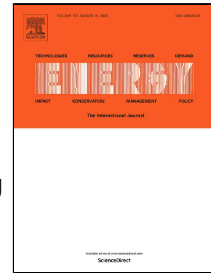


Accepted Manuscript

A Two-Stage Approach for Combined Heat and Power Economic Emission Dispatch: Combining Multi-Objective Optimization with Integrated Decision Making

Yang Li, Jinlong Wang, Dongbo Zhao, Guoqing Li, Chen Chen



PII: S0360-5442(18)31497-X
DOI: 10.1016/j.energy.2018.07.200
Reference: EGY 13465
To appear in: *Energy*
Received Date: 26 April 2018
Accepted Date: 29 July 2018

Please cite this article as: Yang Li, Jinlong Wang, Dongbo Zhao, Guoqing Li, Chen Chen, A Two-Stage Approach for Combined Heat and Power Economic Emission Dispatch: Combining Multi-Objective Optimization with Integrated Decision Making, *Energy* (2018), doi: 10.1016/j.energy.2018.07.200

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1 **A Two-Stage Approach for Combined Heat and Power Economic Emission**
2 **Dispatch: Combining Multi-Objective Optimization with Integrated Decision**
3 **Making**

4 Yang Li ^{a,b*}, Jinlong Wang ^a, Dongbo Zhao ^b, Guoqing Li ^a, Chen Chen ^b

5 ^a School of Electrical Engineering, Northeast Electric Power University, Jilin 132012, China

6 ^b Energy Systems Division, Argonne National Laboratory, Lemont, IL 60439, USA

7 **ABSTRACT:** To address the problem of combined heat and power economic emission
8 dispatch (CHPEED), a two-stage approach is proposed by combining multi-objective
9 optimization (MOO) with integrated decision making (IDM). First, a practical CHPEED
10 model is built by taking into account power transmission losses and the valve-point
11 loading effects. To solve this model, a two-stage methodology is thereafter proposed.
12 The first stage of this approach relies on the use of a powerful multi-objective
13 evolutionary algorithm, called θ -dominance based evolutionary algorithm (θ -DEA), to
14 find multiple Pareto-optimal solutions of the model. Through fuzzy c-means (FCM)
15 clustering, the second stage separates the obtained Pareto-optimal solutions into
16 different clusters and thereupon identifies the best compromise solutions (BCSs) by
17 assessing the relative projections of the solutions belonging to the same cluster using
18 grey relation projection (GRP). The novelty of this work is in the incorporation of an
19 IDM technique FCM-GRP into CHPEED to automatically determine the BCSs that
20 represent decision makers' different, even conflicting, preferences. The simulation
21 results on three test cases with varied complexity levels verify the effectiveness and
22 superiority of the proposed approach.

23 **Keywords:** Cogeneration; economic emission dispatch; two-stage approach;

24

*Corresponding author. E-mail address: yang.li@anl.gov (Yang Li).

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