An Assessment of the Economic and Carbon Emission Reduction Effects of the Distributed Energy Systems Including New Energy Conversion/Storage Technologies and Unutilized Heat Sources

An analysis using an urban core model that incorporates large buildings revealed the possibility of a simultaneous reduction in costs and CO_2 emissions when compared to conventional systems. This reduction would be enabled by utilizing unused heat energy sources and the introduction of energy interchange among consumers. As part of a verification analysis for suburban residential areas, a highly reproducible model for a power interchange system was developed that utilizes solar cells and secondary batteries.

- In the urban core energy system, using unutilized energy sources and introducing energy interchange systems among consumers allowed for a reduction in total annual costs of 22% (Figure 1, Case-C-0deg) as well as a simultaneous reduction in CO_2 emissions of 26%. These results show that simultaneous reductions can be achieved even when summer temperatures are higher than average.
- The model developed for a power interchange system for suburban residential areas is based around the idea that mutual power interchange among consumers will increase the consumption of solar cell electricity amongst households. This increase will reduce the amount of electricity purchased by 1.4%

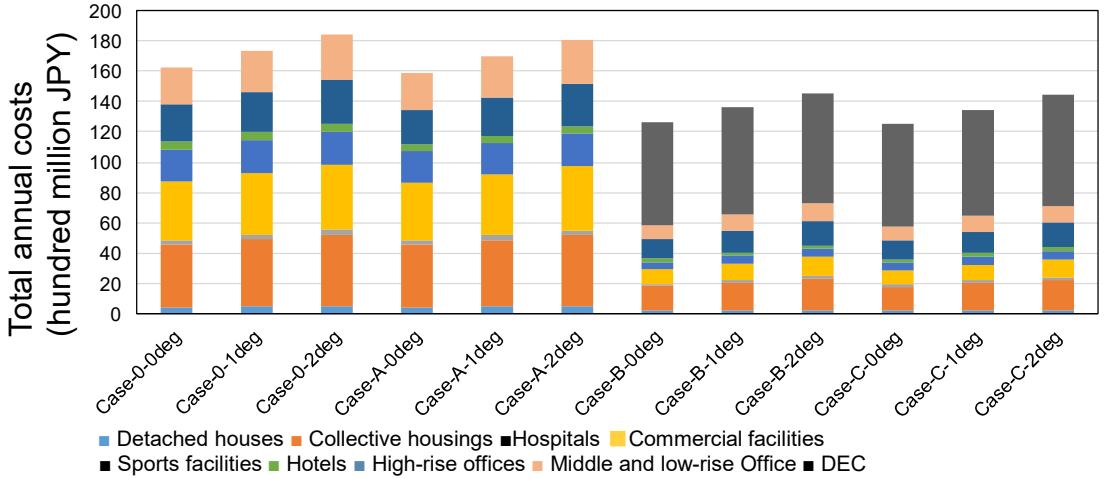

Figure 1: Change in total annual costs by case and type of temperature increase

(Case-0: Conventional equipment, Case-A: CGS/PV/Secondary battery, Case-B: Residual heat utilization + Interchange, Case-C: Inter-regional Interchange, CGS: Cogeneration System, PV: Solar cell (DEC: District Energy Control Center)

Proposals for Policy Development

The following proposals aim to increase utilization of unused heat sources and realize a power interchange system among consumers:

1) There are large regional differences in amounts of energy stored and potential availability. A database of unutilized energy sources must therefore be developed.
2) A refrigerant and control system that can maintain heat pump performance in cold regions must also be developed.
3) The development of a region-wide management system is needed to expand mutual energy exchange which includes Demand-Response (DR) of consumers and linkage with electric vehicles.
4) Consideration of a financial support system for issues such as power wheeling fees, which result from power interchange being performed in existing city blocks. This support is required to realize a reliable city block power interchange system that also contribute to the stabilization of power transmissions across a broader area.

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