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Planning and assessing industrial high-temperature heat pump projects

Questions to ask when planning and assessing an industrial high-temperature heat pump project

This resource provides a structured set of questions to support the early-stage planning and feasibility assessment of industrial high-temperature heat pump (HTHP) projects. It is intended to guide discussions between site engineers and consultants, helping to identify key technical, operational, and financial considerations before progressing to detailed design.

The questions are organised by assessment stage and align with the relevant sections in EECA's guidance for applications, integration, and assessment of high-temperature heat pumps.

Stage of assessment and questions
<p>Section 5 of guide: Technology maturity</p> <ul style="list-style-type: none"> • Are the required temperature and capacity within the ranges of proven heat pump technology? • What credible manufacturers with reference installations are willing to supply the target heat pump?
<p>Section 6 of guide: Preliminary questions for holistic integration</p> <ul style="list-style-type: none"> • What are the site-specific drivers and co-benefits for the heat pump project? • What site-specific issues might limit the selection of heat pump technologies and their integration?
<p>Section 6.1 of guide: Thermal integration (results of pinch analysis)</p> <ul style="list-style-type: none"> • Does the site require substantial heat below 250 °C? • Has a pinch analysis study been previously conducted for the site? Does the study need updating? • What significant heat recovery opportunities could be implemented to reduce demand prior to considering a heat pump? • To what extent are existing site utility lines appropriately used for process heating and supplied at their lowest feasible temperature? • Which pinch analysis integration patterns are of greatest interest to the site? What, therefore, are the minimum data requirements from specific process streams? • For direct process gas compression (heat pump integration pattern 1) specifically, what gas streams in the process sit below the pinch temperature? These will be candidates for mechanical vapour compression application. • According to the calculated net load profile (or grand composite curve), what number of heat pump units and associated temperature levels fit the case? • What acceptable refrigerants and cycle combinations would minimise the mean temperature lift of the heat pump?
<p>Section 6.2 of guide: Electrical supply and network connection</p> <ul style="list-style-type: none"> • What is the current electrical spare capacity on the site? • What would be the network upgrade costs and lead times? • Could flexibility (load shifting, storage) reduce peak demand pricing or enable the site to act as a demand-response agent for the grid operator?
<p>Section 6.4.1 of guide: Operation, control and dynamics</p> <ul style="list-style-type: none"> • How often does the process or site operate each year? • Does the process follow a regular operating schedule? If so, what is the pattern?

- *How regularly do the anticipated heat sources and sinks operate simultaneously?*
- *Are thermal buffers or storage needed to allow the heat pump to operate stably near its design load?*
- *If required, what is the part-load performance curve and is it acceptable?*
- *Are the control requirements for the heat pump compatible with the site control strategy?*

Section 6.4.2 of guide: Space

- *What space is available for the heat pump system and where is it?*
- *How does the space meet regulations and operation guidelines for safe refrigerant use (access, clearances and maintenance requirements)?*

Section 6.4.3 of guide: Infrastructure reuse

- *Can existing pipework, utility loops or heat exchangers be directly used or reused as part of the heat pump system?*
- *To what extent is the process operation infrastructure affected by the heat pump system?*

Section 7 of guide: Financial assessment

- *Is this project replacing a retiring boiler? Or is it viewed primarily as a means to increase energy efficiency (for example, supplementing an existing boiler)?*
- *How does the expected COP compare to the site's electricity-to-fuel price ratio?*