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Contribution of new energy technologies and unused energy sources for the Tokyo commercial buildings

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It is well understood that the energy conservation of the commercial buildings in the metropolitan area is one of the key issue under the environmental constraints. In Tokyo, since Olympic is being held in 2020, distributed energy technologies including CGS, Photovoltaics, new heat-pumps, etc., are expected to meet large air-conditioning demand in the summer season. In order to evaluate the contribution of these energy technologies, we have developed several models focusing on the regional energy supply-demand systems as well as the power expansion planning model of the utility. Recently, the unused thermal sources such as underground heat and the energy source from river are reconsidered; thanks to the progresses in the heat pump technologies. In this study, we investigate the contribution of new energy technologies for the buildings from two views: First, we look into three commercial and office buildings in the Tokyo area. We evaluate the energy demand on room cooling, room heating, hot-water supply and general electricity demand. We then develop an energy technology flow model. We also employ new energy technologies as follows; DC-inverter controlled heat-pumps which have almost constant COP in the low capacity utilization duration and the utilization of the thermal energy of the river and the underground energy which provide higher COP around 5-6. In this model, COP is formulated as a function of capacity utilization rates. This model is thus formulated as non-linear optimization model. We also include the energy transportation among building. Double-skin walls for the heat insulation are also evaluated. Another view focuses on the thermal energy transportation among regions. We divide Koto-area in Tokyo into 151 sub-regions in around 250 m by 250 m meshes specifying the building types. Including the potentials of unused energy sources such as underground heat, river heat sources, waste incineration heat, the possible contributions of these technologies and energy transportations among regions as well as the CGS are evaluated. Our model with the unused energy sources and new technologies demonstrates the potential and the limit of these new sources.

Biography

Shunsuke Mori received Doctor of Engineering from Tokyo University in 1981. He is a Professor, Department of Industrial Administration, Tokyo University of Science since 1994. He is Dean of Graduate School of Science and Technology from 2012 to 2014. He was the Invited Researcher for Economic Planning Agency from 1981-1983; Science Researcher, International Institute for Applied Systems Analysis (Austria) from 1986-1987; the Chief Researcher, Research Institute of Innovative Technology for the Earth from 2002-2007. He joined the IPCC activities and is the lead Author of Special Report of Emission Scenarios and the Third Assessment Report of IPCC, WG-III, Chapter 9. His field is system engineering, energy and economic modeling, regional energy planning, assessment of global warming, model development of environmental technologies. He is a Senior Member of JIE, and Vice Chair of Japan Society of Energy and Resources.

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