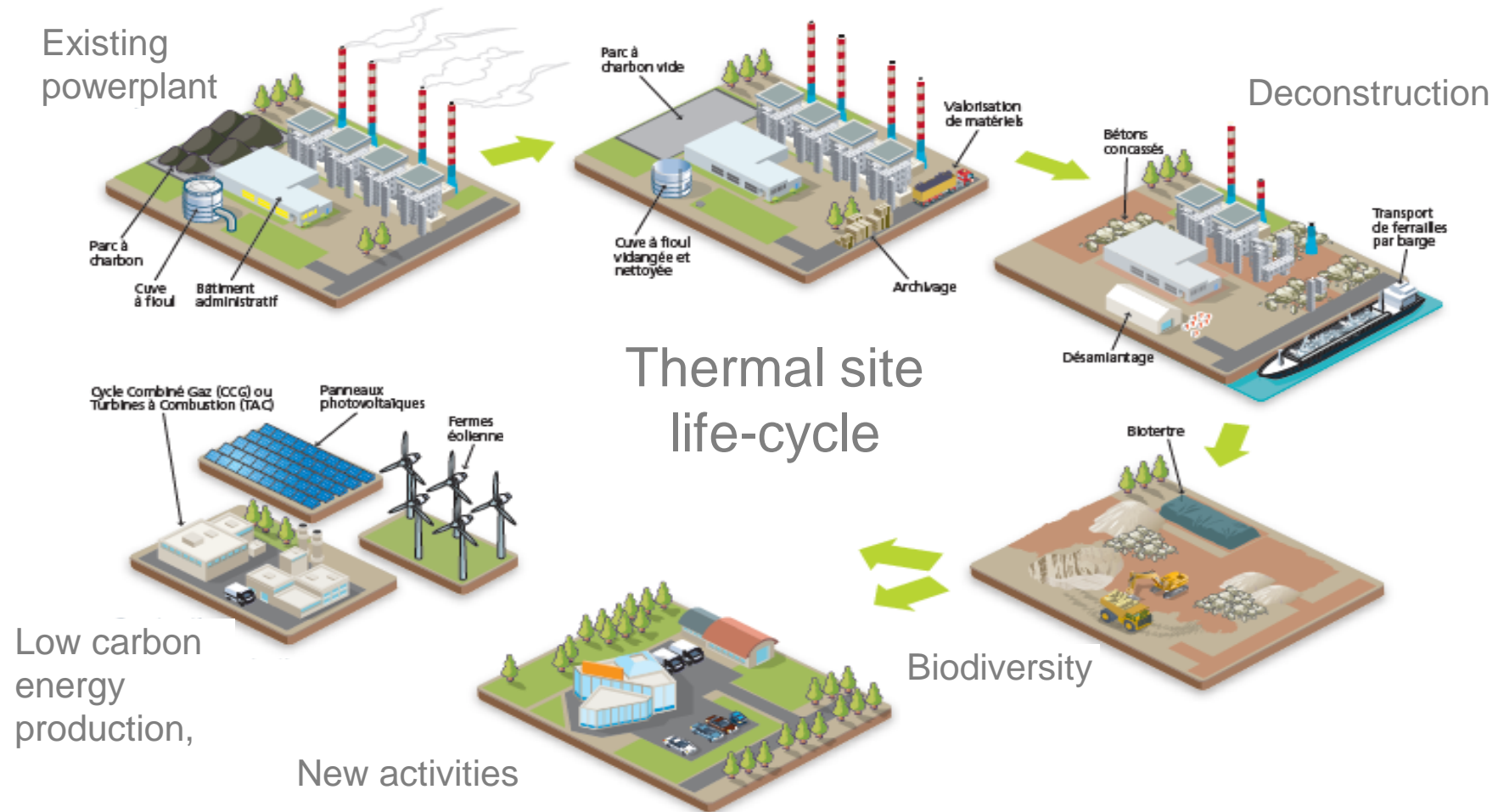
Post Coal Economy and Structural
Transformation

6th Working Group meeting

16-17 October 2019



FROM COAL POWER PLANT TO NEW LOCAL DYNAMICS



THE APPROACH

Limit the impact of the closing !

For people directly concerned

- our employees,
- our suppliers

For the local communities

IDENTIFY WHAT COULD BE THE FUTURE

Analyse the potential of the site

Understand the local situation

Dialogue with local stakeholders

Provide new perspectives

No one fits all solution



VAIRES

Before



After



DECONSTRUCTION : A CONTRIBUTION TO LOCAL CIRCULAR ECONOMY



e + de cette initiative :



Établir un véritable processus
d'Économie Circulaire

*Cet événement unique est co-organisé par
la CCI Versailles-Yvelines dans le cadre de son programme
d'accompagnement aux entreprises
dédié à l'économie circulaire*

**POUR VOUS INSCRIRE
ET EN SAVOIR + SUR CETTE JOURNÉE INÉDITE**

BETWEEN CLOSURE AND DECONSTRUCTION : VITRY AN EXEMPLE OF CULTURAL DEVELOPMENT



A SOLAR PLANT AND THE « CLEANTECH VALLEY » INCUBATOR REPLACED THE POWER PLANT OF ARAMON



INNOVATION : BLACK PELLETS FROM BIOMASS AND WOOD WASTES



Wood waste

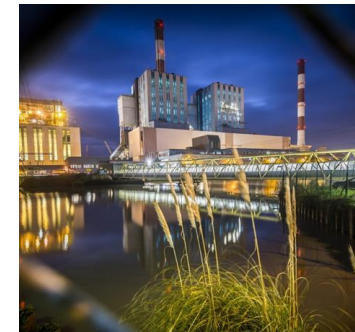
Wood waste, class A wood (pallets) and class B wood (wood that has been only slightly treated) are used to produce packaging, signs, furniture wood and demolition wood.



Biomass

Ligneous residue or bits of wood are created during landscaping and urban tree pruning as a result of parkland, garden and urban tree maintenance programmes.

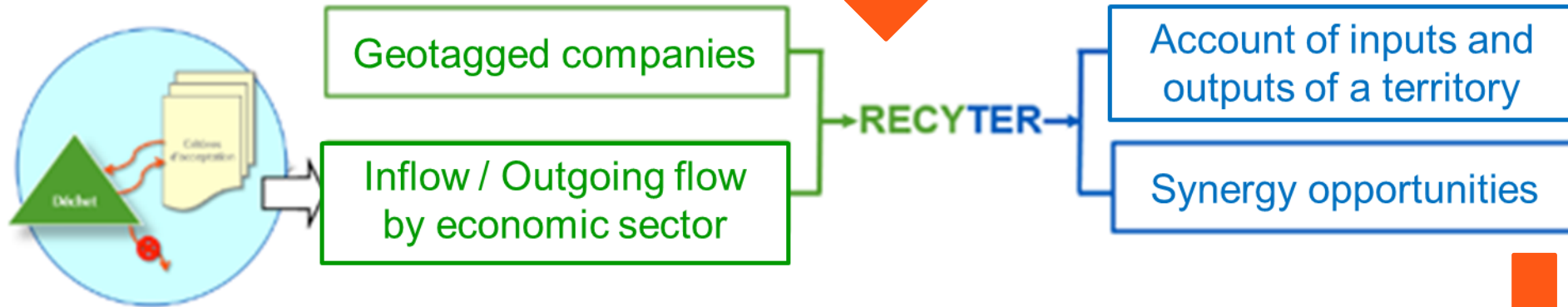
A innovative technology to densify biomass and wood wastes



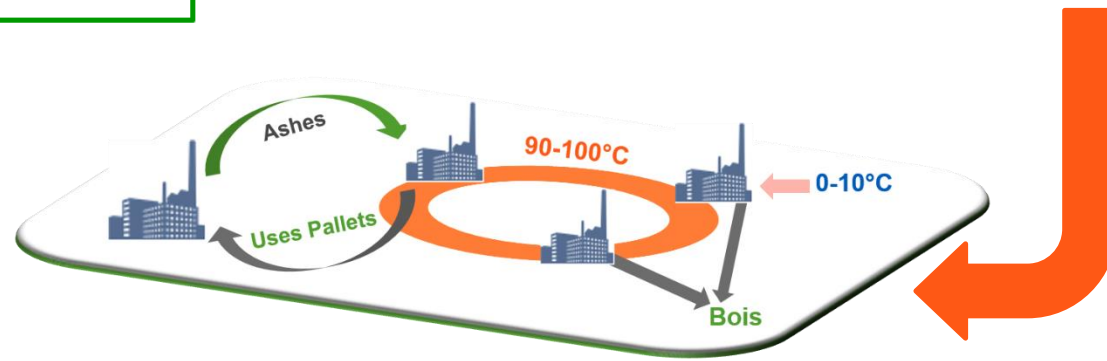
RECYTER : R&D FOR CIRCULAR ECONOMY



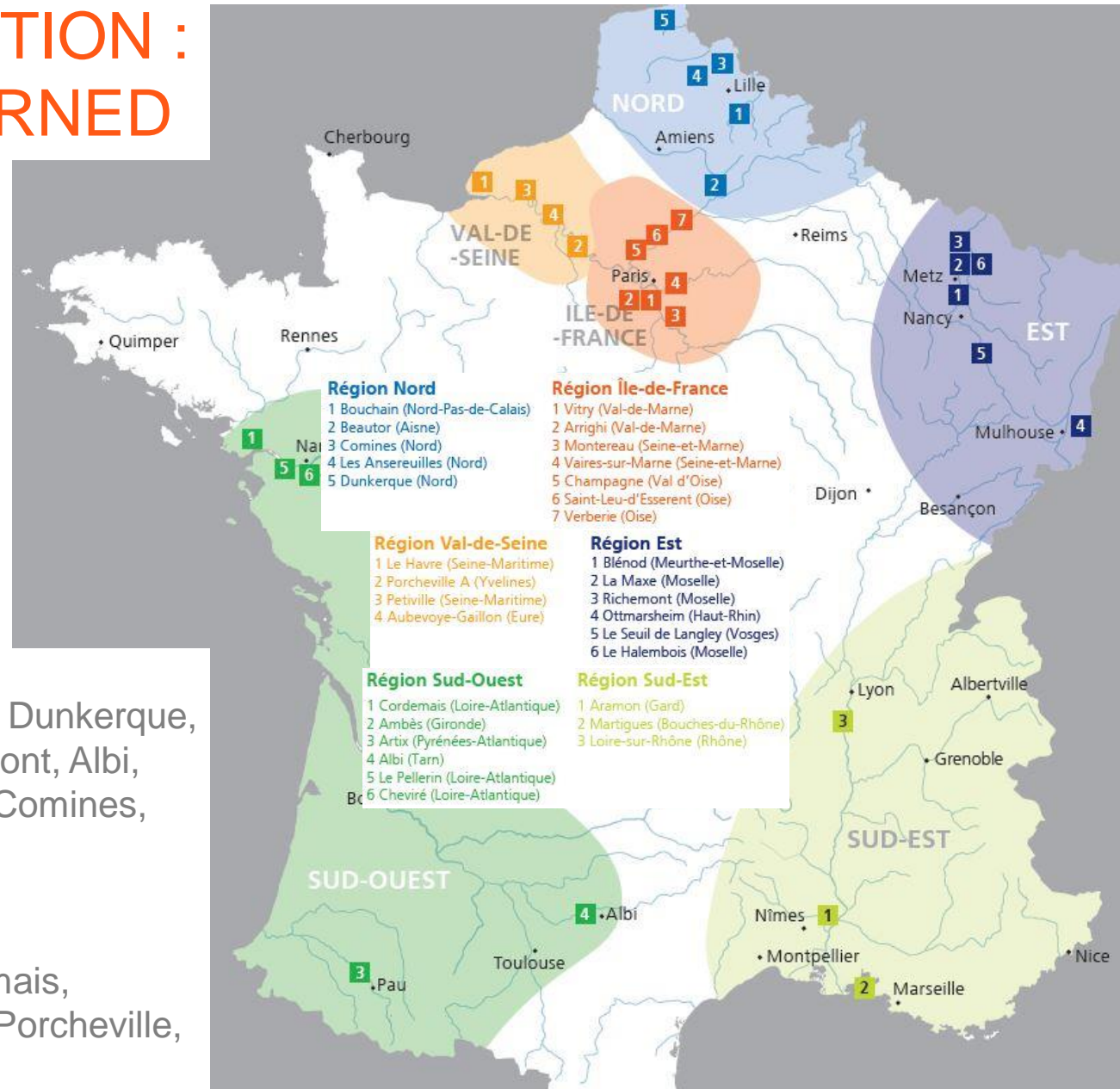
PLANNING TOOL to optimise the flow of heat and matter between the companies of a region in a logic of circular economy.



- Offer services on heat or energy recovery
- Identify facilities to value waste locally
- Energy masterplan



DECONSTRUCTION : LESSONS LEARNED



Already deconstructed

Ambes, Loire, Champagne, Dunkerque, Arrighi, Montereau, Richemont, Albi, Cheviré, Beautor, Lengley, Comines, Ansereuilles, Vaires,

Still to be deconstructed

Aramon, Martigues, Cordemais, Blenod, la Maxe, le Havre, Porcheville, Vitry, Bouchain

Thanks!

Overview of the *Vértés Power Plant Ltd.* Hungary

Dr. József Magyar *CEO*
Dr. László Karda *Deputy CEO*

vértési
erőmű

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Summary of the presentation

- **A brief introduction to the Vértés Power Plant Ltd.**
 - Mine: Closed at the end of 2014
 - The Coal Power Plant: under conservation
- ***The social impact of the collective redundancies***
→ **Solved Issues**
- ***Environmental Items*** → **The Real Problems**
- ***Proposals***

The Company – Vértés Power Plant Ltd.

- The history of the Company – situated in Oroszlány, Hungary - is as old as the Electricity Industry in Hungary.
- It is owned by the MVM Hungarian Electricity Ltd., the largest state-owned energy company in Hungary.
- Historically, this region was home to many coal mines, and the last one, „Márkushegy Mine” (5 kms away from Oroszlány), continued to operate well into 2000s.



Summary of current activity

Today we have:

- A **former mine**, which was closed in 2014 and is in the final stages of its complex remediation process, with the deadline approaching soon (end of this year),
- A **Power Plant**, which is **under conservation** since 2016,
- A second **Power Plant, closed** in 2004 („Bánhida Power Plant”) which is situated 12 kms north, in Tatabánya city,
- The **infrastructure**, suitable for various pilot projects, R+D Activities, PV Plant and Waste-to-Energy project,
- Two **ash disposal areas** under remediation:
 - 200 ha in the Oroszlány site
 - 17 ha in the Bánhida site

Current Activities



end of 2014
COAL MINE CLOSED



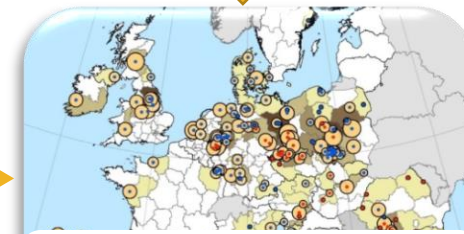
ASH DISPOSAL AREA:
UNDER REMEDIATION



end of 2015
POWER PLANT:
CONSERVATION



Identify
opportunities for post-
utilization



Find partners with
common interests

“Márkushegy Mine” – before 2014



The Closure and Remediation of the Mine

Underground works 2015-17 → Surface works from 2016

- Subsidy available till end of 2018 and capped!

Areas:



„Drawing off” Materials



The Closure and Remediation of the Mine

- 2017 – the currently closed former „entrance” (shaft)



The social impact of the collective redundancies - a positive experience

Solved issues:

We took the following measures, involving our social partners:

- Elaboration of a Human Resources (HR) concept,
- Signing a Medium-Term Agreement on HR,
- Defining a schedule for the execution of the Agreement on HR,
- Agreement on future Employment,
- Agreement for ensuring the future operation of the trade associations,
- Agreement on the release of the protection under the Employment Protection law.

The social impact of the collective redundancies - a positive experience

- As of today, the Employer terminated over 1100 employee contracts from 2009, without any major conflicts.
- The staff reduction was executed in line with the Labour Code, the Sectorial Collective Labour Agreement of the Electricity Industry, the Collective Labour Agreement and the local Agreements.
- *We would like to emphasize the importance of continuous communication and consultation with the:*
 - Local and National Labour Unions,
 - Local Employment Centre,
 - Local Enterprises with labour shortage.

The social impact of the collective redundancies - a positive experience

Further positive experiences:

- We had the opportunity to draw resources from the State's official "Subsidy approved for coal industry restructuring" and the "*Aid to facilitate the closure of uncompetitive coal mines*" (2011-2018),
- Our owner, the MVM Ltd. *outsourced the heat supply* into a new, gas-powered heating plant - which ensures the district heating and hot water supply for the town Oroszlány and the village Bokod,
- Oroszlány also built a *new industrial park* to attract small and medium manufacturing to provide jobs.
- To the best of our knowledge, there were no major problems with our former suppliers as our company's closure process has been lengthy.

The social impact of the collective redundancies - a positive experience

- There are two industrial parks in the nearby towns (Oroszlány, Tatabánya), where there is a permanent shortage of staff. We supported the workers from our company to find jobs in the industrial parks.
- There are dozens of companies in the industrial parks (e.g. related companies in the automotive industry, health care, paint industry, water purification, etc.)



Industrial park in Oroszlány



Industrial park in Tatabánya

The social impact of the collective redundancies - a positive experience

- Surrounding companies have held job fairs for our departing colleagues at our site.
- Our company helped former employees with the following:
 - Financial assistance for new enterprises established by them
 - Housing support for those who had to relocate for their new jobs
 - Income support in the event that the former employee has a lower salary at his/her new job
- We supported workers with retraining (by helping them learn entirely new professions) e.g.:
 - Forklift operator
 - Warehouse worker
 - Warehouse manager
 - Help workers gain driving licences
 - Language courses
 - Etc.

Environmental Issues of the Ash Disposal Areas – The Real Problems



- **Site: 200 ha, 6 disposal sections**
 - ✓ 100 ha under remediation (1-4)
 - ✓ 100 ha on stand-by (5-6)
- **Accumulated approx. 30 million m³ non-hazardous waste since 1961** (waste from coal burning-process)
- **We have official remediation prescription (to cover with 1m topsoil)**
- **The current, actual prevention of contamination through:**
 - ✓ Deep drainage system (pipes)
 - ✓ Curtain-wall
 - ✓ Continuous monitoring of 20 + 8 driven well system

Environmental Issues of the Ash Disposal Areas – The Real Problems Continued

- ***Short term – what we do currently***

The remediation of the inactive 1-4 ash disposal sections:

- At this moment, this is *the largest* ash disposal *remediation* in Hungary,
- The covering material and the whole procedure of remediation is getting through a *complex qualitative control procedure* (pre- and after control for the purity of the covering material etc.).

Oroszlány ash disposal - current situation

Sections finalized (1. and 3.)



Stand-by sections (5. and 6.)



Sections under remediation (2. and 4.)



Remediation of section 1. and 3. - finalized

- 2014-2017

Cost:

- 8.5M EUR
(~35 ha)



Remediation of section 2. and 4.– under operation

- 2016- preparation



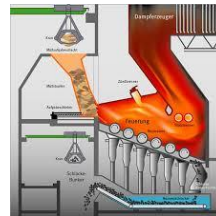
- 2017/18
first
phase



Our Targets

In medium- and long term

- Total remediation,
- Extension of the current infrastructure
- New projects



Our Targets

- At the Oroszlány power plant site, the equipment and facilities remain valuable and are useable. There is potential for the establishment to be used for energy production, industrial purposes or to possibly function as a new industrial park.

Noteworthy facilities and qualities include:

- ✓ The existence of authorisations
- ✓ Accredited Laboratory
- ✓ Social acceptance
- ✓ Human capital, skills and competences available for energy exploitation
- ✓ Electrical-Basic Network
- ✓ Road and rail infrastructure
- ✓ Close distance from a residential area
- ✓ Free sites within the site
- ✓ Free operating capacity in the ash disposal areas
- ✓ Recultivated ash disposal areas
- ✓ Buildings needed for operation
- ✓ Cooling water system, cooling lake

Our Targets

Alternative uses of the Oroszlány power plant site:

- Option I: Usage of the site for energy purposes:
 - Option I/A – continued operation and progressive development of an existing power plant
 - Option I/B – establishment of a new household waste incineration plant
 - Option I/C – Installation of a quick-start gas turbine block for energy recovery
 - Option I/D – Establishment of PV plant
 - Option I/E – Installation of PtG technology
 - Option I/F – Installation of other recovery technologies
- Option II: Other utilisation of the site (e.g. site lease, industrial park, etc.)
- Option III: Recultivation and servicing of the gas-powered heating plant (MVM OEF Ltd.)

The Real Problems

Identification of the problems in short- and long term

- Lack of sources for finalizing the remediation of all sections of ash disposal areas.
- This one is not an isolated, but a *nation-wide* (perhaps *Europe-wide*) problem for the former-working ash disposal areas.

Proposal

- Generate and/or identify new financial sources for environmental remediation and post-mining landscape utilisation

The Real Problems

We're confident that there are a lot of similar coal power plants and/or mines in the EU, at different stages of „phasing out”. Creating a community of similar companies would be beneficial.

SHORTLY: THIS IS WHY WE ARE HERE!

Thank you for your attention!

