

# EUROPEAN NETWORK FOR A CIRCULAR CARBON ECONOMY – ENC<sup>2</sup>E

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# Motivation for Closing the Carbon Cycle via Sector Coupling



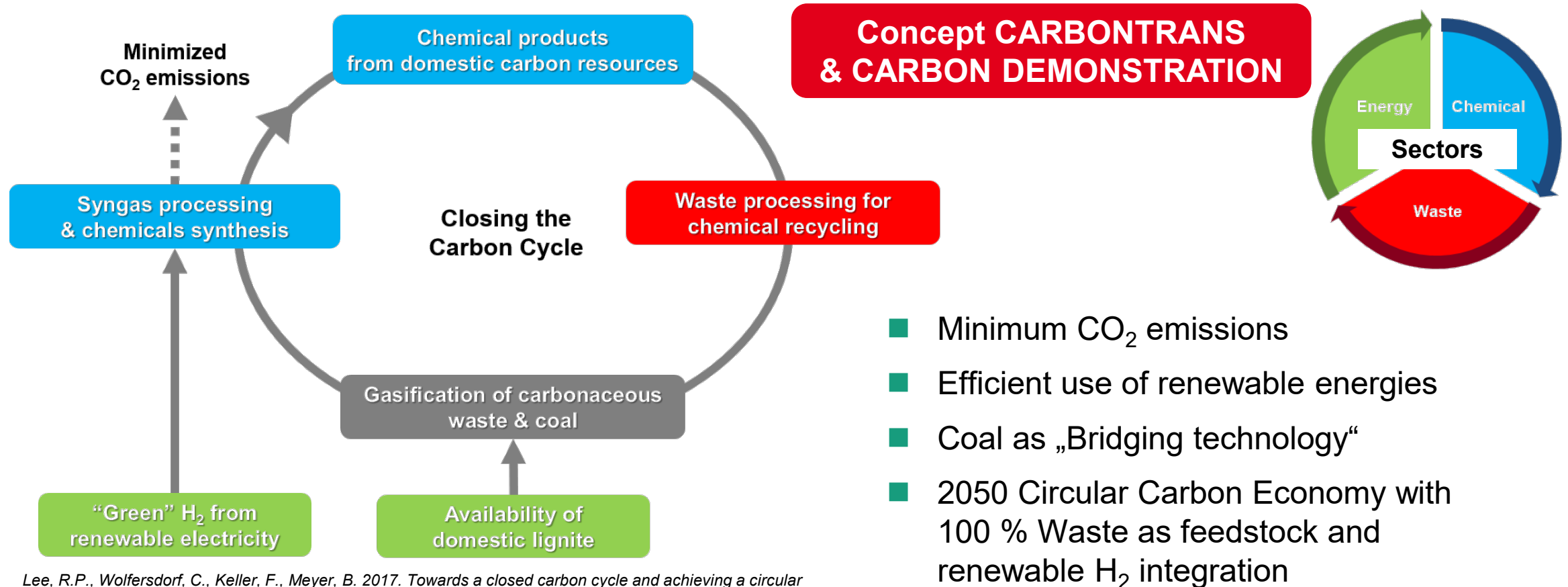
# Potential for Closing the Carbon Cycle

## Waste Hierarchy

Hierarchy	Objectives	Route	Applicable carbon waste
Reduce	Ultimate aim	From design to utilization	
Reuse	As much as possible	Direct reutilization	
Recycle (Material)	More sector targeted solutions	Material recycling <i>not "down cycling"</i>	<ul style="list-style-type: none"> <li>• Separated &amp; "pure" plastics</li> </ul>
Recycle (Chemical)	Highest potential for closing the carbon cycle	<p>Chemical recycling Via <i>gasification, depolymerization, pyrolysis, solvolysis</i></p> <p><i>*Gasification is the only technological route to close the carbon cycle for residual &amp; problematic waste</i></p>	<ul style="list-style-type: none"> <li>• Mixed plastic waste &amp; Sorting residues</li> <li>• Problematic waste (high Cl, Shredder light fraction, carbon &amp; glass fiber composites, organic residues, PCB-containing, ...)</li> <li>• Municipal waste fractions</li> <li>• ...</li> </ul>
End of Life Utilization	As little as possible	<ol style="list-style-type: none"> <li>1) Waste incineration</li> <li>2) Substitute fuel (EBS) combustion</li> </ol>	<ol style="list-style-type: none"> <li>1) Municipal waste</li> <li>2) Different waste fractions</li> </ol>
Disposal	When no other options apply	Landfill	

# Circular Carbon Economy

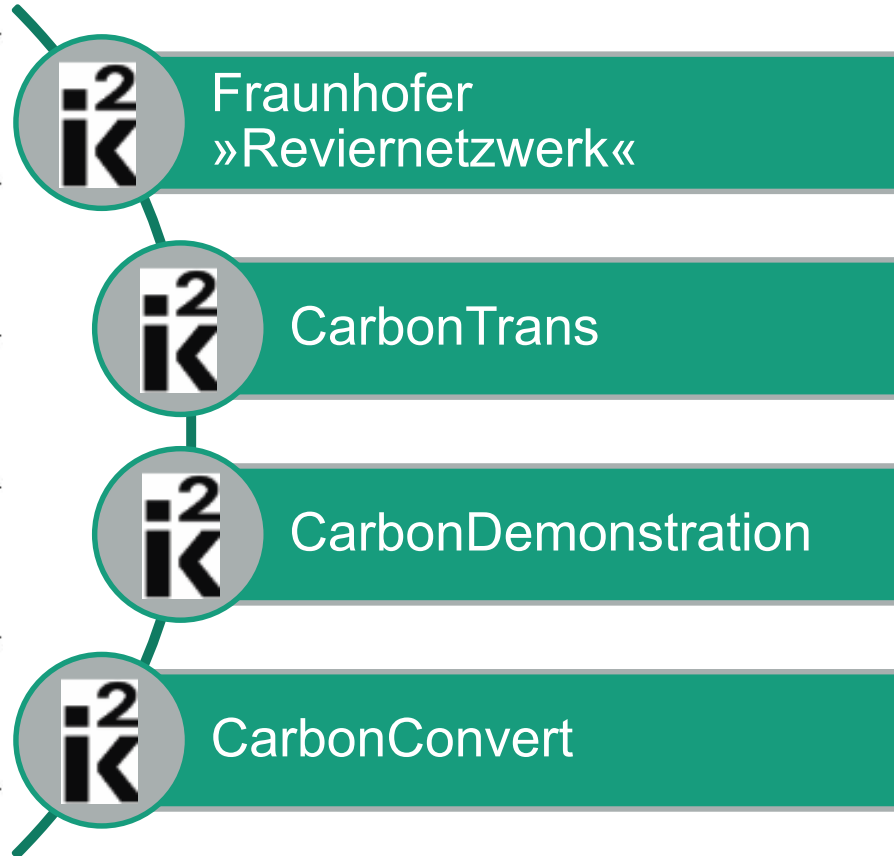
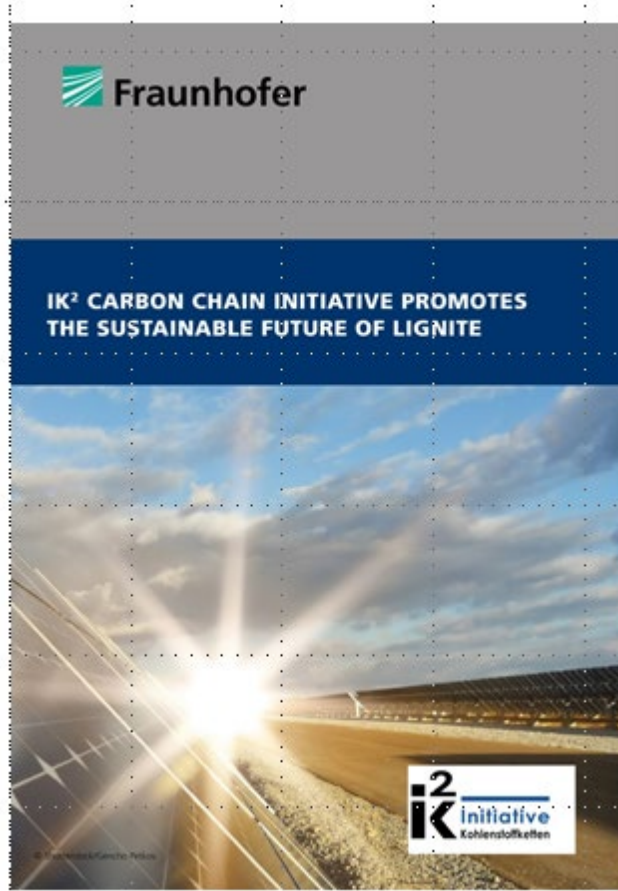
## Sector coupling using gasification as interface technology



Lee, R.P., Wolfersdorf, C., Keller, F., Meyer, B. 2017. Towards a closed carbon cycle and achieving a circular economy for carbonaceous resources. Erdöl, Erdgas, Kohle, Heft 6, 2017, S. 77 – 80

# Starting Initiative for ENC<sup>2</sup>E

## National Initiative Kohlenstoffketten IK2



- Advisory board: RWE, Mibrag, EP Power Europe, LEAG



- Technology demonstration Saxony-Anhalt (Leuna)
- Technology demonstration (Rhineland)



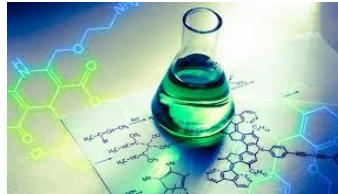


# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy

## Scope of ENC<sup>2</sup>E

### ■ European Circular Carbon Economy Network coupling the sectors

- Energy Management, Waste Management, Plant Engineering & Construction, Chemical Industry as well as
- Members from R&D institutions & Universities, ministeries, NGO's, politics



### ■ Prepare the implementation of sustainable technology options to

- Secure feedstock basis for European industry by domestic resources
- Keep employment by transforming jobs in coal regions
- Reduce CO<sub>2</sub>-emissions by removing coal & waste from energy sector
- Integrate renewable power and hydrogen

# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy

## Open Network integrating National Networks

■ Lead  **Fraunhofer**  
IMWS

■ Initiating institutions:

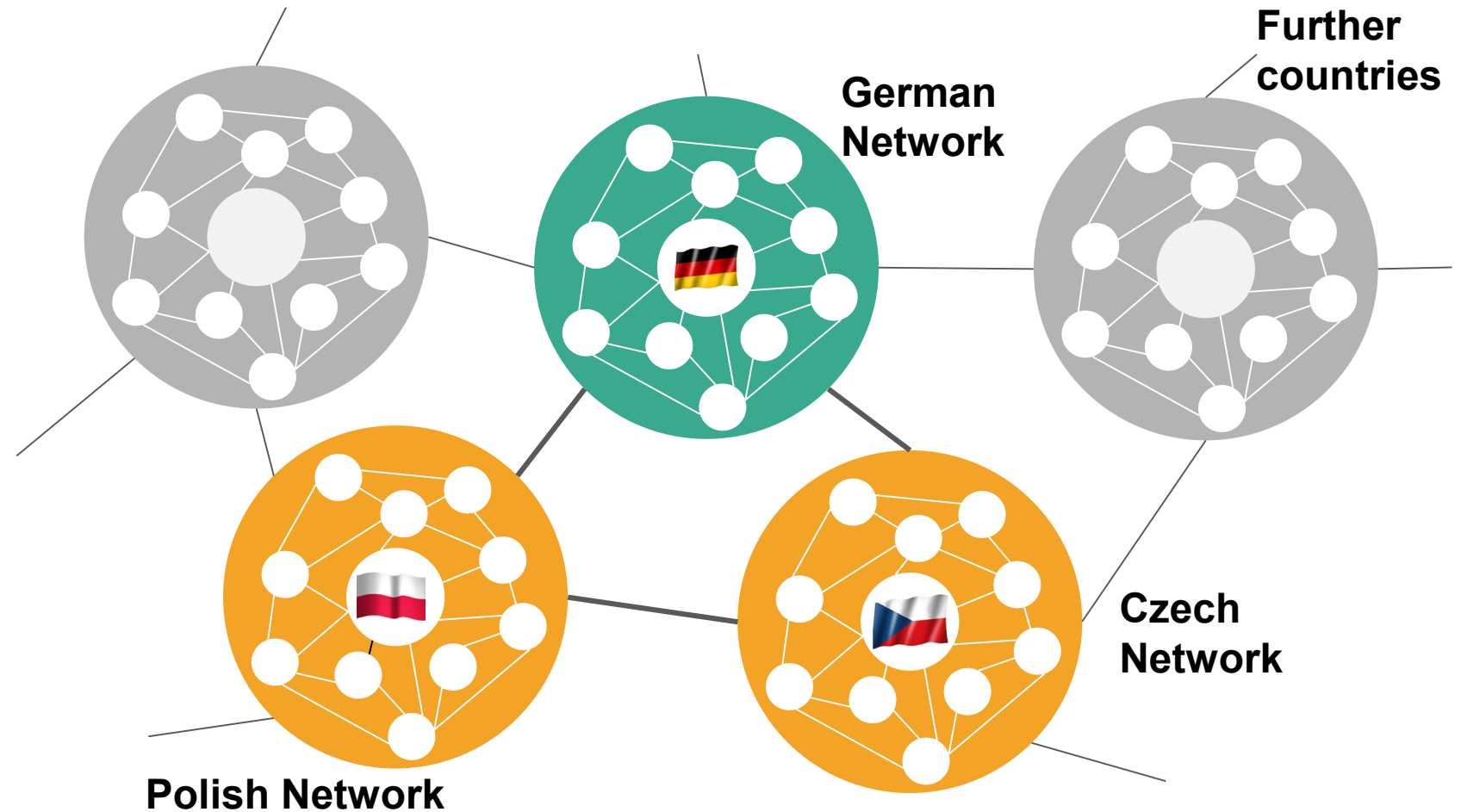
■ GER  **Fraunhofer**  
IMWS

■ Poland 

■ Czech Republic

  
INSTITUTE OF  
CHEMICAL TECHNOLOGY  
PRAGUE

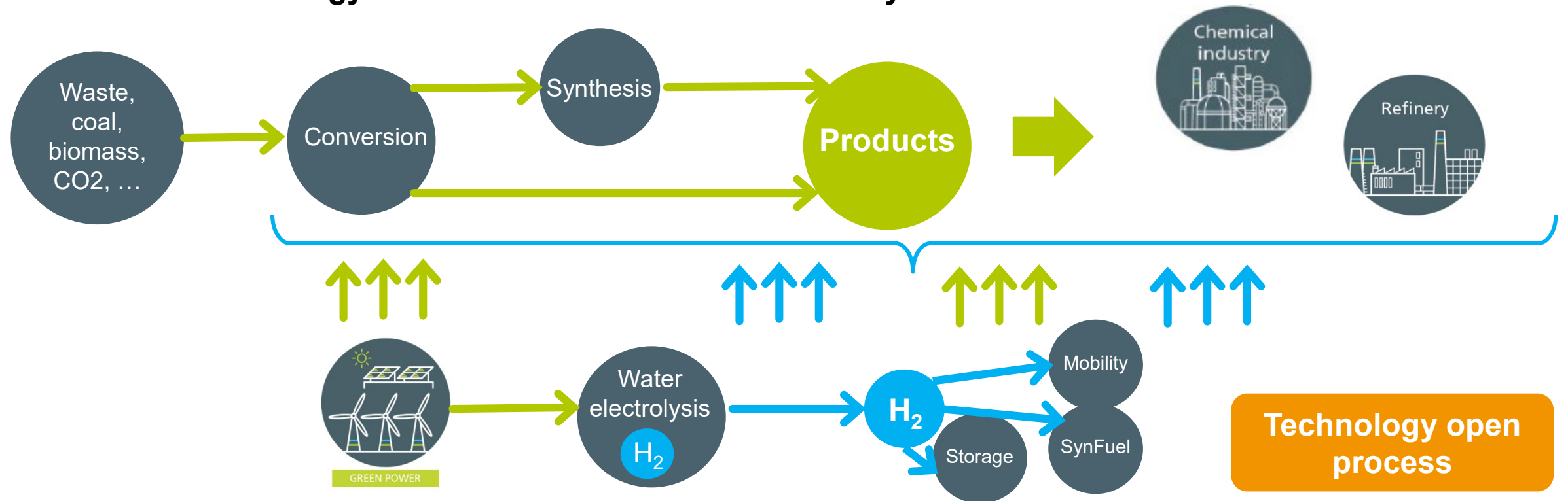
  
The Czech Academy  
of Sciences



# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy

## Scope

### ■ Different technology routes for circular carbon economy



**Key Evaluation Criteria: Technical Feasibility, Economy, Environmental Impact, Socio-Economic Impact**



# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy

## European Strategic Trinational Network Project, funded by EC

### POLAND

- Capacity Building, Education & Information, National Networking
- Technology Evaluation and Assessment, Process Modelling
- Economic Evaluation & Social Acceptance

### GERMANY

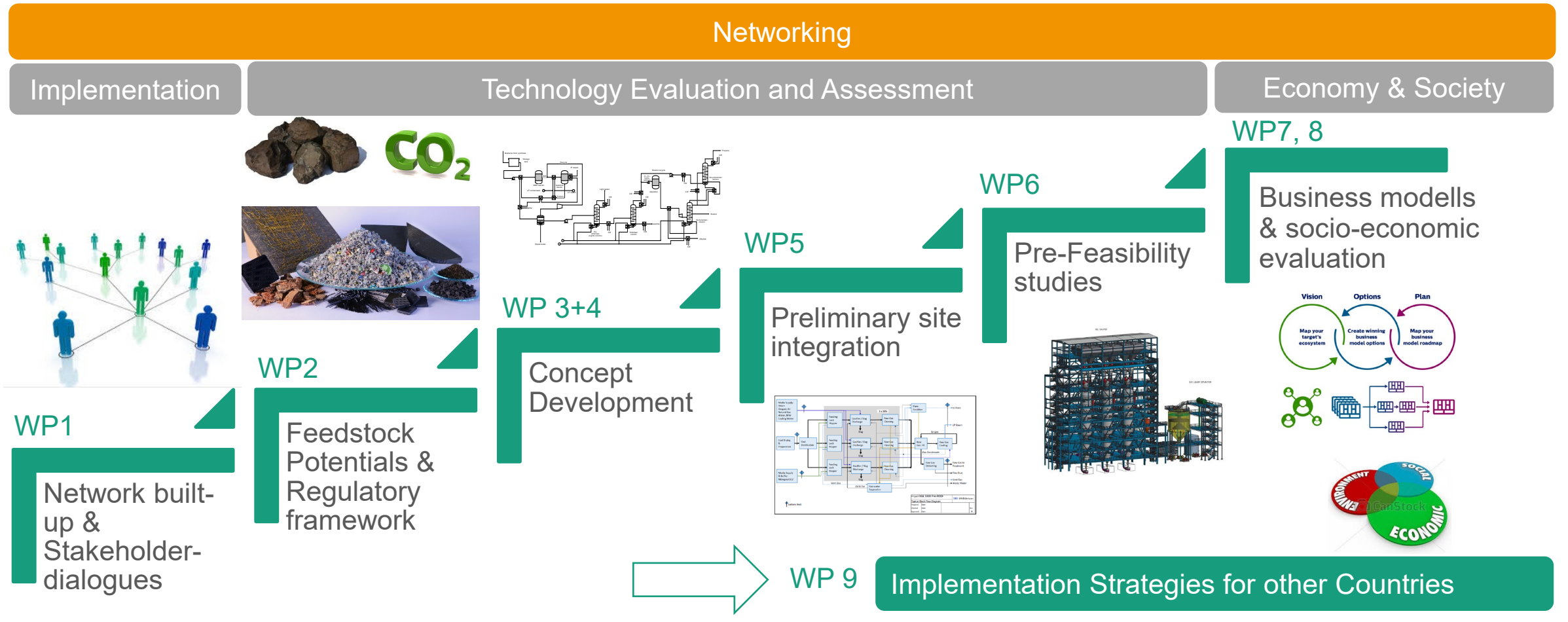
- European Network Coordination, Network Expansion, Workshop & Conference Organization
- Capacity Building, Education & Information, National Networking
- Technology Evaluation and Assessment, Process Modelling
- Economic Evaluation & Social Acceptance

### CZECH REPUBLIC

- Capacity Building, Education & Information, National Networking
- Technology Evaluation and Assessment, Process Modelling
- Economic Evaluation & Social Acceptance

Aim: 3 years seed funding of 8.5 million € by EC & Co-funding by network partners

# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy Implementation Strategy (9 Workpackages)



# ENC<sup>2</sup>E – European Network for a Circular Carbon Economy

## Next Steps

15<sup>th</sup> – 17<sup>th</sup>  
April

- Workshop „**Innovative Chemical Utilization of Carbon and Renewable Resources for a Circular Carbon Economy**“ in Berlin from 15<sup>th</sup> and 17<sup>th</sup> April
  - Germany, Poland, Czech Republic and China
  - Participants from Industry, Research Institutions and Politics

June

- Official establishment of NK2 network project in Germany (planned in June)

Summer

- Workshop on **Circular Carbon Economy** in summer together with Permanent Representation of Saxony-Anhalt in Brussels
  - Presentation of Projects in the framework of Circular Carbon Economy & Renewable Hydrogen Production in Saxony-Anhalt and Saxony
  - Research & Demonstration Projects
  - Intensive discussion of EU-funded cooperation possibilities



# Fraunhofer

**Im Auftrag der Zukunft.**