

Module 6

Refurbishment of District Heating systems

Part of the SHaKE Educational Package on District Heating and Cooling Systems

Question Bank

Reusable assessment and classroom discussion resource. Answer key included.

Developing institution: BME
Erasmus+ KA220-HED Cooperation Partnerships in Higher Education
Version: 1.0
Date: March 2026

<https://www.shakeproject-dhc.eu/>



Instructions: Select the single best answer for each question. Only one answer is correct.

Time limit: 18 minutes

1. Why do many legacy district heating systems in Eastern Europe struggle to meet modern decarbonization objectives?

- A. They were originally designed for low-temperature renewable heat sources.
- B. Their high operating temperatures and network characteristics are poorly matched to modern low-energy buildings and low-exergy heat sources.
- C. They exclusively use geothermal energy.
- D. They lack heat exchangers in substations.

2. Which combination of factors contributed most significantly to excessive heat consumption in Soviet-era housing estates?

- A. Individual metering, thermostatic control, and low-temperature networks.
- B. High-performance insulation and decentralized substations.
- C. Poor building insulation, limited temperature control, and heavily subsidized energy prices.
- D. Heat pumps and renewable energy integration.

3. Why does hydraulic imbalance occur in large district-heated housing estates?

- A. Consumers furthest from the circulation pump naturally receive the highest flow rates.
- B. Heat exchangers create excessive resistance in all circuits.
- C. Heating strings closer to the circulation pump experience lower hydraulic resistance and therefore receive higher flow rates.
- D. Differential pressure controllers always increase flow to distant consumers.

4. Which statement best explains why balancing valves are considered essential in refurbishment projects?

- A. They increase supply temperature to compensate for building heat losses.
- B. They allow engineers to control and verify flow rates, improving network-wide hydraulic performance.
- C. They eliminate the need for circulation pumps.
- D. They replace the function of heat exchangers in substations.

5. A district heating operator wants to integrate industrial waste heat and large-scale heat pumps. Which modernization strategy would be most appropriate?

- A. Increase network supply temperatures above 120°C.
- B. Replace all substations with larger shell-and-tube heat exchangers.
- C. Transition toward low-temperature district heating operation.
- D. Increase circulation flow without modifying the network.

6. What is the principal advantage of apartment-level substations compared with traditional centralized building substations?

- A. They eliminate the need for heat meters.
- B. They allow residents to control heating and domestic hot water consumption individually while improving billing transparency.



- C. They require higher district heating supply temperatures.
- D. They function without heat exchangers.

7. Why is reducing return temperature considered a key objective during district heating refurbishment?

- A. It increases thermal losses from the network.
- B. It enables larger pipe diameters to be installed.
- C. It improves overall system efficiency and facilitates the integration of renewable and low-exergy heat sources.
- D. It reduces the need for building insulation upgrades.

Answer Key

- 1. B
- 2. C
- 3. C
- 4. B
- 5. C
- 6. B
- 7. C