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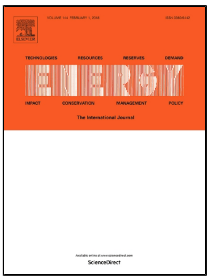

Decentralized Optimal Multi-Energy Flow of Large-Scale Integrated Energy Systems in a Carbon Trading Market

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| PII: | S0360-5442(18)30311-6 |
| DOI: | 10.1016/j.energy.2018.02.083 |
| Reference: | EGY 12383 |
| To appear in: | *Energy* |
| Received Date: | 06 September 2017 |
| Revised Date: | 11 January 2018 |
| Accepted Date: | 17 February 2018 |

Please cite this article as: Kaiping Qu, Tao Yu, Linni Huang, Bo Yang, Xiaoshun Zhang, Decentralized Optimal Multi-Energy Flow of Large-Scale Integrated Energy Systems in a Carbon Trading Market, *Energy* (2018), doi: 10.1016/j.energy.2018.02.083

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

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

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

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