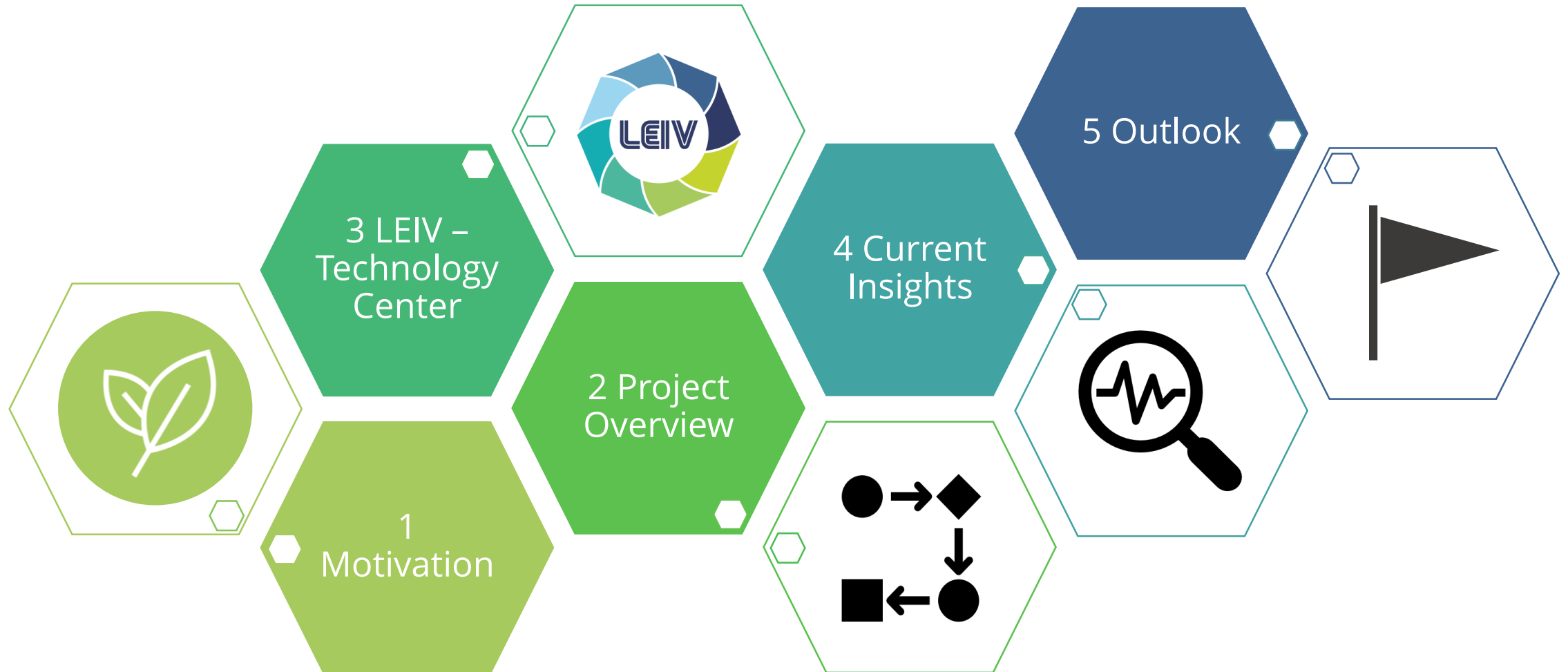


Prof. Maik Gude, Rebecca Bräuer, Tino Mrotzek, Dr. Marco Zichner, Dr. Thomas Behnisch  
Institute of Lightweight Engineering and Polymer Technology, TU Dresden

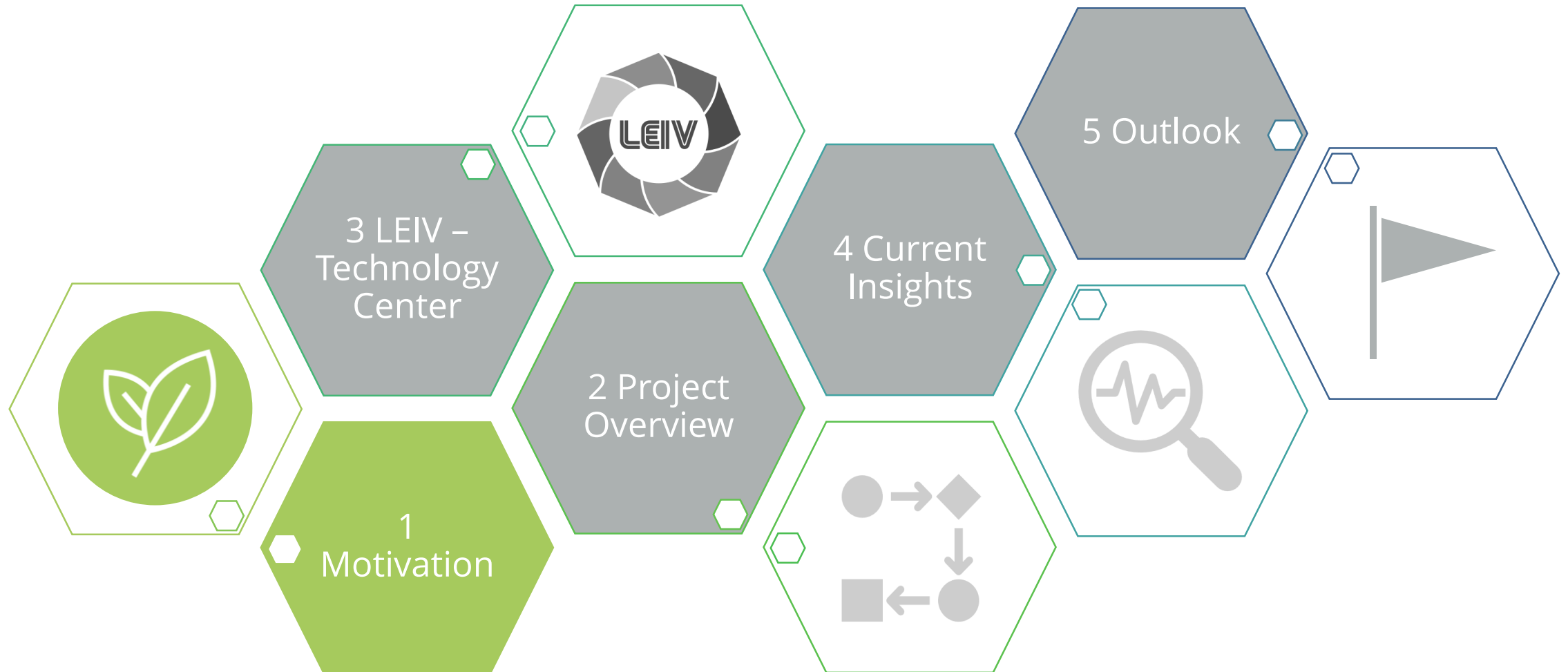
# Project METEOR

## Optimising the resource efficiency of manufacturing hybrid lightweight structures

24th International Dresden Lightweight Engineering Symposium / Online / 18 June 2021



# 1 Motivation





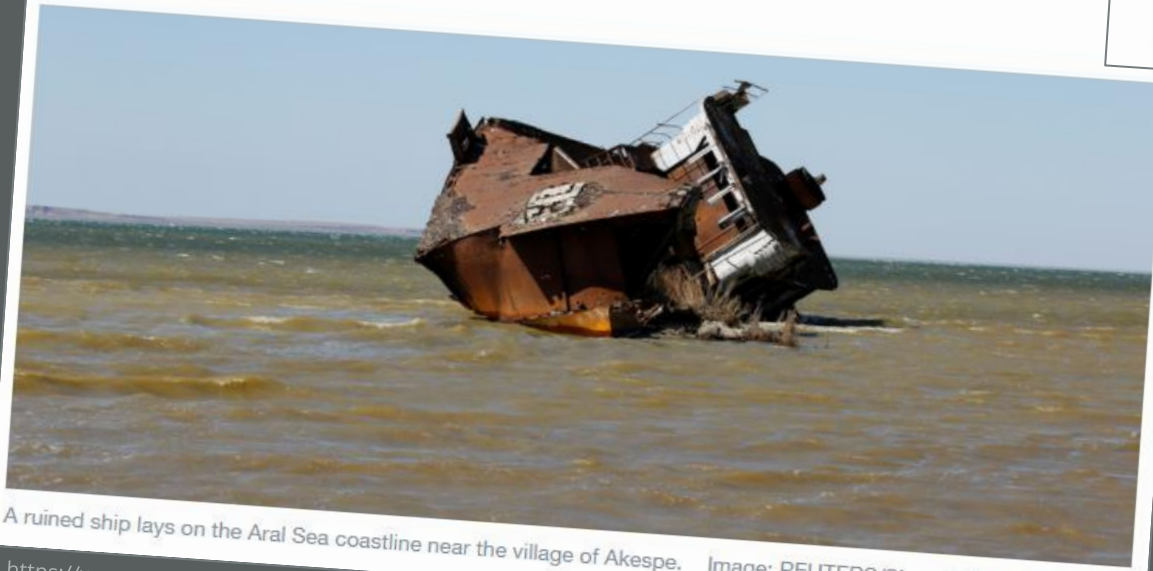
# The Arctic is in a death spiral. How much longer will it exist?

The region is unravelling faster than anyone could once have predicted. But there may still be time to act

<https://www.theguardian.com/us-news/ng-interactive/2020/oct>

Supported by

# This Central Asian lake is a stark reminder of the impact we have on the planet



A ruined ship lays on the Aral Sea coastline near the village of Akespe. Image: REUTERS/Shamil Zhumatov

<https://www.weforum.org/agenda/2020/02/aral-sea-lake-water-nature-human-impact/>

19. Januar 2014, 11:06 Uhr Bericht des Weltklimarates

# Frist für den Klimawandel läuft ab



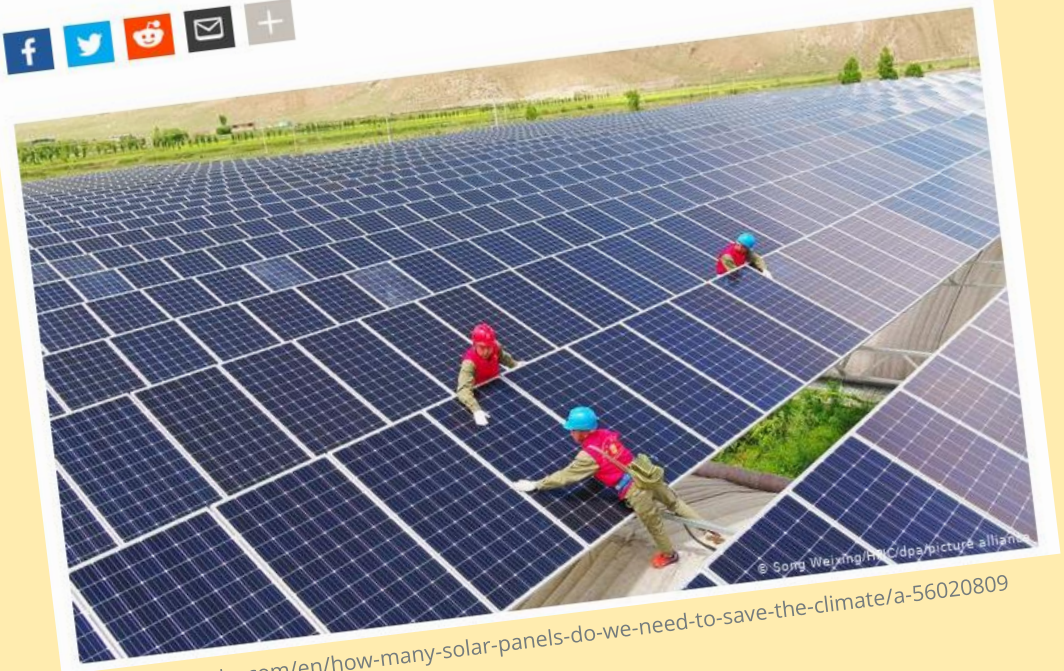
Braunkohlekraftwerk Jämschwalde nordöstlich von Cottbus: 15 Jahre bleiben für einen bezahlbaren Klimawandel. (Foto: dpa)

**Die Zeit wird knapp: Nur 15 Jahre bleiben der Weltgemeinschaft noch, wirksame und vor allem bezahlbare Maßnahmen gegen den Klimawandel zu ergreifen. Das zeigt ein internes Papier des Weltklimarates.**

<https://www.sueddeutsche.de/wissen/bericht-des-weltklimarates-frist-fuer-den-klimawandel-laeuft-ab-1.1866115>

# How many solar panels do we need to save the climate?

A zero-carbon-emissions energy system will rely mostly on low-cost solar electricity, experts say. About 100 giant solar panel factories must be built by 2025 for the world to "defossilize" its energy supply by 2035.



<https://www.dw.com/en/how-many-solar-panels-do-we-need-to-save-the-climate/a-56020809>

## Accelerating sustainability with virtual twins

JANUARY 26, 2021

<https://www.accenture.com/us-en/blogs/industry-digitization/accelerating-sustainability-with-virtual-twins>

### RESEARCH AND DEVELOPMENT

## Recycling is the Way to Sustainable Manufacturing

With many of our planet's environmental issues linked to human consumption, it's time to rethink our 'take-make-dispose' economy.

W Lundberg

<https://www.primaryenergy.com/research-and-development/recycling-is-the-way-to-sustainable-manufacturing>

## Energy Recycling: Turning Waste Heat into Added Power



Existing industries waste 2/3 of their energy through heat loss.

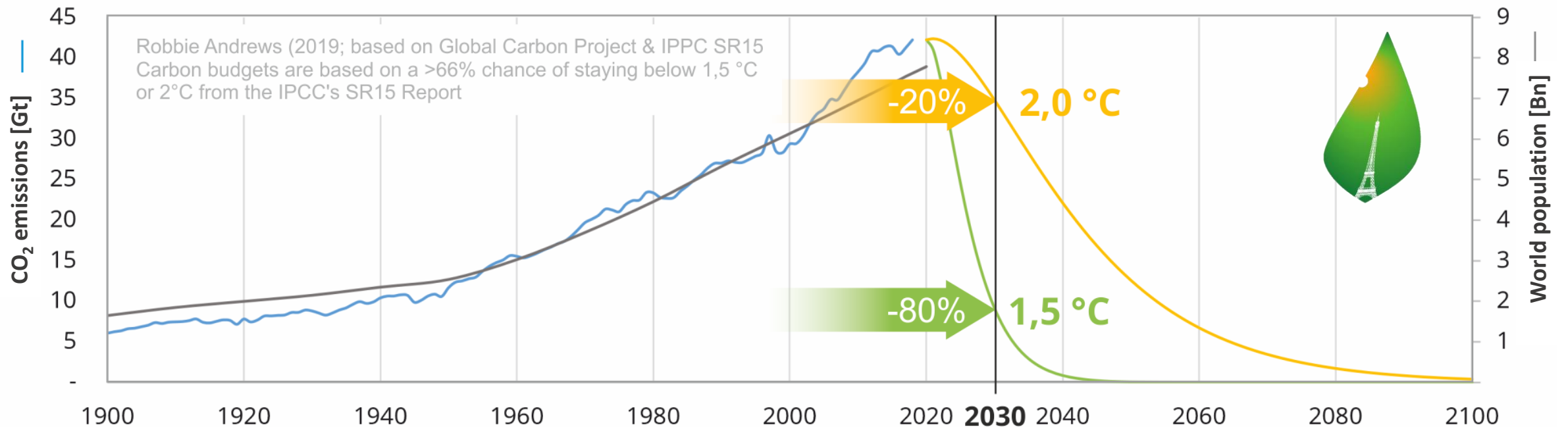


Primary Energy facilities capture that wasted heat and turn it into usable energy.

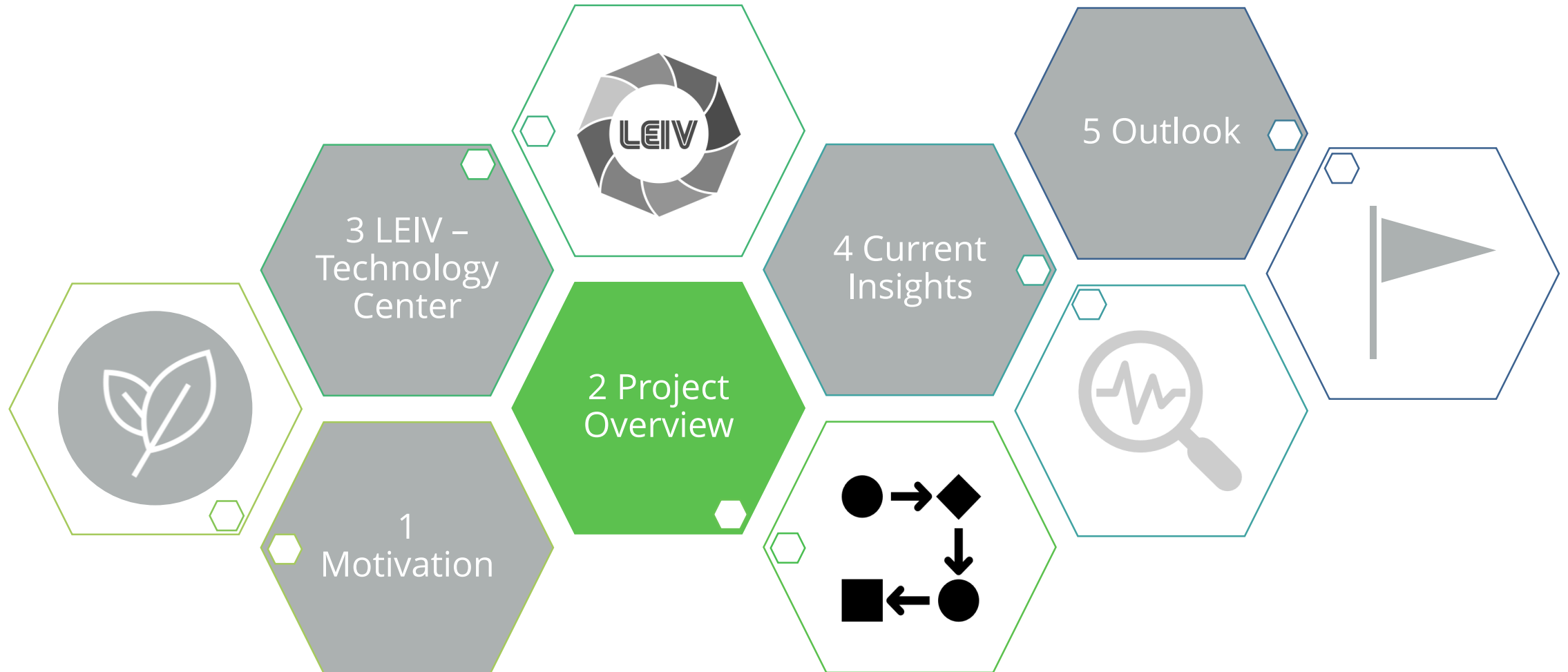
**'The energy lost in the United States from wasted heat in the utility sector is greater than the total energy use of Japan.'**  
- U.S. Department of Energy  
<https://www.primaryenergy.com/energy-recycling/>

# 1 Motivation

**METEOR:** Methods and technologies for validating and optimising the resource efficiency of process networks in the manufacture of hybrid lightweight structures



# 2 Project Overview



# 2 Project Overview



Start of project: **1 December 2020**  
Duration: **36 months** (until 11-2023)  
Project partners: **6 partners** – 3x industry + 3x R&D  
Project lead: **ILK, TU Dresden**



Supported by:



on the basis of a decision by the German Bundestag

Supervised by:

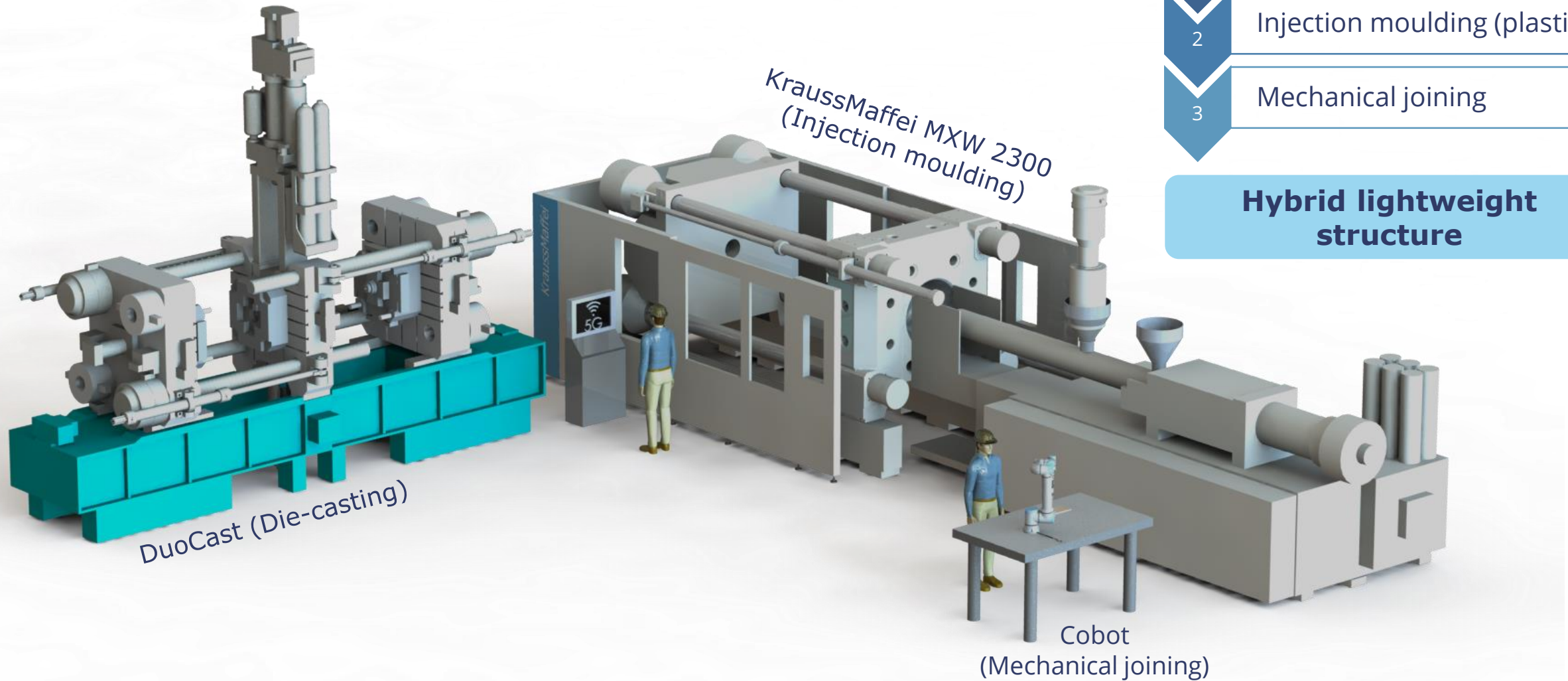


**Funding initiative:**

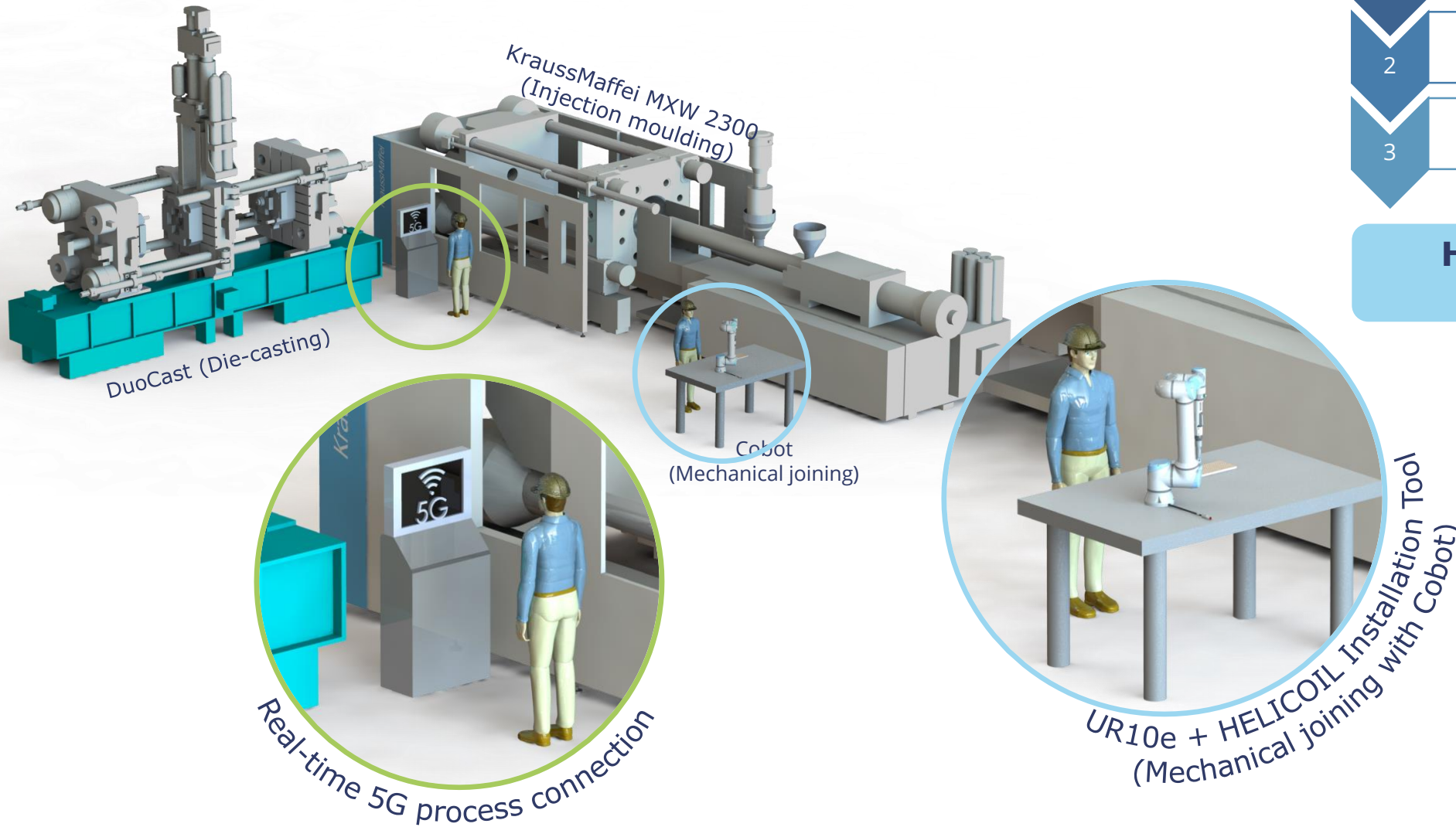
**TTP LB** = Technology transfer program lightweight engineering



## 2 Project Overview



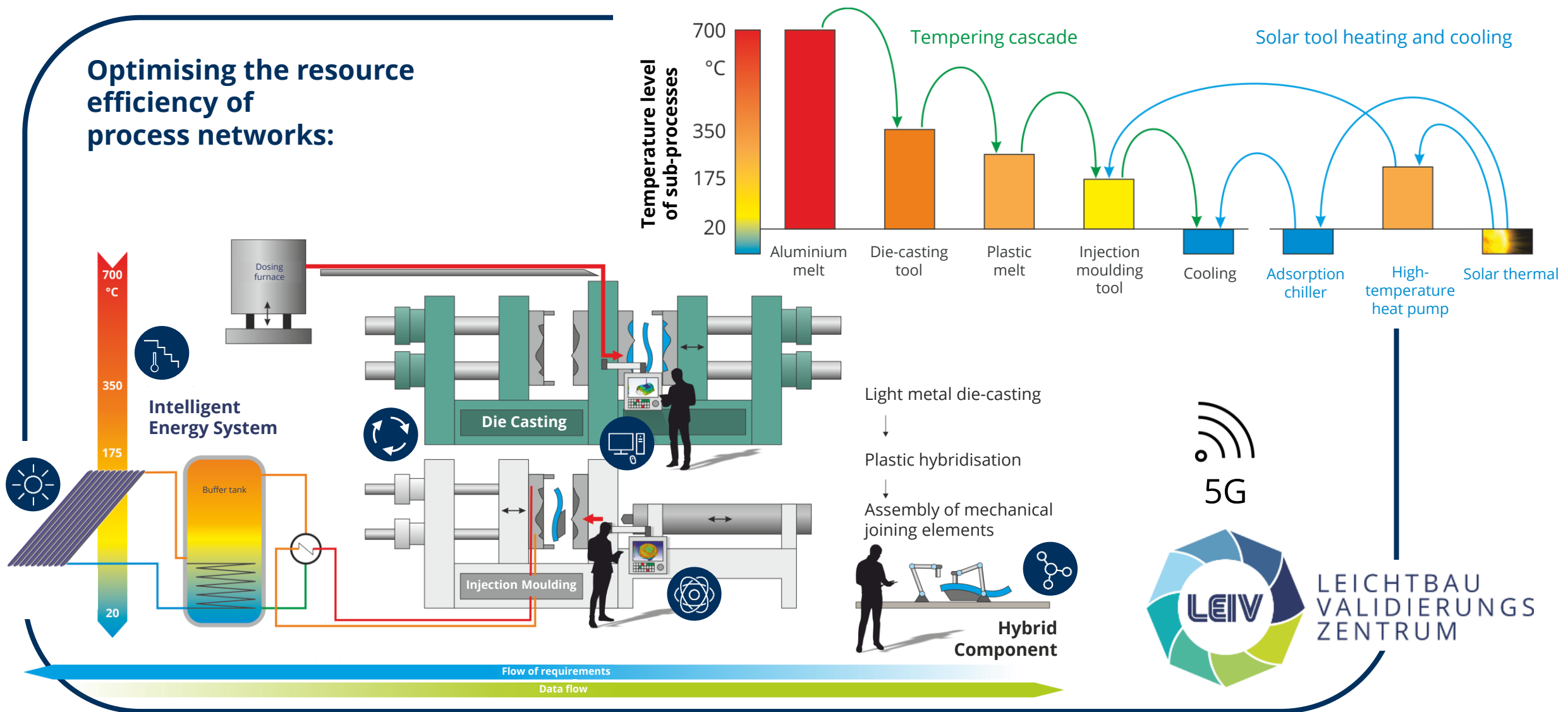
# 2 Project Overview



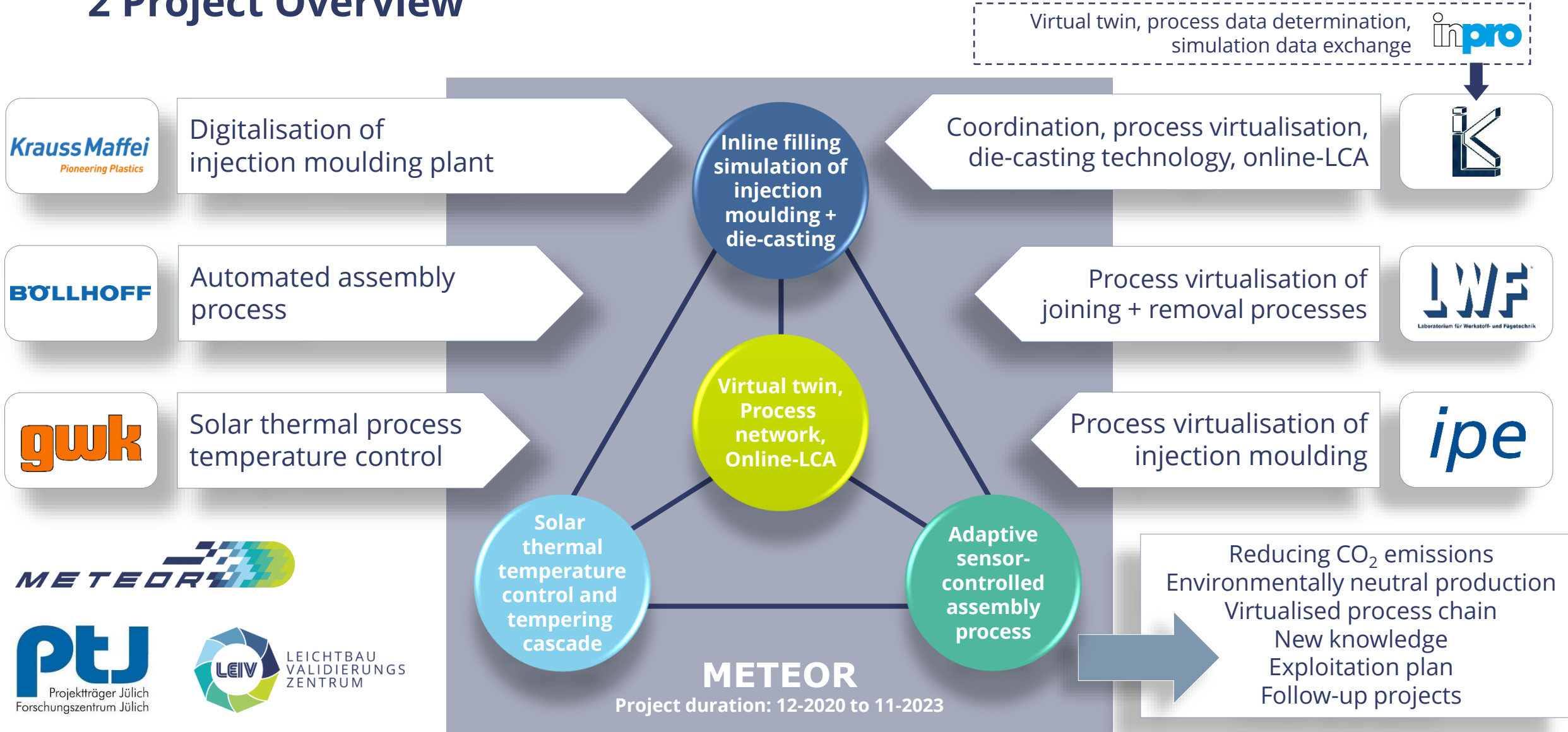
- 1 Die-casting (aluminium)
  - 2 Injection moulding (plastic)
  - 3 Mechanical joining
- Hybrid lightweight structure**

# 2 Project Overview

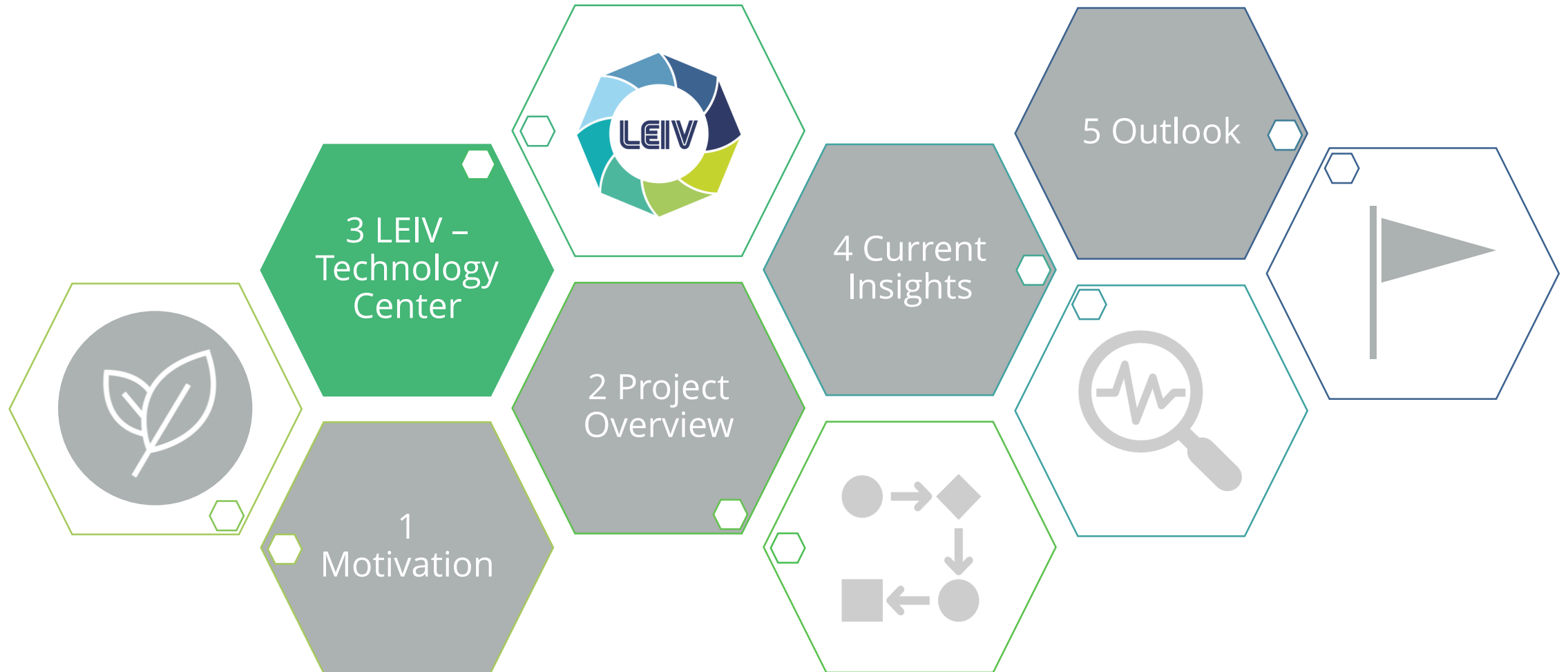
Optimising the resource efficiency of process networks:



# 2 Project Overview



# 3 LEIV - Technology Center



# 3 LEIV – National Lightweight Technology Validation Center



Open process network space

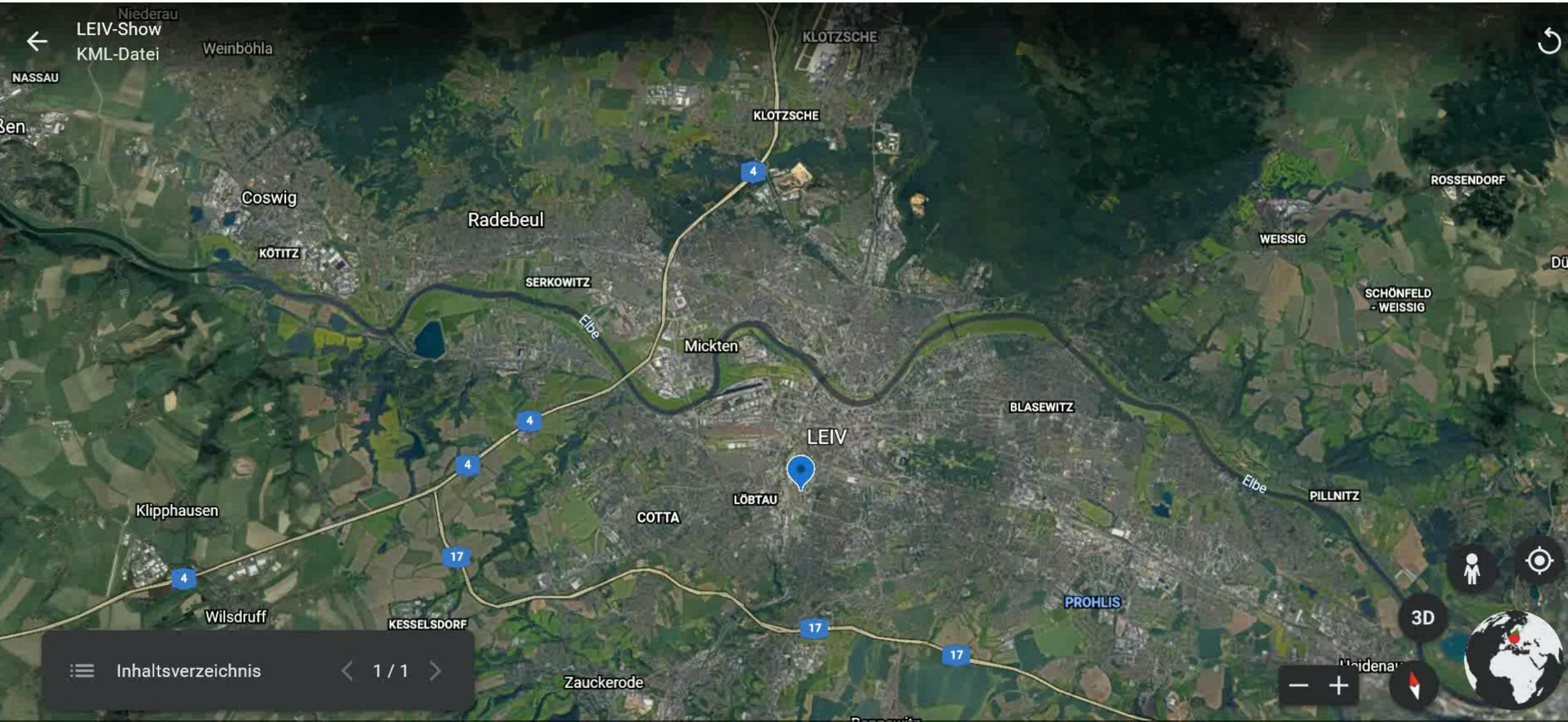
Demonstration and transfer center

Training and advanced education center and technology transfer to industry



38 LOIs from industry support the FOREL approach and the Technology Center

# 3 LEIV - Located in Dresden



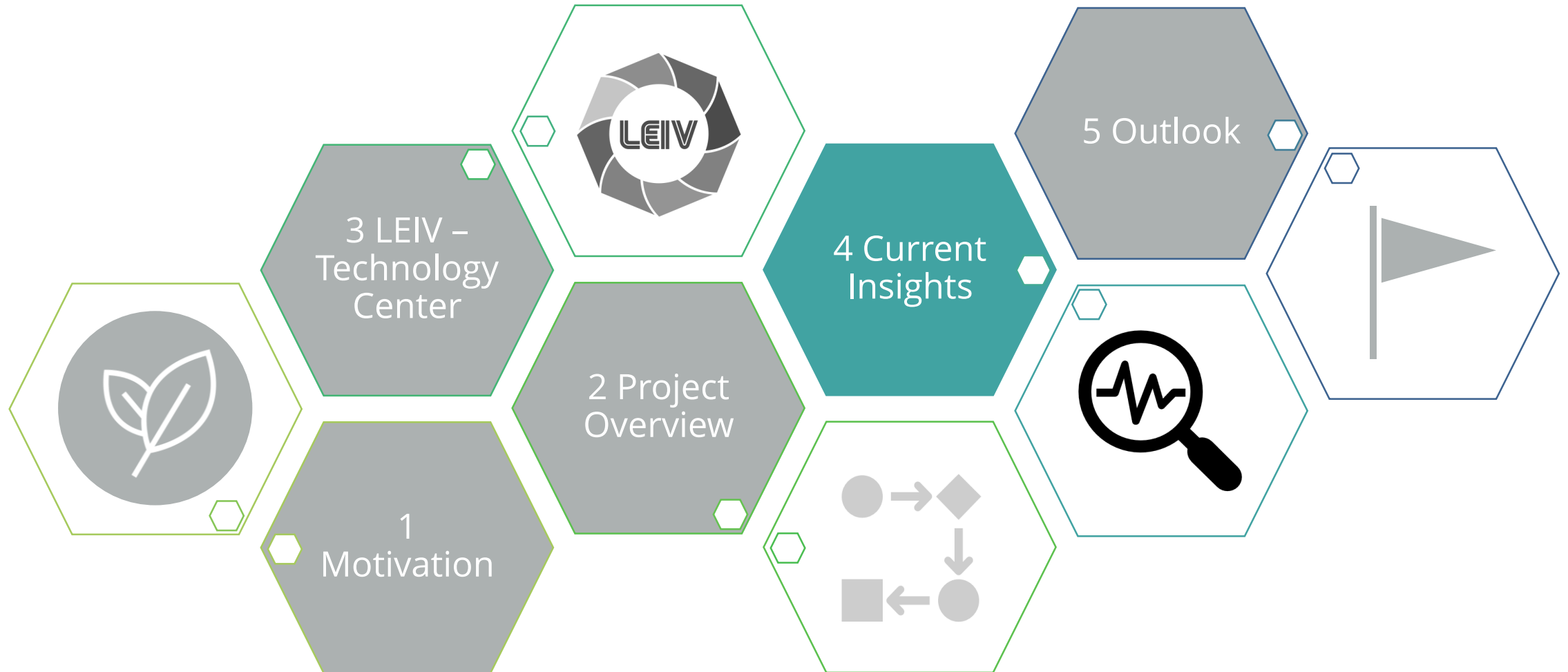


LEICHTBAU  
VALIDIERUNGS  
ZENTRUM





# 4 Current Insights

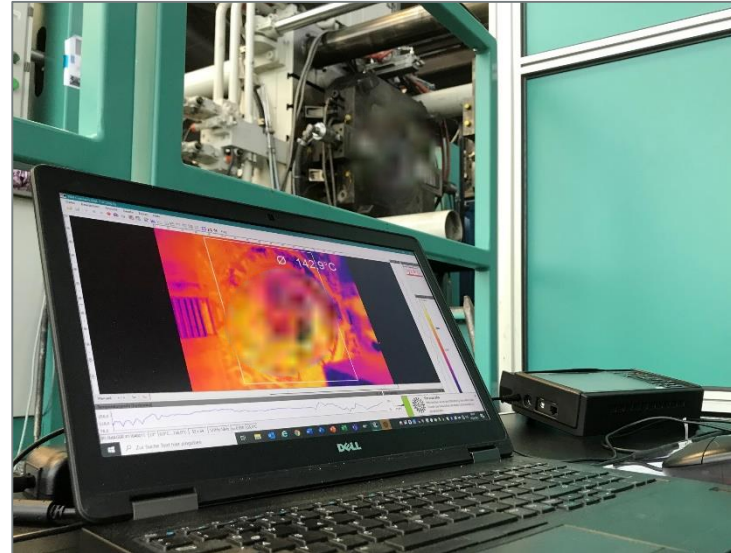


# 4 Current Insights

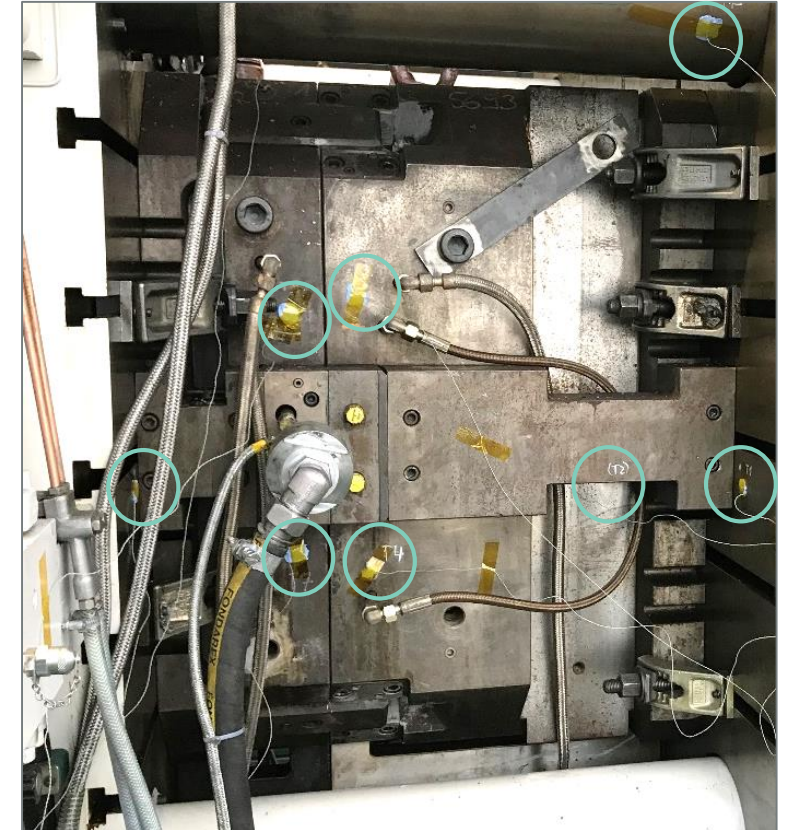
## DuoCast die-casting process



## Thermography of the tool



## Measuring the tool temperature with thermocouples



Experimental determination of the energy balance of the die-casting plant

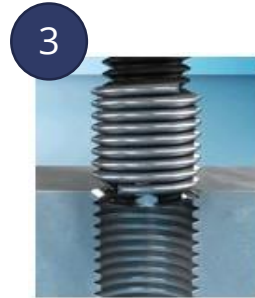
# 4 Current Insights



1 Pick up installation tool



2 Equip installation tool with HELICOIL



3 Place HELICOIL



4 Remove installation tool



5 Use installation tool manually



6 Pick up installation tool

Mechanical joining process

Option 1 Magazine feeding system

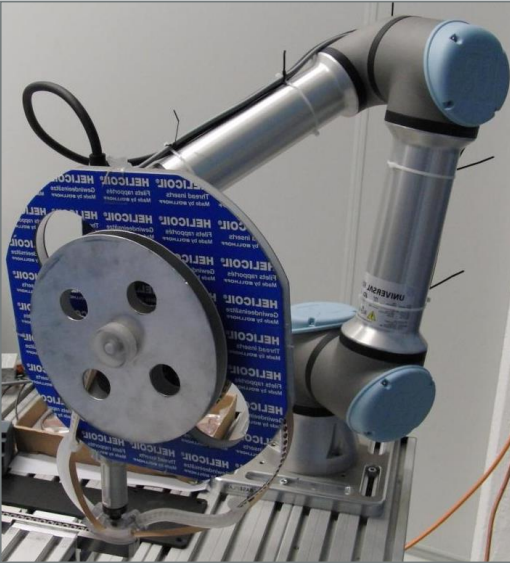


Development of an automated element feeding system

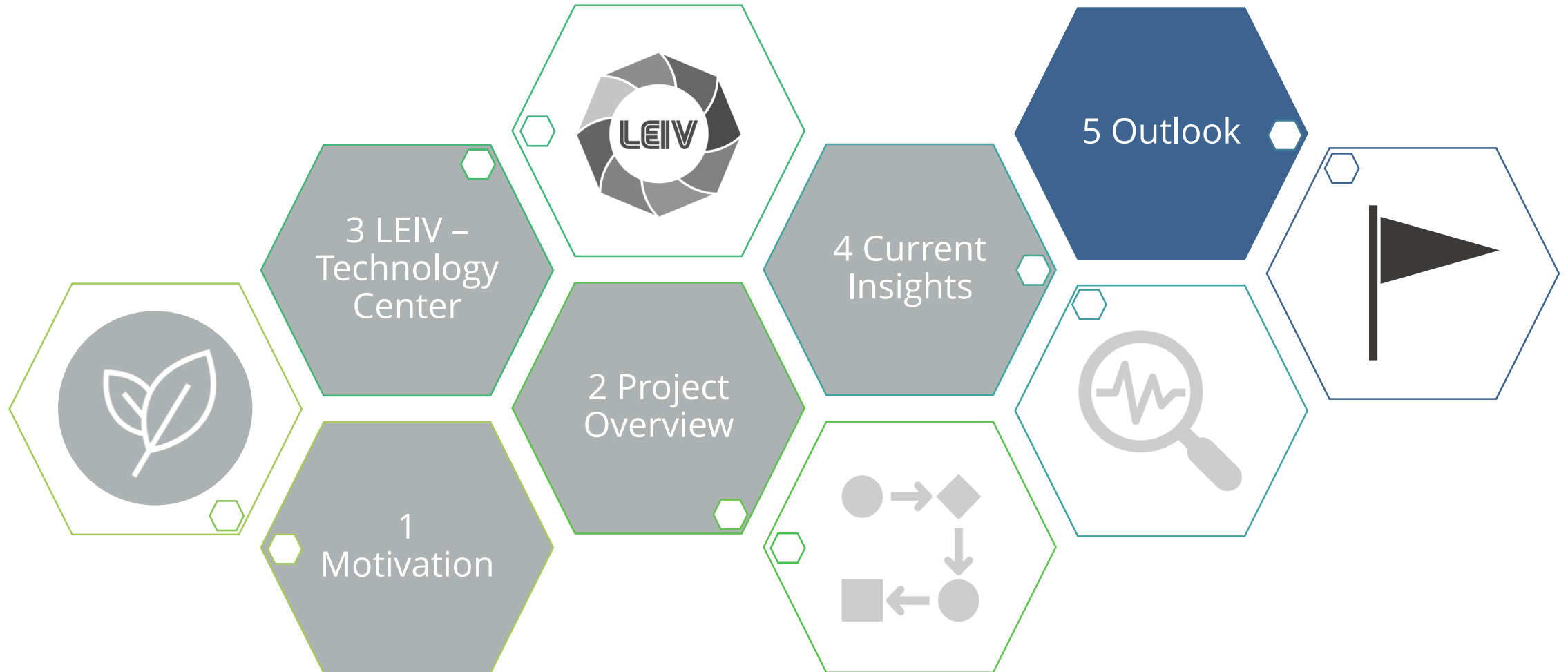


© Böllhoff

Option 2 Wheel feeding system



# 4 Current Insights



# 5 Outlook

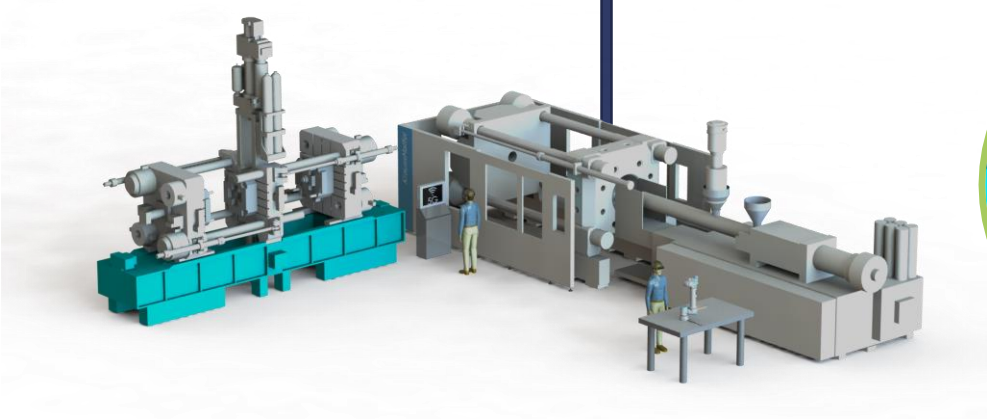
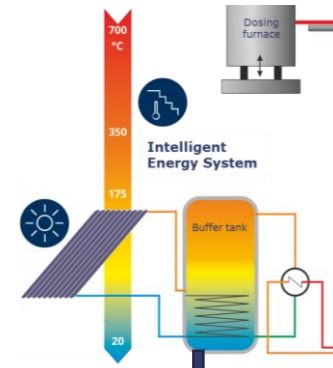


Finishing the development of the solar thermal energy system

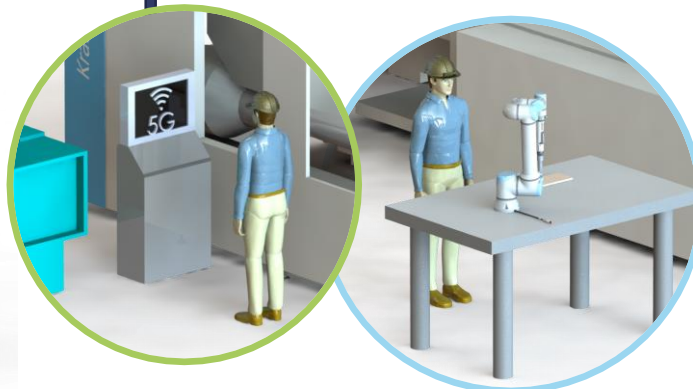
Expected opening ceremony of the LEIV



Today  
18-06-2021



Moving machines into the LEIV



Basis for an inline simulation and process-stable joining with cobot

**Validated and optimised resource efficiency for hybrid structures**

- ✓ connected sub-processes
- ✓ renewable energy

**2023**

- ✓ connected intelligent energy system
- ✓ continuous LCA of the new process network

**MAX environmentally neutral production**





Supported by:



Federal Ministry  
for Economic Affairs  
and Energy

on the basis of a decision  
by the German Bundestag

Supervised by:



Projektträger Jülich  
Forschungszentrum Jülich

# Thank you for your attention!