

ELLISE

CLIC ProjectBooster

CLIC ProjectBooster is a time-forced, challenge-driven innovation project design process.

- The target of the CLIC ProjectBooster process is to create new challenge driven ideas to solve our systemic challenges
- The challenges are initially defined by companies and are based on the industry needs
- In spring 2023, we will bring topics related to green energy transition, circular economy and bioeconomy to ProjectBooster
- ProjectBooster is open to all CLIC owner organizations and partners paying the annual partnership fee and companies operating in the 4Recycling or/and GreenE2 ecosystems
- More information on the ProjectBooster process [here](#)

ProjectBooster pitch event for energy and GreenE2 is organized on April 17 2023, 13-16.

Topics for Energy ProjectBooster

Main topics are listed here – see rest of the slides for details

- Storage of Electricity, Heat, H₂, CO₂ and P2X fuels
- Safety and Security in H₂ Production, Logistics and Utilisation
- Hydrogen in city solutions
- Catalytic processes & P2X solutions
- Carbon capture, utilisation and storage
- Improving resilience of transmission and distribution grids
- Power to People
- Data Analytics and modelling for energy systems
- Raw materials and rare metals
- Open ideas from researchers



Hydrogen

H2 production, infrastructure and utilisation

Storage of Electricity, Heat, H₂, CO₂ and P2X fuels

Hydrogen Storage

- Safety issues, Concepts and technology, Ammonia as a hydrogen storage, Relevant places, Long term/short term, How to integrate it to hydrogen production/utilization, Optimization

Electricity Storage

- Batteries, electro-mechanical storage, liquid air...

Heat storage

- Waste heat recovery from electrolyzers, data centers, industrial processes, heat pumps utilization, solar heating
- Long-term thermal storage
- Thermal batteries in urban environment: phase change batteries to level down the daily peaks in residential buildings' energy consumption
- Seasonal heat storages: ground heat exchangers and coastal heat pumps to take care of cities' seasonal energy demand

Safety and Security in H2 Production, Logistics and Utilization

- How to manage, optimize and control the safety system?
- How to identify the possible risk scenarios and how to handle them?
- National and EU regulation, implication in hydrogen economy
- Which are the materials suitable for safe handling of hydrogen?
- Retrofitting of existing gas networks or engines and safety issues related to it

Hydrogen in city solutions

- Public transport, incl. e-fuels
- Energy storage
- Safety issues
- Hydrogen infrastructure in city areas
- Small-scale hydrogen production in city areas
- Technoeconomic analysis and comparison of alternative solutions



P2X and CCU

Deployment of Power-2-X and Carbon Capture and Utilisation solutions

Catalytic processes in P2X

- For electrofuel production
- Photocatalytic hydrogen production
- Local small scale green electrofuel production facilities
 - Low pressure and temperature catalytic methanol synthesis reactor - feasibility, technological aspects and market potential
 - Bioelectrochemical reactor for small scale hydrocarbon synthesis
 - Utilization of SOEC electrolyzers in syngas production
 - Energy balance, feedstock availability and yield prediction analysis
 - Waste heat recovery and utilization - industrial and domestic collaboration, heat pumps

Carbon Capture, Utilisation and Storage

- Carbon storage and biomass conversion through acetate metabolism
 - Optimizing the microbiological process efficiency comparison to photosynthetic biomass conversion
 - Utilization and business opportunities - finding a solid source for feedstock and products through industrial cooperation
- Captured carbon trading and business models
 - Value mining
- Integration of syngas to the energy system
- New CO₂-based products and production lines



Smart grids and sector integration

Smart grids and sector integration technologies and their value chains



Improving resilience of transmission and distribution grids

- AI tools for forecasting for anomalies and faults to electric grids ; Techniques for improving quality of available data and granularity of data for grid fault detection for machine learning and training
- Using quantum computing for accurate forecasting and optimizing smart grids
- Distribution-level and weather-related challenges; How to tackle extreme weather hazards in different contexts and locations?
- Modeling climate-change grid resilience: mapping assets, vulnerability, modeling detailed physical and economic grid-impact scenarios, identifying resilience measures, and implementing mitigation interventions.
- Cyber security & Cyber physical system resilience : how to handle cyberattacks?; How to tackle data modification in the system caused by attacks? Cyberattack resilience metrics, Communication network resilience.
- Develop resilience metrics and frameworks to guide the targeted deployment of advanced technologies on the grid.
- How to build the resilience and how to control and manage the system efficiently? Estimate cost and effectiveness of different resilience measures.
- Where to prioritize and invest to mitigate the most risk?

Increasing the resilience and flexibility of energy systems

- Heat to electricity –conversion: Thermoelectric generators and batteries coupled with waste heat sources, e.g. hydrogen production and industrial processes
- District cooling to reduce residential energy consumption and to store heat during summer time
- Heat walls and other structures with high specific heat capacity materials in buildings
- Hydrogen fired CHP plants as a peak load power
- Virtual power plants: remote controlled water heaters and heating systems. Business models for energy producers and consumers. Legislative requirements in the future
- Flexibility of new electrified industrial processes
- How to finance large-scale hydrogen storage so that hydrogen economy supports security of electricity supply?
- Multicriteria optimization: heat and electricity for all seasons



Power to People

- Affordable energy and fuels in the context of high markets volatility: addressing energy poverty
- Societal impact of the energy transition: balancing urban / rural environments in terms of access to energy, mobility and employment possibilities
- Vehicle to grid, EV battery logistics in urban and rural areas, Load balancing e.g., with EV charging with low demand
- Energy communities (Regulatory sandbox areas for export), aggregators, microgrids and related regulation in Finland
- Positive energy districts



System-level efficiency

Enhanced system-level efficiency and security



Data Analytics and modelling for energy systems

- Technologies for acquisition, monitoring and management of big data (AI, IoT, Digital twin)
- Energy flexibility with demand side management
- Symbiosis of energy solutions with industries
- System of systems concept: sector integration in industry, cities and energy communities
- Quantum computing for EV battery optimization and energy demand
- Discounted Cash Flow modelling for investments in energy systems



Others

Topics not directly related to the four main themes

Raw materials and rare metals

- The mining of minerals: additional bottleneck for the green transition?
- Future scarcity scenarios in global supply chains, especially copper, lithium, cobalt and graphite
- How to substitute rare materials and metals with abundantly available materials in energy sector? Ex: replacement of rare metal in catalysts
- EU legislation - Critical Raw Materials (CRM) list, European Raw Materials Alliance, etc.
- The CRM importance in circular economy and energy sector

Open ideas

- You may also present an idea not related to the previously mentioned topics, as long as it is energy-related

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Facilitating sustainable growth