To realize the prosperous and comfortable living environment

FUKUYAMA Hiroshi (Ph.D. in engineering), Director
Housing Department

(Keywords) Living environment, housing stock, housing market, stable living, architectural production, energy conservation

1. Introduction

The mission of the Housing Department is to ensure that citizens can live in healthy and comfortable houses from the technical perspectives. The basis of this mission is that housing is one of the basic needs of people that include food, clothing, and shelter. This paper introduces some of the activities that the Housing Department is implementing.

2. Activities of the Housing Department are based on national policy targets

To fulfill the mission stated above, the Housing Department is conducting research and development to realize the following goals (i) to (iv) as stipulated in the Basic Plan for Housing (nationwide plan). The Basic Plan for Housing is a ten-year plan that is stipulated based on the Basic Act for Housing established in 2006. It is revised approximately every five years, and the last revision was in 2011.

In addition to these goals, the Housing Department is conducting research and development in the architectural production field described in (v) below, including architecture besides houses. In terms of the field of architectural environment, the Department is conducting research and development to improve the architectural environment shown in (vi) to improve energy efficiency including architecture besides houses.

Details of the main research that Housing Department is working on are introduced below for each category.

i. Establishment of the living environment to support safe, reliable, and prosperous lives
- ・Design of houses to suit the lifestyles of elderly and people with disabilities, and development and promulgation of renovation technologies
- ・ Development of evaluation standards for technologies to assist the elderly, people with disabilities, and young children to evacuate in case of a disaster

ii. Proper management and regeneration of houses
- ・Development and promulgation of methods to efficiently evaluate and diagnose conditions of currently available buildings and easily determine maintenance and management method and necessary renovations
- ・Development and promulgation of evaluation standards to elongate the service lives of houses
- ・Development of decision criteria to deal with vacant houses

iii. Development of the housing market in which diversified housing needs are properly satisfied
- ・ Development of effective methods to plan, implement, and evaluate housing policies based on diversified housing satisfaction levels
- ・Development of methods to plan housing to suit changes in regional social and economic situations

iv. Securing stable living (safety net) for people who require special consideration to secure housing
- ・Development of policies of using public housing and private housing (integration, abolition, rearrangement, and longer service lives, etc.) and development of policies to contribute to the rational renovation and repair for long-term uses of housing
- ・Development of plans to provide emergency housing and public housing for disaster victims

v. Rationalization of architectural production and quality assurance
- ・Development and use of databases and BIM technologies to improve the efficiency of the design and construction of new housing and renovation
- ・Development of methods to organize and manage housing history

vi. Promotion of energy conservation and reduction of CO_2 in the residential sector to mitigate the global warming
- ・Development of evaluation method in preparation for the mandatory energy conservation standards and improvement of the precision and convenience of the method
- ・ Organization of the information of energy conservation technologies of designers, contractors, and manufacturers of construction materials, facilities, and equipment
- ・Evaluation of effects to reduce energy consumption during peak hours

3. Guide to energy conservation designs for housing and architectures

The Act on Improvement of Energy Consumption Performance of Buildings (the Building Energy

Conservation Act) was established in July 2015, and mandatory application of the law to energy conservation standards is gradually starting. As seen in this trend, the movement to improve the energy efficiency of housing and buildings is expected to increase its speed and scale. This section introduces two activities that the National Institute for Land and Infrastructure Management is implementing to conserve energy and reduce CO_2 emissions.

The first activity is the development of technologies to support mandatory compliance with energy conservation standards for buildings. Specific activities include the development and distribution of evaluation programs to measure energy consumption and sheltering performance, as well as support for small and mid-size businesses by providing guidelines for energy efficient designs.

High equity and reliability are required to uniformly evaluate the energy conservation performance of various technologies and buildings. Thus, the Housing Department has conducted many experiments and investigated actual operations. The photo is an example of an experimental housing in which home appliances in buildings are automatically operated to simulate the lives of people to analyze actual values of energy efficiency. In addition, sensors were installed in 29 buildings that are actually being used to obtain actual data of energy consumption.

The Housing Department is using the outcomes of these experiments and investigations to develop and distribute programs to evaluate energy consumption. Specific computation methods (formulas) used in the programs and grounds of the methods are described in a technical reference to ensure transparency as much as possible.

Photo. Investigation of energy consumption by simulating lives of people

The second activity is related to the reduction of energy consumption during peak hours to rationalize the energy supply. The objective of this activity is to establish methods to evaluate the effect of technologies (e.g. use of unused heat, heat storage, and electricity storage) to reduce energy consumption during peak hours and to provide guidelines of designs.

While the theme of the first activity is to deal with annual energy consumption, the second is to compute the energy consumption at a given point. Thus, using and elaborating on the research outcomes related to the energy consumption computation program, which is the outcome of the first activity, enabled quantitative evaluation of peak-hour energy management technologies.

Technologies used here include the peak-shift in which electricity and heat stored during nighttime are used during daytime, and peak-cut in which the energy consumption during peak hours is reduced by using solar power and ground heat. These technologies cut energy uses during peak hours.

The goal of this study was to build a win-win relationship including the drastic reduction of energy consumption during peak hours and also the reduction of the overall energy consumption. The Housing Department is working to realize an energy efficient society without lowering the quality of the living environment.

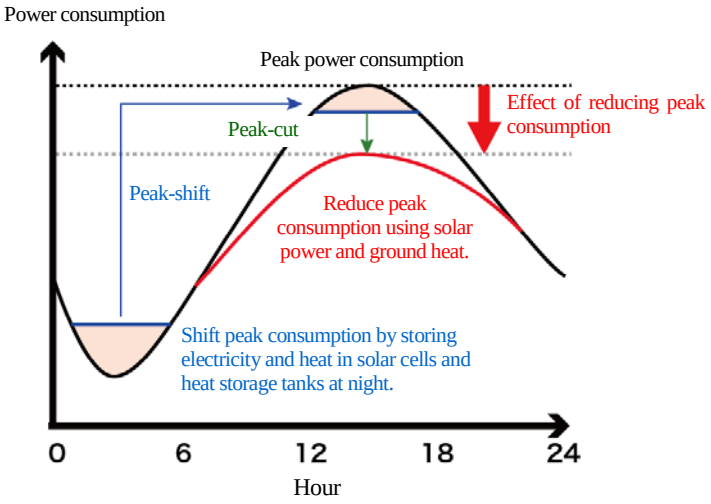

Figure. Evaluation of technologies to reduce energy consumption during peak hours

4. Conclusion

The Housing Department is working to improve the quality of housing as introduced in section 2. The revision of the Basic Plan for Housing, which will greatly affect the activities of the Department, is being planned in 2016. The Department is going to properly determine the direction of researches while taking into account of the revisions and social conditions.

We appreciate your continuous support. Thank you.