



# Horizon2020 Information Days on Public-Private Partnerships

***1. DISTRIBUTED ENERGY MANAGEMENT, PRODUCTION  
AND STORAGE SYSTEMS FOR EFFICIENCY OPTIMIZATION  
IN THE PROCESS INDUSTRY – DEMPROSE***

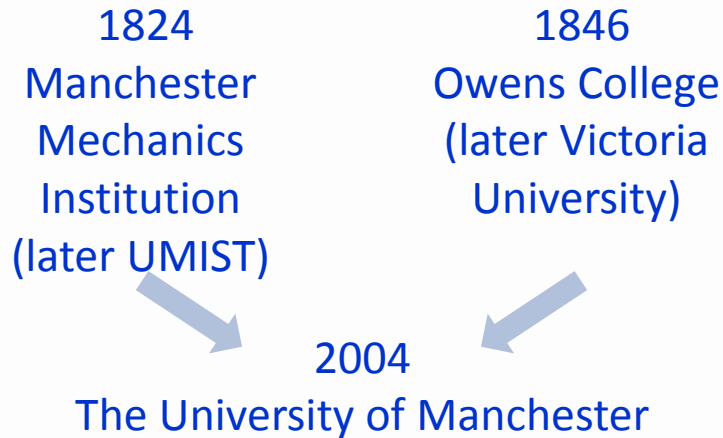
***2. HOLISTIC ENERGY AND RESOURCE MANAGEMENT  
SYSTEMS BY DESIGN, INTEGRATION AND OPTIMISATION –  
HERMES-DIO***

Brokerage event  
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# ORGANIZATION/COMPANY

## The University of Manchester



- Staff: 11,000+ (5800 academic & research)
- Students: ca 40,000
- Within last 10 years: 53<sup>rd</sup> to 38<sup>th</sup> world ranking in Academic Ranking of World Universities, 7<sup>th</sup> in Europe, and 5<sup>th</sup> in UK
- Biggest investment programme in UK higher education

## Centre for Process Integration

- Birthplace of pinch technology
- Staff
  - 7 academic staff
  - 25 PhD students
  - 40 MSc students
- Activities
  - Research
  - Software development
  - Professional training
  - Innovative technology transfer
  - Consulting
  - Teaching
- Centre of Excellence in Process Integration - energy recovery systems, total site analysis tools, water and waste water minimization, utility networks, optimization of integrated schemes, distributed energy

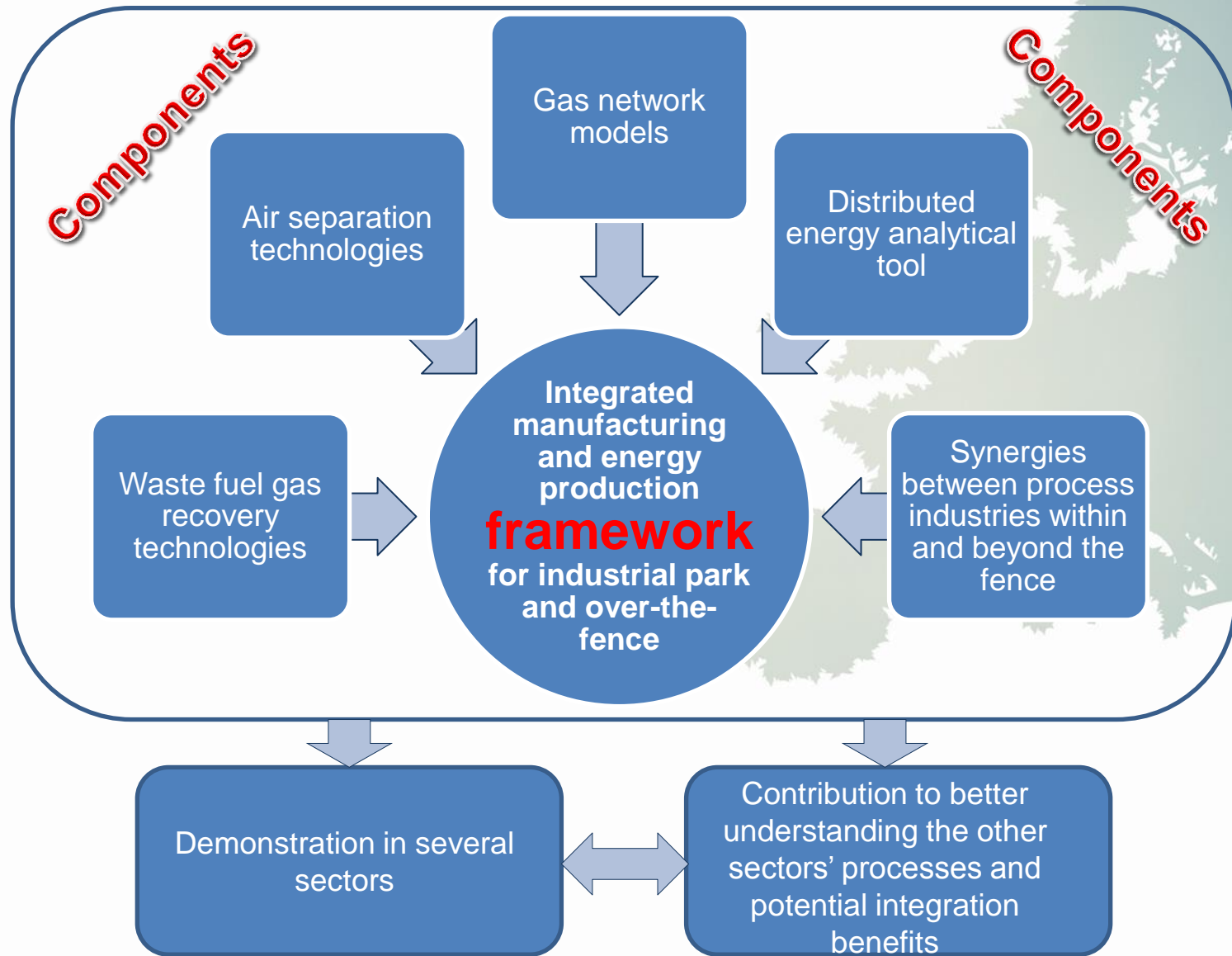
# DEMPROSE PROJECT IDEA

**Main objective:** *to develop holistic distributed energy production, storage and resource management systems for efficiency optimization in the process industry by exploiting different material and energy resources in the most efficient way overall.*

## **Objectives:**

- *To screen purification technologies for upgrading waste fuel gases.*
- *To develop equipment that is capable of recovering energy streams that are now not exploited*
- *To develop models for air separation units suitable for use in the steel, chemicals and petrochemicals sectors, including their use for the storage of power using liquid air.*
- *To develop gas network models capable of simulating and optimising the recovery, purification and collection of the gases for use in power production.*
- *To develop new analytical tools to design and carry out operational optimisation of distributed energy systems.*
- *To investigate and promote synergies among the process industries located in the same industrial park/geographical region and synergy between industries and local communities*
- *To develop a single management system that integrates environmental, energy and economic factors*
- *Demonstrating the developed methodologies and systems at pilot plant tests*

# DEMPROSE PROJECT IDEA



# DEMPROSE EXPECTED IMPACT

## *In relation to the call*

- *Optimisation of interdependencies through Total Site optimization aimed at increase of power production through more efficient use of resources without affecting manufacturing, and improving its economic and environmental sustainability.*
- *Technology components allowing for a breakthrough regarding a cost effective reduction in the use of resources will be identified eg Waste heat distributed from manufacturing and from energy centres. Power stored in the form of liquid air as part of the industrial gas systems of both steel and chemicals manufacture. Hot water stored in the energy centres to partly overcome the variability in demand. Renewables in the form of biomass, wind and solar power also integrated with the system to exploit the storage potential.*
- *The most economic and environmentally friendly solution for European society is a holistic approach: industrial manufacturing and power production are considered simultaneously by **holistic energy and resource management system developed by the Project**. This requires a framework that will allow manufacturing in the process industry, centralised power generation and distributed energy generation to be optimised simultaneously.*
- ***Reduction of costs in energy intensive industries by at least 15%***

# DEMPROSE EXPECTED IMPACT

## *In relation to SPIRE roadmap*

A reduction in fossil energy intensity of up to 30%

- Distributed energy systems for more efficient production of heat and power generation across both industry and the wider community
- Integration of energy systems for steel, chemicals and power production
- Integration of energy storage with industrial operations and power production

Up to 20% reduction in non-renewable, primary raw material intensity

- Reduction of waste of industrial fuel gasses
- More efficient use of fuel gasses for power production
- Integration of fuel systems for manufacturing and power production

Cross-sectorial feature of the project

- Integration of steel, chemicals and power production

# DEMPROSE EXISTING PROJECT CONSORTIUM

Participant organisation name	Main role
The University of Manchester (UK)	Co-ordination, total site analysis, optimisation, fuel gas management system, design and optimisation of distributed energy systems
Scuola Superiore Sant'Anna (IT)	Resource optimisation in the steel industry
Steel company (IT)	Demonstration of the methodology
Warsaw University of Technology	Development of process equipment, energy aspects of the separation of gas mixtures , modelling and simulation of complex process systems
Petrochemical company (PI)	Demonstration of the methodology developed
GE Oil&Gas (UK, PL, IT)	Novel equipment development
Chemical company (TK)	Demonstration of the methodology developed
Espirit Global Industrial Gas Consultants	Development of air separation models for supply of industrial gases and storage of power for use in optimisation framework

# DEMPROSE LOOKING FOR PARTNERS

Software developer for integrated management system

Industrial gases company

More demonstrators from industry

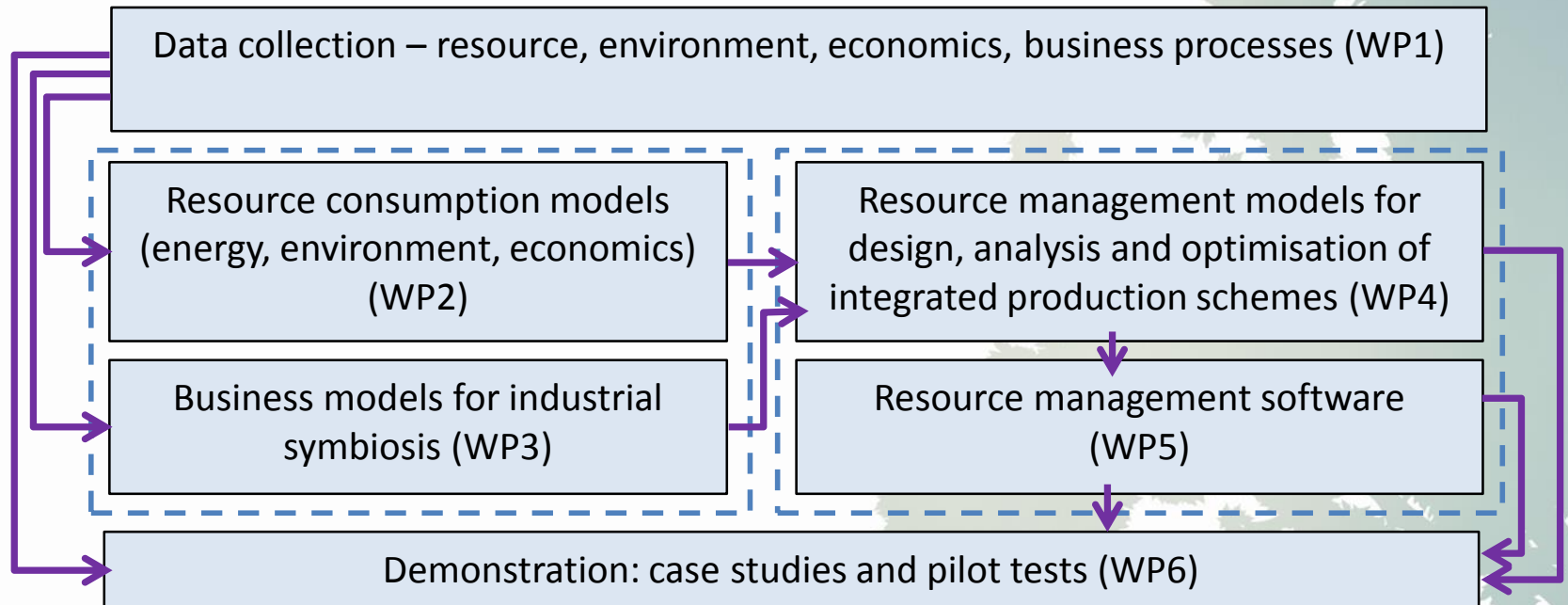
# HERMES-DIO PROJECT IDEA

**Main objective:** to pursue a major technological, scientific and commercial breakthrough by developing **novel optimisation-based tools for energy and material resource management to facilitate industrial symbiosis in the process industries.**

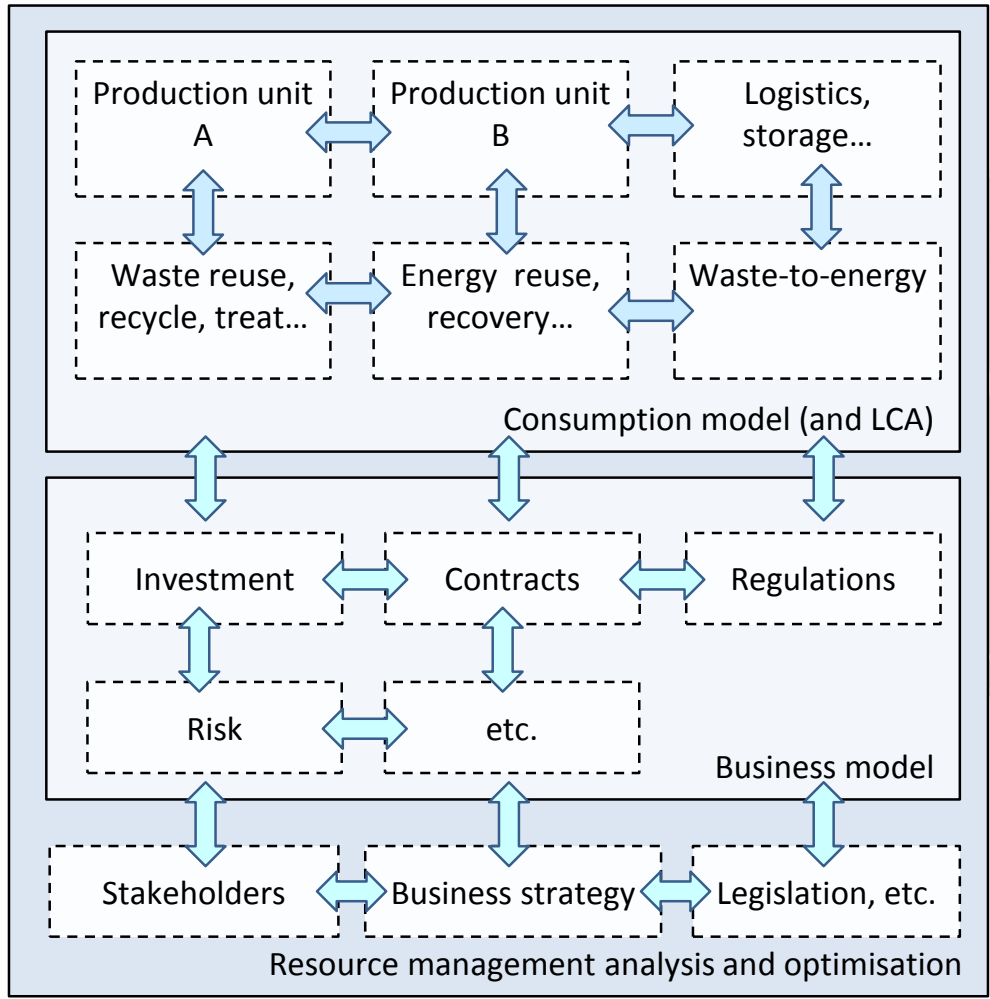
## **Objectives:**

- Develop novel **resource management models** for consumption of resources in production units and integrated production schemes, considering life cycle costs and environmental impact.
  - Collect **data on resource consumption**, considering economics, environment and business processes.
  - Develop resource (energy and materials) **consumption models**.
- Develop advanced **business models** accounting for key technical and non-technical issues related to resource management in integrated production schemes.
  - Codify impacts of and processes for **inter-company and cross-sectorial interactions and exchanges**.
- Develop cutting-edge **resource management methodologies** for industrial symbiosis, considering economics and environmental impact and using model-based optimisation.
  - Implement these methodologies in standards-based **software**.
- Demonstrate the novel methodologies and software through **case studies and pilot tests** on symbiotic production schemes.

# HERMES-DIO PROJECT IDEA



# HERMES-DIO – NEW METHODOLOGY



- IMPACTS:**
- Energy
  - Resources
  - Environment
  - Economics

# HERMES-DIO Project Partners

Partner		Country	Role
University of Manchester	Research	UK	Co-ordination Consumption models for ind. symbiosis Optimisation
ETH?	Research	CH	Business models Ind. symbiosis case study
DTU	Research	DK	Environmental impact and LCA models
Faxe Municipality	Local government	DK	Ind. symbiosis case study
Haribo	Industry	DK	Ind. symbiosis case study
Koc University	Research	TR	Methodology development
Alexandra Instituttet	Research	DK	Software development & demonstration

# HERMES-DIO Seeking Project Partners

Partner	Role
Pharmaceuticals manufacturer	Ind. symbiosis case study
Chemicals producer	Ind. symbiosis case study
Resource management consultancy	Business models Methodology development & demonstration
Steel producer	Ind. symbiosis case study
Other producer	Ind. symbiosis case study
University / researcher	Data collection Consumption models Ind. symbiosis case study
Other?	

# DEMPROSE and HERMES-DIO

- *Project proposals relate to SPIRE-06-2015 'Energy and resource management systems for improved efficiency in the process industries'*

## 1. Key Component Feed

- KA 1.1: Enhancing the availability and quality of existing resources
- KA 1.2: Optimal valorisation of waste, residue streams and recycled end-of-life materials as feed
- KA1.3: Optimal and integrated (re) use of water

## 2. Key Component Process

- KA 2.1: Novel advanced energy technologies
- KA 2.2: Energy harvesting, storage and reuse
- KA 2.3: Process monitoring, control and Optimization
- KA 2.4: More efficient systems and equipment
- KA 2.5: New energy and resource management concepts (including industrial symbiosis)

## 3. Key Component Applications

- KA 3.2: New processes for energy and resource efficient materials applied in sectors down the value chain

## 4. Key Component Waste2Resource

- KA 4.1: Systems approach: understanding the value of waste streams
- KA 4.2: Technologies for separation, extraction, sorting and harvesting of gaseous, liquids and solid waste streams
- KA 4.3: Technologies for (pre)treatment of process and waste streams (gaseous, liquids, solids) for re-use and Recycling
- KA 4.4: Value chain collection and interaction, reuse and recycle schemes and business models (HERMES-DIO)

## 5. Key Component HORIZONTAL

- KA 5.1: Identification, benchmarking and crosssectorial transfer of good energy and resource efficiency solutions and practices
- KA 5.2: Methodologies and tools for cross-sectorial Life Cycle and Cost Assessment as well as novel social Life Cycle Assessment of energy and resource efficiency solutions
- KA 5.4: Enhancing innovation and entrepreneurial skills and culture

## 6. Key Component OUTREACH

- KA 6.1: Analysis and establishment of efficient technology dissemination methodologies, mechanisms and frameworks
- KA 6.2: Develop social responsibility for the process industry

# DEMPROSE vs HERMES-DIO

DEMPROSE		HERMES-DIO
More efficient use of resources Distributed energy (power production)	Core focus	Industrial symbiosis (materials and energy)
Industrial energy systems Distributed energy systems Cryogenic separation units Gas networks	Modelling	Consumption of resources Business processes Inter-business interactions
Fuel gas purification Distributed energy equipment	Equipment development	–
Materials and energy conversion Gas network optimisation Operational optimisation of distributed energy systems	Resource management	Industrial symbiosis (reuse, recycle, upgrade, etc. energy and materials)
Software suite for resource management and energy system optimisation	Software	Resource management software for industrial symbiosis
Apply methodologies	Case studies	Apply methodologies and software
Yes	Demonstrations	No
Energy, more efficient use of resources, environment (life cycle assessment), economics	Impacts	Materials, energy, environment (life cycle assessment), economics

# CONTACT DETAILS

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