SPIRE: Sustainable Process Industries through Resource & Energy Efficiency

Lionel Platteuw
EUnited and A.SPIRE

www.spire2030.eu
- **Value chain, Innovation chain and Industrial chain**
  - from materials to used and reused products – TiAl powder for additive manufacturing powder

- **Integration** across economic and industrial sectors
  - from mining minerals to medicines to mobility and ICT

- **Manufacturing** - political & societal understanding
  - ubiquitous yet invisible (KETs manifesto).

- **Industry** capacity and competitiveness
  - as a requirement for societal challenges in cities, the food chain or mobility
Situating SPIRE in broader context

- Public Private Partnerships (PPPs), contracted
- Knowledge Innovation communities (KICs)
- European Innovation Partnerships (EIPs)
- European Technology Platforms
- Joint technology initiatives (JTI)
Europe 2020 priorities

**SOCIETAL CHALLENGES** 31.7 billion €
- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bioeconomy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, Resource Efficiency and Raw Materials
- Inclusive, innovative and secure societies

**INDUSTRIAL LEADERSHIP** 17.9 billion €
- Leadership in enabling and industrial technologies (ICT, nano, materials, bio, manufacturing, space)
- Access to risk finance
- Innovation in SMEs

**EXCELLENT SCIENCE** 24.6 billion €
- European Research Council
- Future and Emerging Technologies
- Marie Skłodowska Curie actions on skills, training and career development
- Research infrastructures

Supporting the objectives:
- European Institute for Innovation and Technology 2.8 billion €
- Joint Research Centre 1.96 billion €

Shared objectives and principles
Common rules, toolkit of funding schemes

International cooperation
European Research Area

Simplified access
Dissemination & knowledge transfer
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Focus</th>
<th>Lead</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPPs Public Private Partnerships</td>
<td>Contracted partnership for R&amp;I</td>
<td>DG research and Innovation</td>
<td>SPIRE, Factories of the Future</td>
</tr>
<tr>
<td>European Technology Platforms</td>
<td>Older established sector specific e.g. Water</td>
<td>Industry led, but multiple stakeholders</td>
<td>Water platform (Water Supply and Sanitation Technology Platforms)</td>
</tr>
<tr>
<td>JTIs Joint Technology Initiatives</td>
<td>‘long term public private partnership’ for large scale multinational research</td>
<td>European Research Area</td>
<td>Clean Sky, fuel cells, innovative medicine</td>
</tr>
<tr>
<td>EIPs European Innovation partnerships</td>
<td>To address societal challenges, ‘where government intervention is necessary’</td>
<td>European Institute of Innovation &amp; Technology</td>
<td>Active and Healthy Ageing, Smart cities, Raw materials, Water</td>
</tr>
<tr>
<td>KICs Knowledge Innovation Communities</td>
<td>Regional centres, very wide remit including incubators</td>
<td>European Institute of Innovation &amp; Technology</td>
<td>Climate KIC, ICT Labs, Manufacturing skills KIC</td>
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SPIRE PPP

- Launched 17 December 2013 by the signature of a contractual agreement between the EC and A.SPIRE aisbl
- First-ever 7-year innovation partnership with Europe’s process industry
Integrating

- CHEMICALS
- METALS
- STEEL
- MINERALS
- WATER
- CEMENT
- ENGINEERING
- CERAMICS

Integrating CHEMICALS, METALS, STEEL, MINERALS, WATER, CEMENT, ENGINEERING, and CERAMICS.
EUnited: machinery & equipment suppliers

- Cleaning
- Vehicle Cleaning
- Metallurgy
- Municipal
- Robotics
- Valves
EUnited: SPIRE and KETs

- SPIRE founder member

- ‘Key Enabling Technologies’ KETS High Level Group
  - Mandate on competitiveness from diverse actors – research, industry, associations, trade unions etc.
  - Manifesto to reindustrialize Europe via innovation
  - Policy recommendations e.g.
    - Political priority for industrial investment
    - Support strategic industrial domains – projects of common European interest in buildings, mobility etc.
Challenges

LESS RESOURCES

EUROPE?

MORE NEEDS
INNOVATION
for
RESOURCE
ENERGY
EFFICIENCY
PROCESS INDUSTRY

TODAY
Within the existing installed base of industrial processes

- **Reduce** feedstock: enhance the availability and quality of existing resources
- **Reduce** emissions
- **Reduce** energy and water: integrated use, new materials
- **Reduce**, prevent waste
Within the existing installed base of industrial processes

- **Re-use** energy within and between different sectors: energy harvesting, storage and re-use
- **Re-use** water within the sector and within the area
- **Re-use** waste streams as feed, including recovery, recycling and re-use of post-consumer waste; waste system approach – new business models

**PROCESS INDUSTRY STRATEGIC AGENDA**

**RE-USE with SPIRE**
Within the existing installed base of industrial processes

- Replace current feedstock by integrating novel and renewable feedstock (such as bio-based) to reduce dependency while reducing the CO₂ footprint of processes or increase the efficiency of primary feed stock.
- Replace current inefficient processes
Rejuvenate & invest in industrial processes

- **(Re-)invent** feedstock
- **(Re-)invent** more efficient equipment
- **(Re-)invent** devices for better monitoring, control & optimisation
- **(Re-)invent** energy & resource mngt. concepts, incl. industrial symbiosis
- **(Re-)invent** materials & products with a significantly increased impact on resource & energy efficiency down the value chain: transport, housing
- **(Re-)invent** technologies for valorisation of waste streams
SIX KEY COMPONENTS

1. **Feed**: Increased energy and resource efficiency through optimal valorisation and smarter use and management of existing, alternative and renewable feedstock.

2. **Process**: Solutions for more efficient processing and energy systems for the process industry, including industrial symbiosis.

3. **Applications**: New processes to produce materials for market applications that boost energy and resource efficiency up and down the value chain.

4. **Waste2Resource**: Avoidance, valorisation and re-use of waste streams within and across sectors, including recycling of post-consumer waste streams and new business models for eco-innovation.

5. **Horizontal**: Underpinning the accelerated deployment of the R&D&I opportunities identified within SPIRE through sustainability evaluation tools and skills and education programmes as well as enhancing the sharing of knowledge, best practices and cross-sectorial technology transfer.

6. **Outreach**: Reach out to the process industry, policy makers and citizens to support the realisation of impact through awareness, stimulating societal responsible behaviour.
AMBITIONS

- A reduction in fossil energy intensity of up to 30% by 2030
- Up to 20% reduction in non-renewable, primary raw material intensity by 2030
- A significant contribution to a drastic efficiency improvement in CO$_2$-equivalent footprints of up to 40% by 2030
- Potential improvements extend beyond “process industry”

KEY PERFORMANCE INDICATORS

- By 2020 EU will be leading in the re-use of CO$_2$ emissions and its transformation in new molecules
- By 2020 advanced energy systems allow drastic reductions
- By 2025 novel recycling process concepts for at least 5 different waste streams demonstrated and ready for markets
- By 2020 at least 4 projects realised which report added value from the process industry to end-user sectors
- By 2020 a new framework for cross-sectorial technology transfer developed and implemented
- etc.
WHY WE WILL SUCCEED

THE SYSTEMIC APPROACH...

- From raw resources to the end user industries = the value chain
- From research to demonstrations and market = the innovation chain
- From the big to small and medium enterprises = the industrial chain

... to outpace the other regions
WHY WE WILL SUCCEED

CROSS-SECTORIAL TRANSFER: integrated processes

BUILD ON EXCELLENT BASIS: world leaders

NEW BUSINESS MODELS: hybrid materials

ADEQUATE SKILLS: knowledge into work force
OFFER for EUROPE

GROWTH

+15 EU countries

+100 members

+450K enterprises (+ SMEs)

+30 RTOs

+6.8M employees

+1,600bn € turnover

RESOURCES

20% EU economy

1bn € company investments

+1,600bn € turnover

8 sectors
MEMBERSHIP OVERVIEW

A.SPIRE membership by countries

<table>
<thead>
<tr>
<th>Membership type</th>
<th>Number of members</th>
</tr>
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<tbody>
<tr>
<td>Associate member</td>
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<tr>
<td>Associations</td>
<td>12</td>
</tr>
<tr>
<td>Industry member (intermediate)</td>
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<tr>
<td>Industry member (large)</td>
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<tr>
<td>Industry member (medium)</td>
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<tr>
<td>Industry member (small)</td>
<td>9</td>
</tr>
<tr>
<td>Research member (large)</td>
<td>27</td>
</tr>
<tr>
<td>Research member (small)</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>116</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of companies &amp; associations</th>
</tr>
</thead>
<tbody>
<tr>
<td>cement</td>
<td>5</td>
</tr>
<tr>
<td>ceramics</td>
<td>4</td>
</tr>
<tr>
<td>chemicals</td>
<td>25</td>
</tr>
<tr>
<td>engineering</td>
<td>6</td>
</tr>
<tr>
<td>minerals</td>
<td>2</td>
</tr>
<tr>
<td>non-ferrous metals</td>
<td>4</td>
</tr>
<tr>
<td>steel</td>
<td>7</td>
</tr>
<tr>
<td>water</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>54</strong></td>
</tr>
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SPIRE calls 2014

• SPIRE-01-2014: Integrated Process Control

SPIRE strategic themes for 2016-2017 Horizon2020 programme:
• CIRCULAR ECONOMY CONCEPTS AND CLEAN TECHNOLOGIES (collaboration and contributions are expected from LEIT NMBP, SC5, LEIT ICT)
• Optimal valorisation of mineral waste (not just waste use, but replacement of other materials with less energy production and of course less materials)
• Upgrading, pre-treatment and valorisation for several waste streams from the process industry at large, including plastics as a feedstock for chemicals
• Valorisation of valuables from waste gases
  – demonstration of high volume selective conversion of CO/CO2-containing gases (high TRL)
  – carbon (CO/CO2) in flue gas to chemicals (lower TRL)
• Novel sorting systems and analytics to make valuables from side and waste streams available for recycling
• System approach to water as feedstock and energy source for process industries

SUPPORT FOR THE PROCESS INDUSTRY TOWARDS INTEGRATION OF BIO-BASED FEEDSTOCK (collaboration and contributions are expected from LEIT NMBP, SC2)
• Development of industrial chemical products based on biomass (contrary to SPIRE 2 where most proposals where written as biomass to energy use in energy intensive industries)
• Advanced location scenarios for biomass transformation (retrofitting)

SPIRE (Continued)

• ENERGY AND RESOURCES EFFICIENCY IN AND THROUGH PROCESSES AND MATERIALS (collaboration and contributions are expected from LEIT NMBP, SC3, LEIT ICT)
• New techniques for industrial furnaces with especial focus on developing knowledge in the design of new equipment (low TRL with the collaboration of a modeling and simulation lab network)
• New technologies for utilization of waste heat in large industrial systems, considering the whole energy cycle from the heat production to the delivery and end use, including environmental impact. It aims especially at polluted flows in different intensive sectors
• Robust through process optimization methods including big data
• New energy- and resource efficient process concepts
• Process intensification: More flexible and scalable processes (high TRL), lower capital and operating costs
• Novel high temperature materials (e.g. ceramics, metals, etc.) that enable development of novel energy and resource saving industrial processes in energy intensive industries (e.g. furnaces, reactors, etc.)
• New industrial processes for the production of energy and resource efficient lightweight materials and multi-material composites for downstream applications beyond buildings (e.g. automotive, renewable energy, aeronautics etc.) – TRL 4-7
• Research of new designs for processes and equipment enabling integration of renewable electricity (TRL 3-4)

• NON TECHNOLOGICAL ACTIONS TO PROMOTE SUSTAINABILITY ASSESSMENT, SHARING AND TAKE-UP OF SPIRE RESULTS (contributions are expected from LEIT NMBP and A.SPIRE)
• Development of a comprehensive sustainability assessment approach as part of process and product design in the process industry
• SPIRE framework for knowledge sharing and transfer - Dissemination and exploitation of SPIRE results
2015 SPIRE calls for proposal

- SPIRE-05-2015: New adaptable catalytic reactor methodologies for Process Intensification
- SPIRE-06-2015: Energy and resource management systems for improved efficiency in the process industries
- SPIRE-07-2015: Recovery technologies for metals and other minerals
- SPIRE-08-2015: Solids handling for intensified process technology
High-Level Expert Group on
Key Enabling Technologies

KEY ENABLING TECHNOLOGIES
CORNERSTONE OF THE EUROPEAN
INDUSTRIAL RENAISSANCE
July 2014
To reindustrialize Europe we need...

... an integrated KETs-based industrial policy

We request the European Parliament to provide support and political leadership to:

◊ Give a **high political priority** to an integrated KETs innovation and manufacturing policy and stimulate all types of investment for growth and jobs in the European Union.

◊ Create **market pull** by ensuring the systematic use of European KETs to meet Europe's societal challenges.

◊ Use **public procurement** to accelerate market uptake of European KETs-based products and services across the European Union.

◊ Increase investor and public **confidence** in new technologies and address barriers to investment.

◊ Support policies to reduce the **skills** gap in KETs-related industrial sectors.

◊ Support large-scale manufacturing initiatives in **strategic European industrial domains**, using instruments such as important projects of common European interest.

THE EUROPEAN PARLIAMENT IS REQUESTED TO GIVE ITS FULL SUPPORT TO ENSURE THE SUCCESS OF EUROPE'S INDUSTRY, TODAY AND TOMORROW.
In Summary ...

- **SPIRE** is a joint initiative from a substantial part of European industry – with a clear strategic roadmap

- **SPIRE** has broad commitment from industry, academia, SMEs and RTOs

- **SPIRE** will help improve Europe’s competitiveness and help address societal needs

www.spire2030.eu

http://www.youtube.com/watch?v=0evBMV_If6Y
- **Decide on strategy** and your mode of engagement
  - long term visionary or practical – if you want to build a revolutionary breakthrough solution engage in ‘roadmaps’ and conception stages, you have your work cut out and should engage with one of the PPPs, KICs, EIPs etc.
  - ‘take it or leave it’ ‘low key engagement’, go for individual project calls and ‘explore’
- **Network – e.g. brokerage events** – knowledge and ideas come in interaction with people that you meet
- **Follow calls and approach partners early**, especially manufacturing partners
- **Closely scrutinize and understand the competitiveness issues** – they guide the engagement key partners and how close you can get to core issues