IEA DHC Annex XIV FlexVal – Flexibility and District Heating Value Chain

KEY MESSAGES

1. Flexibility is becoming a core feature of future district heating systems

As variable renewable electricity, electrification of heat supply, and low-carbon heat sources increase, district heating systems need to become more flexible. The FlexVal project shows that flexibility is not limited to a single technology or solution, but emerges from the coordinated use of thermal energy storage, demand response, heat pumps, electric boilers, CHP, low-temperature operation, and smart system control.

2. District heating flexibility must be assessed from a systemic and local perspective

The value of flexibility depends strongly on the surrounding energy system, electricity market conditions, taxation, regulation, and the existing district heating infrastructure. Long-term energy system modelling and Nordic operational modelling show that flexibility can improve cost efficiency and system robustness, but the benefits vary significantly by local context and operational year. This highlights the need for case-specific analysis rather than generic solutions.

3. Buildings are a key enabler of low-temperature and flexible district heating

The demand side plays a central role in unlocking district heating flexibility. Improved building-level control, digital diagnostics, lower return temperatures, and solutions such as advanced domestic hot water substations can support low-temperature operation without necessarily requiring extensive retrofits. However, technical potential alone is not enough: tariffs, ownership models, and incentives must be aligned so that building owners, tenants, and district heating operators all benefit.

4. Flexibility should be integrated already in planning, design, and pricing

The project shows that flexibility is most valuable when considered early in system planning, network design, and business model development. Smart control and peak-shaving assumptions can reduce overdimensioning and total system costs, while pricing mechanisms can steer both operators and customers towards more efficient operation. Future-proof district heating therefore requires integrated planning across the value chain, from buildings and networks to heat supply and energy markets.

More details on the project are available at [on the project website at iea-dhc.org](iea-dhc.org).