

**Modeling and stochastic dynamic optimization for energy management system**

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With ever-growing global demand for energy and severe environmental regulations, optimal management of energy distribution system and policy is becoming an important problem for many countries. This necessitates investments in R&D infrastructure as well as resource allocation strategies for alternative energy resources.

We present a stochastic model that describes energy resource allocation under uncertainty and derive an optimal policy for long-term investments in novel technologies. A probabilistic model based on Markov chain that balances the demand and supply constructed considering the city boundaries and electric power system in South Korea. This study proposes an algorithmic strategy based on the framework of approximate dynamic programming and demonstrate the methodology using the available data in the literature reflecting the current situation of Korea.