Coal Regions in Transition Platform

Ministry of Economic Affairs, Innovation, Digitalization and Energy of the State of North Rhine-Westphalia

Energy system transformation and clean air – Priority projects in NRW

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Some facts about North Rhine-Westphalia

- Around 18 Million inhabitants
- 30 % of Germany‘s power production
- 30 % of Germany‘s GHG emissions (286 Million t CO2 eq in 2016)
- Around 70 % of NRWs GHG emissions are due to energy and industry sector
- Almost 70 % of NRWs power production based on hard coal and lignite

Synlight – the world‘s largest artifical sun for basic research

Exploring the synthesis of solar fuels – both for DLR research projects and external research and development projects

Focus on hydrogen production via thermal splitting of water, but also testing components for solar power plants

Project volume of 3,5 Mio. EUR, started operation in 2017, co-funding of federal and regional government

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GrEEN – sustainable heat from former mining infrastructure

- Using mining water for heating the nearby energy experience museum Energeticon
- Initial construction problems as it was not possible to use the degassing pipe for the heat exchanger
- Drilling through 150 meters of concrete necessary to reach the mining water (temperature 26 °C)
- Project volume of around 1,2 Mio. EUR; funded by the state of NRW, RWE and Energeticon gGmbH; operation started last month
- In two weeks: publication of a study on the potential of former mining infrastructure for sustainable heating

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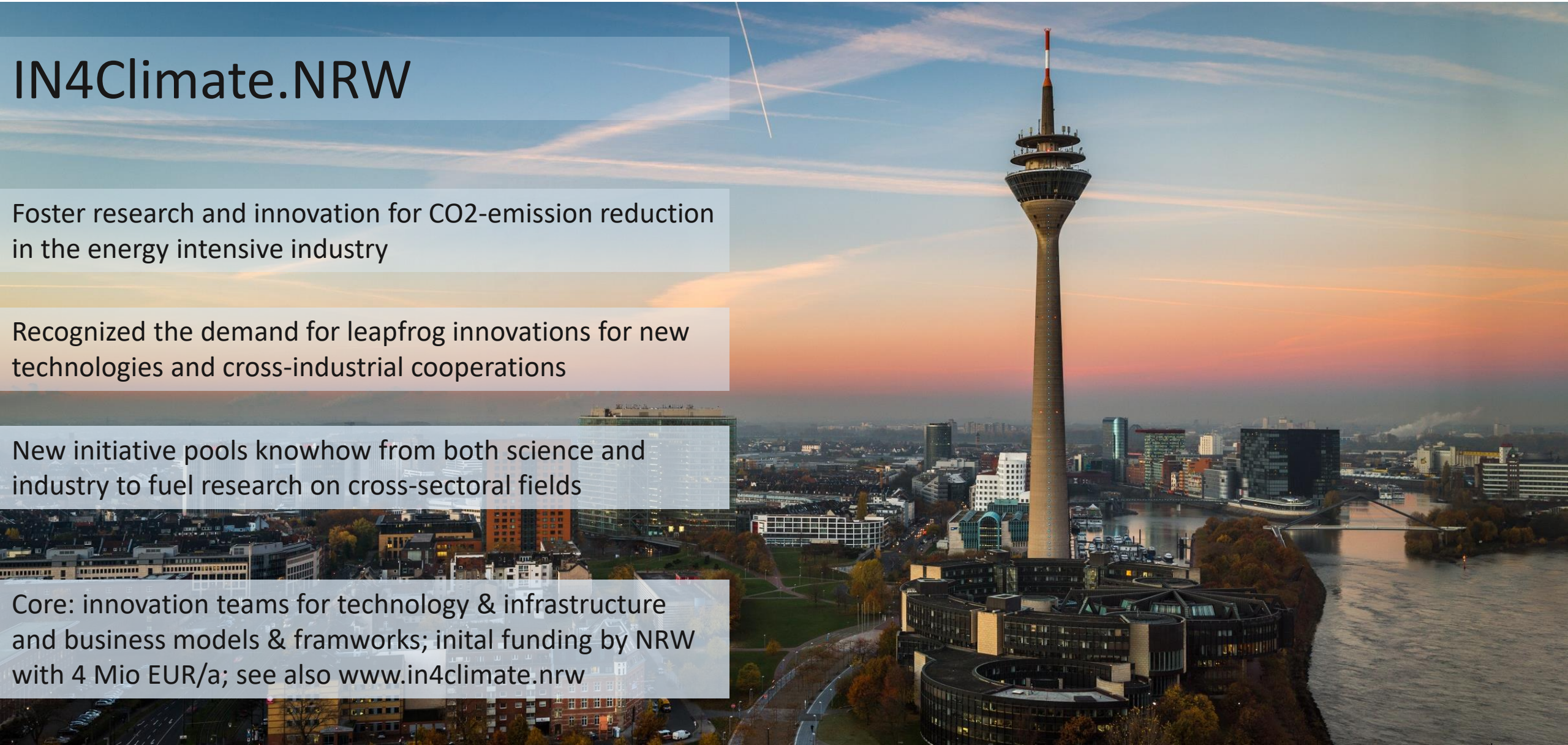
IN4Climate.NRW

Foster research and innovation for CO2-emission reduction in the energy intensive industry

Recognized the demand for leapfrog innovations for new technologies and cross-industrial cooperations

New initiative pools knowhow from both science and industry to fuel research on cross-sectoral fields

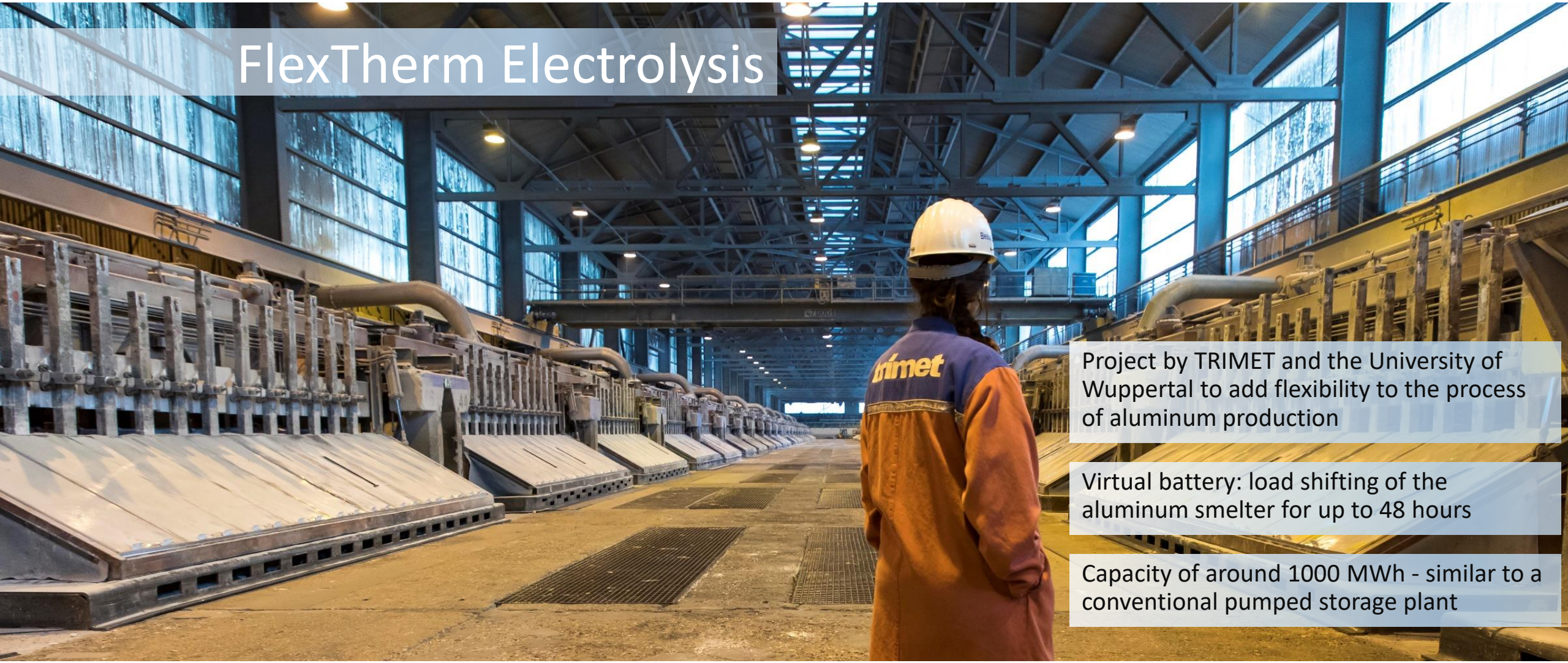
Core: innovation teams for technology & infrastructure and business models & framworks; inital funding by NRW with 4 Mio EUR/a; see also www.in4climate.nrw



Carbon2Chem® – reusing top gases from steel production

- Major research project to explore the possibilities to convert top gases from coal-intensive steel production into basic chemicals and fuels
- Pilot plant successfully in operation since 5 weeks
- Modular approach of Carbon2Chem® can be scaled up to 50 steel plants worldwide
- Led by thyssenkrupp AG, the consortia consists of various scientific and industrial partners, such as AkzoNobel, BASF, Covestro, Linde, Siemens, Fraunhofer Umsicht, KIT, MPI, RWTH, ZBT, …
- Overall budget app. 84 Mio EUR from which 62 Mio. EUR are funded by the Federal Government of Germany
- Potential CO2 reduction in the German steel industry of around 20 Mio. t/a

FlexTherm Electrolysis



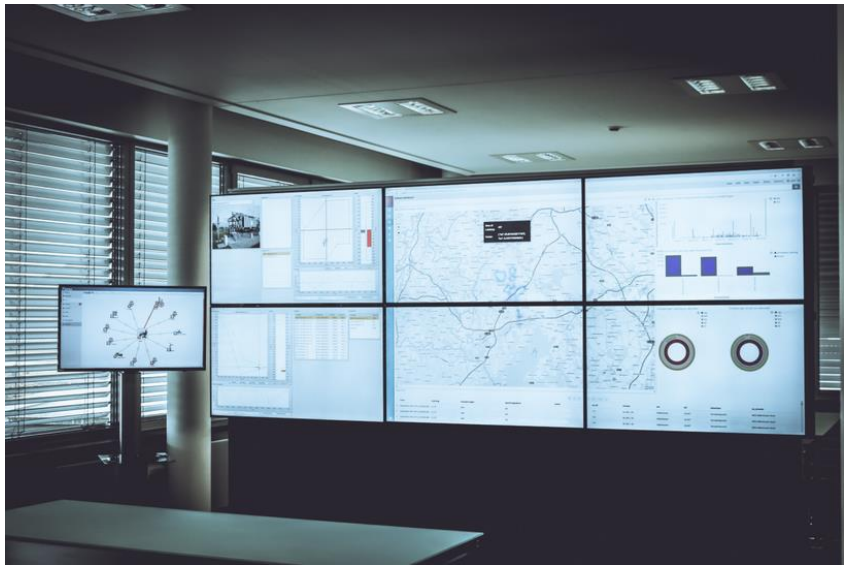
Project by TRIMET and the University of Wuppertal to add flexibility to the process of aluminum production

Virtual battery: load shifting of the aluminum smelter for up to 48 hours

Capacity of around 1000 MWh - similar to a conventional pumped storage plant

QUIRINUS – a regional virtual power plant

- QUIRINUS won the contest “virtual power plants” in 2017 and is now designing, implementing and testing a regional virtual power plant
- The aim is to establish a real-time management system for decentral production, storage and consumption units and thus avoid critical situations in the distribution grid
- Consortium consists of four different distribution grid operators, large and small enterprises and scientific institutions
- Project volume of around 6 Mio. EUR with funding from both the EFRD and the state of NRW; project is scheduled until 2020



http://www.quirinus-projekt.de/

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Lignite for basic material production and circular carbon economy

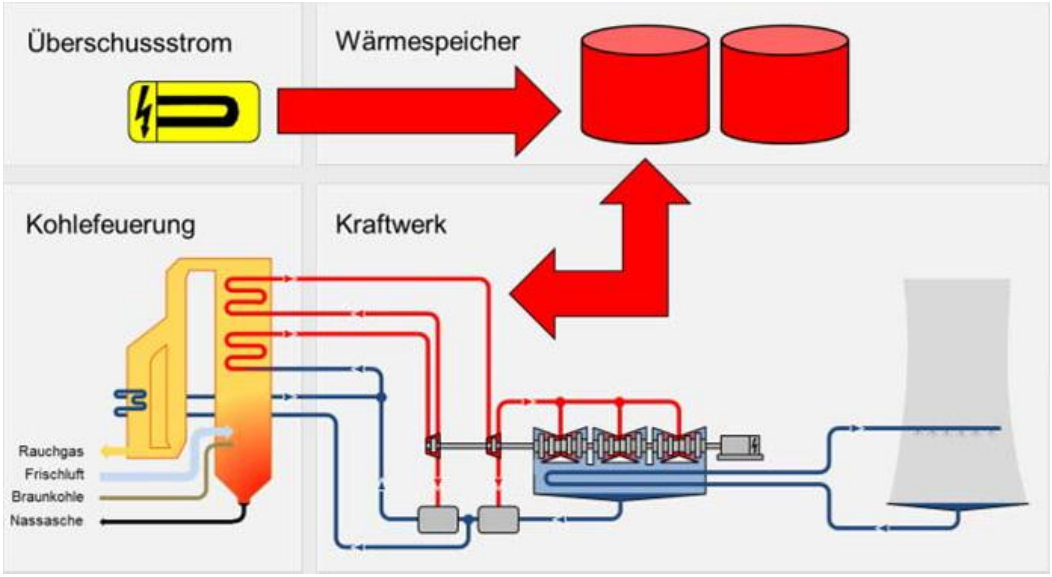
- Carbon is an essential resource for major industries in North Rhine-Westphalia → Looking for new primary and secondary carbon sources and start the circular carbon economy
- Goal: develop new technologies to convert lignite and other carbon sources into new products, e.g. Methanol
- A circular carbon economy can contribute to integrate renewable energies, to reduce the dependence of (fossil) imports and to set up a sustainable structural transformation in coal regions as new added value is created and existing infrastructures are used
- Support pilot plants in the region
- Support scientific projects within the framework of the initiative carbon chains IK^2 led by Fraunhofer

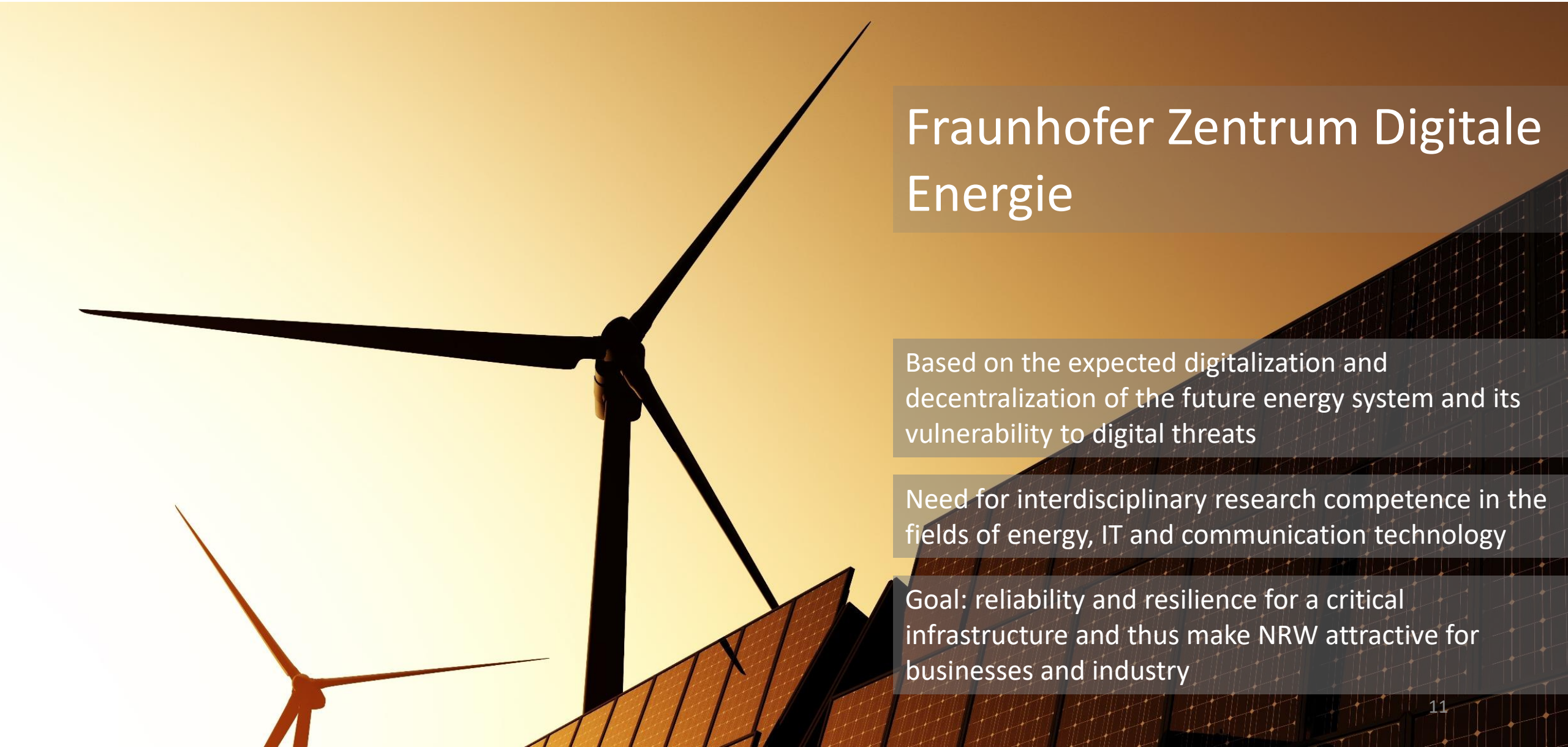
StoreToPower

- Exploring the possibilities to upgrade existing coal-fired power plants through heat storage
- During the transition phase the power plant can either be fed with steam from coal or from RES → Hybrid Power Plant
- For the post-coal phase only steam from the molten salt storage is used

- Challenge to integrate the heat storage into an existing power plant and develop an optimized operation scheme

- Advantages:
  - Scalability
  - Using existing infrastructures and grid connections, thus lower costs
  - Using existing sites, thus easier to acquire the requested permissions





Fraunhofer Zentrum Digitale Energie

Based on the expected digitalization and decentralization of the future energy system and its vulnerability to digital threats

Need for interdisciplinary research competence in the fields of energy, IT and communication technology

Goal: reliability and resilience for a critical infrastructure and thus make NRW attractive for businesses and industry

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