Technical assessment of electric heat boosters in low-temperature district heating based on combined heat and power analysis

This paper provides a technical assessment of electric heat boosters (EHBs) in low-energy districts. The analysis is based on a hypothetical district with 23 terraced single-family houses supplied by both a low-temperature district heating (LTDH) network and a low-voltage network (LVN). Two case studies are provided to show the active role of EHBs in a smart energy system (SES). The first case compares annual heat and power flow analyses for LTDH at five supply temperature levels, focusing on their impacts. The results show that district heating network (DHN) losses can be reduced by 35% if the supply temperature is reduced from 70°C to 50°C, but the LVN peak power will have to be increased by up to 2% using heat boosting. The second case further aggregates EHBs to provide a fuel shift (FS) service for the DHN. The results show that while LVN peak power was increased by up to 4.3%, the basic power production and peak boiler usage for DHN could be reduced by as much as 15% and 48%, respectively. In summary, lower supply temperatures and intelligent components can improve system efficiency and turn the DHN into an integrated part of a SES.

General information
Publication status: Published
Organisations: Department of Electrical Engineering, Center for Electric Power and Energy, Energy System Management
Corresponding author: You, S.
Contributors: Cai, H., You, S., Wang, J., Bindner, H. W., Klyapovskiy, S.
Pages: 938-49
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Energy
Volume: 150
ISSN (Print): 0360-5442
Ratings:
BFI (2018): BFI-level 2
Scopus rating (2018): CiteScore 6.2 SJR 2.048 SNIP 1.822
Web of Science (2018): Impact factor 5.537
Web of Science (2018): Indexed yes
Original language: English
Keywords: Smart energy systems, 4GDH, Low-temperature district heating, Electric heat boosters, Fuel shift, Combined heat and power
DOIs:
10.1016/j.energy.2018.02.084
Source: PublicationPreSubmission
Source ID: 14534572
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review