

## D1.2: Thermal energy analysis of R3VOLUTION demo sites

### What is the deliverable about?

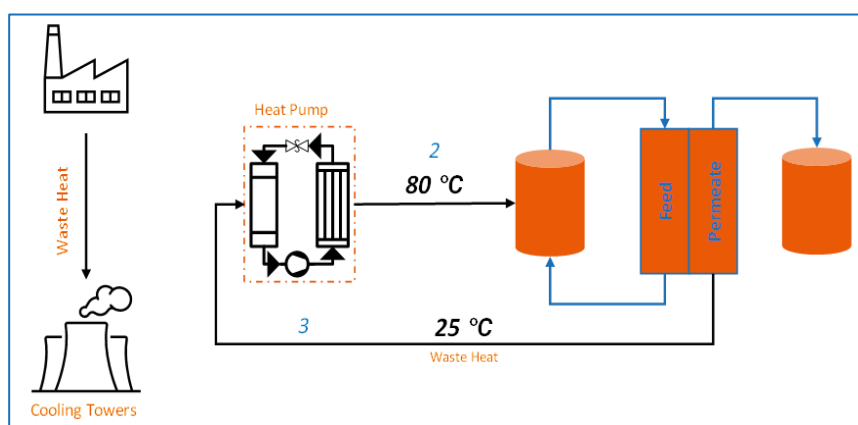
Deliverable D1.2 presents a comprehensive evaluation of excess-heat availability at the four R3VOLUTION demonstration sites (REPSOL, CELSA, FELIX SCHOELLER, BLOOM) and quantifies its potential to meet the thermal demands of Membrane Distillation (MD) processes. Using Composite Curves, the study maps temperature- and quantity-related heat streams, assesses when and where heat pumps are required for Vacuum MD (VMD) or Direct Contact MD (DCMD), and proposes integration strategies for each site.

### Why was this done?

While the use of excess heat for membrane distillation (MD) has been conceptually proposed in the past, this study provides a first-of-its-kind quantification of how much excess heat is practically available across different industrial sectors for MD integration. This allowed us to identify which industries are most suitable for MD deployment, determine the most appropriate MD configurations (VMD or DCMD), and outline the specific technical requirements for integration at each site. By doing so, the work in R3VOLUTION goes beyond pilot-scale concepts and lays the groundwork for scaling MD systems to industrial implementation in the future.

### What is the innovation?

For each demo site and MD configuration, we quantified the maximum membrane distillation capacity based on site-specific excess heat availability. In addition, we introduced a new “closed-loop” concept that directly couples a heat pump with a VMD system - particularly suitable for cases like the pulp & paper demo site, where excess heat is only available at low temperatures. This concept minimizes dependency on external heat sources and enhances system flexibility. The findings provide a foundation for the technical design and further development of MD pilots in the project’s physical demonstration cases.



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