

HORIZON-CL5-2022-D4-01-04

Programme: Horizon Europe Title: Development and pilot demonstration of heat upgrade technologies with supply temperature in the range 150-250°C Is Processes4Planet Call: Yes Year: 2022 Publication Date: Tuesday, 15 June, 2021 Opening Date: Thursday, 28 April, 2022 Deadline Date: Tuesday, 6 September, 2022 Expected Outcomes:

Efficient, sustainable and inclusive energy useThis Destination addresses activities targeting the energy demand side, notably a more efficient use of energy as regards buildings and industry. Demand side solutions and improved energy efficiency are among the most cost effective ways to support the transition to climate neutrality, reduce pollution and raw materials use, to create inclusive growth and employment in Europe, to bring down costs for consumers, to reduce our import dependency and redirect investments towards smart and sustainable infrastructure. The transition to a decentralised and climate neutral energy system will greatly benefit from the use of digital technologies which will enable buildings and industrial facilities to become inter-active elements in the energy system by optimising energy consumption, distributed generation and storage and vis-à-vis the energy system. They will also trigger new business opportunities and revenue streams for up-graded, innovative energy services which valorise energy savings and flexible consumption. This Destination contributes to the following Strategic Plan's Key Strategic Orientations (KSO):C: Making Europe the first digitally enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems;A: Promoting an open strategic autonomy[['Open strategic autonomy' refers to the term 'strategic autonomy while preserving an open economy', as reflected in the conclusions of the European Council 1 – 2 October 2020.]] by leading the development of key digital, enabling and emerging technologies, sectors and value chains to accelerate and steer the digital and green transitions through human-centred technologies and innovations. It covers the following impact areas:Industrial leadership in key and emerging technologies that work for people;Affordable and clean energy; Circular and clean economy. The expected impact, in line with the Strategic Plan, is to contribute to the "Efficient and sustainable use of energy, accessible for all is ensured through a clean energy system and a just transition", notably through Technological and socio-economic breakthroughs for achieving climate neutrality and the transition to zero pollution of the building

stock by 2050, based on inclusive and people-centric R&I (more detailed information below). Increased energy efficiency in industry and reducing industry's Greenhouse Gas (GHG) and air pollutant emissions through recovery, upgrade and/or conversion of industrial excess (waste) heat and through electrification of heat generation (more information below). Other Horizon Europe Clusters include topics and activities that can be relevant to this Destination, e.g. in order to seek synergies. These include (but are not limited to) the following: Cluster 2: Destination 2 - Innovative Research on the European Cultural Heritage and the Cultural and Creative Industries. That Destination is most relevant for the topics which scope addresses heritage buildings. Destination 3 -Innovative Research on Social and Economic Transformations. That Destination is most relevant for the social innovation items included in some of the topics. Cluster 3: Destination 4 - Increased Cybersecurity. This potential link is most relevant for the topics that address smart buildings and digitalisation of buildings. Destination 5 – A Disaster-Resilient Society for Europe. This potential link can be relevant for the topics that address the resilience of the building stock.Cluster 4: the whole cluster is relevant, in particular Destination 1 – Climate Neutral, circular and digitised production, which is highly relevant for all topics on buildings (e.g. for the digitalisation of construction / renovation workflows). Cluster 6: Destination 3 - Circular economy and bioeconomy sectors and Destination 4 - Clean environment and zero pollution. This potential link is relevant for all topics, in particular those that address sustainable renovation of buildings. Beyond Horizon Europe, other programmes include some components with which synergies and complementarities can be found. For instance, the Clean Energy Transition and Circular Economy sub-programmes under LIFE can contribute to the market uptake of the innovation delivered under this Destination. The Digital Europe programme includes actions that can be relevant to consider in relation to the topics that entail the development or use of (big) data approaches.

Scope:

This topic aims to satisfy the need for low-medium temperature heat in the relevant industrial sectors, by upgrading lower temperature heat flows, including from renewable heat sources, ambient heat or industrial excess (waste) heat, as a cost-efficient way to improve energy efficiency and reduce the GHG emissions. Available heat upgrade technologies, such as for example heat pumps, are limited to supply (sink) temperatures of 150°C. Innovative heat upgrade technologies have the potential to extend the temperature range up to 250°C, which would allow to cover more industrial applications. In order to reach this goal all the following development areas need to be covered: Identify the target industrial processes which would benefit from this higher temperature heat upgrade technology, as excess (waste) heat sources and as users (heat sinks); make a preliminary assessment of the potential impacts of these industrial applications in terms of energy savings and GHG and air pollutant emissions reductions in the EU (and Associated States, if data are available), so as to maximise the impact and coverage of the most promising applications in the subsequent development step; estimate by extrapolation the benefits at global level. A preliminary analysis of the feasibility and GHG emissions reduction impact, of the proposed heat upgrade process is expected already in the proposal. Develop one or more heat upgrade technologies to raise the sink output temperature to the range 150 to 250°C. If needed investigate in new working fluids. Optimise the technical performances in terms of: temperature increase between sink inlet and sink outlet temperatures; temperature spread between source and sink temperatures; flexibility to source input temperature variations; higher sink thermal power potential; higher coefficient of performance. Integration and demonstration of at least one system at pilot scale, in conditions, as far as practical, similar to real industrial environment. The optional integration of renewable heat sources (e.g. solar thermal) as the input heat flow to be further upgraded, is in scope.Make a

preliminary estimation of the future equipment cost for at least two industrial applications, to evaluate its economic potential; define an exploitation strategy. Dissemination of the technical and economic benefits, notably (but not only) to the communities of the relevant Horizon Europe privatepublic partnerships.Activities are expected to achieve TRL 5 by the end of the projectBudget 10M€, proposals between 3M€ to 5M€, 2 projects will be funded.

(Ref: European Commission)

Types of action: IA Specific conditions/Comments:

Project results are expected to contribute to all the following expected outcomes:

- Validate the technical feasibility of industrial heat upgrade systems capable of supplying various industrial processes with useful heat in the (sink) temperature range of 150 - 250 °C from renewable heat sources (e.g. solar thermal), ambient heat or industrial waste heat.
- Development and demonstration at pilot scale (5 200 kWth).
- Better awareness of the challenges and benefits of heat upgrade in the relevant industrial sectors.

Short name:

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P4Planet