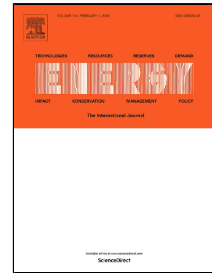


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1 Decentralized Optimal Multi-Energy Flow of Large-Scale 2 Integrated Energy Systems in a Carbon Trading Market

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6
7 **Abstract--** This paper proposes a novel decentralized optimal multi-energy flow (OMEF) of large-scale integrated energy
8 systems (IES) in a carbon trading market, to fully exploit economic and environmental advantages of the system
9 considering difficulties of information collection from subareas. The decentralized OMEF is solved by three
10 decentralized optimization algorithms, including auxiliary problem principle (APP), block coordinates down (BCD), and
11 approximate Newton directions (AND). Moreover, a dynamic parameter adjustment is developed for APP and BCD to
12 ensure convergence. So that a cooperative optimization among subareas can be achieved through utilizing only the local
13 information and the boundary information. Finally, case studies of a two-area IES with 8 energy hubs and a three-area
14 IES with 33 energy hubs are carried out to deeply compare the performance of the three decentralized algorithms,
15 together with a thorough analysis about the effect of carbon trading price on the system.

16
17 **Keywords** –Decentralized optimal multi-energy flow, Integrated energy systems, Carbon trading, Energy hub
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