Introduction of Yokohama Smart Community

Yokohama Smart Community Representative
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Sharing the conviction of Smart Energy Research Laboratory's Yoshimichi Nakamura that "learning from nature is important to enjoying a truly abundant, fulfilling life," like-minded companies and organizations have joined forces to inaugurate the Yokohama Smart Community to incorporate natural energy into daily living and securing truly effective technologies for doing so. This document reports the activities of the Yokohama Smart Community to date and shares our vision for the future.

1. Introductory Overview

The Yokohama Smart Community is an organization established on June 14, 2011, together with Fukuoka Smart-House consortium participant companies, Yokohama companies, and scientific organizations with the assistance of the city of Yokohama. This organization aims to become a community not only where technology is used to solve problems, allowing individuals to enjoy an affluent lifestyle, but also where they coexist with nature, utilizing energy in a manner that does not negatively impact the environment. We believe that public resources like buildings and roads must be in positive harmony with the secondary forests, rivers and other aspects of the natural environment inside the Smart Community in order for people to enjoy active lives. We want to make the Community a project that extends 100 years into the future, continuing to involve and constantly constructing architecture and making improvements with an eye toward the future. Based on this philosophy, we aim to become capable of constructing flexible, low-cost energy systems that skillfully use natural energy, and capable of developing technologies that contribute to solving problems like reducing CO_2 emissions and food shortages.

2. Yokohama Smart Community Vision

We have made "creating communities that learn from and make constructive use of nature" the basic theme of the Smart Community. From the mechanism of plant-cell energy production, storage and

regulation in the Fukuoka Smart House Consortium, we have constructed a grand vision of the energy systems needed in smart houses, worked out an actual energy system, constructed a mini-house using the system, and evaluated it. We then researched the potential of an energy-exchange system between neighboring houses that would be made possible by increasing the degree of development of this one mini-house's energy system. Using the results of this research, it has become possible to flexibly supply energy needed by communities of several houses balancing the use of solar generators, wind-generated electricity, and electric power from commercial grids. In addition, it has also become possible to conduct various performance tests such as those on the production, electrical and heat storage of batteries and generators for solar, wind-powered electricity generators, and fuel batteries needed for household energy; the use of geothermal heat; energy transformer experiments; the validation of IT information devices like HEMS (Home Energy Management Systems), household-appliance energy-reduction experiments, and tests of the heat insulation furnished by windows and walls. We have also introduced an environment incorporating leading technologies like mathematical models and simulations making it possible for regional companies to join the research. We have made the community an infrastructure that members can use for trial experiments. Using the low-cost energy systems obtained through such research, we are also planning research and experiments on horticulture and aquafarming, as well as on the use of biomass in a recycling-based society.

Because they are both thought to lead to a sense of emotional well being, culture and art are indispensable tocommunity living. This is why we are planning on building a community that capitalizes on the natural environment and landscape, Yokohama's land and rivers and plants, and fusing culture and the arts, in which foreign and domestic community members from a broad array of fields participate.

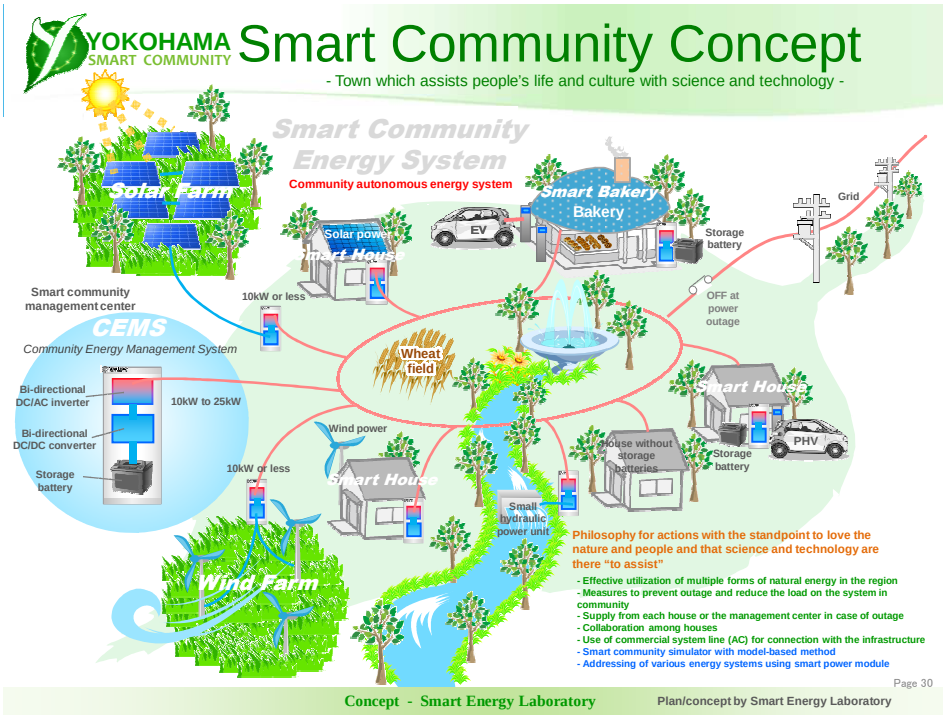

Figure 1 Conception of Yokohama Smart Community

3. Technical Dimensions of Yokohama Smart Community

The Fukuoka Smart House Consortium's research and development on smart-energy regulation methods have received particular attention. In developing smart-energy systems, we are employing model-based methods, which are the global standard for automotive and air plane development and validation. In model-based methods, first the control system and the controlled object are validated using mathematical models. Once a suitable model has been designed, the efficiency of the control system is increased, making it possible for the system to respond more promptly to changes in the controlled object and yielding many other advantages in the areas of development reliability, speed, and dealing with complications. The process involves actually alternately testing the hardware and software of the control and plant models to validate the development. The smart energy development process begins with a vision followed by the construction of a circuit, development of control models and plant models, performance of computer simulations, and implementation to the processor. At Yokohama Smart Community, we conduct simulations on energy and images, rendering the process visual, and are also devising ways of actually experiencing the results. We regularly present the results of these activities at seminars and private meetings.

4. Yokohama Smart Community Participant Members

Participation from a variety of industries including architecture firms and distributors

of energy devices is desirable in the field of urban development. Accordingly, we have not limited membership in our organization to just one industry, but have companies from diverse industries participating. We are also conducting joint research with technical organizations, receiving their assistance as well. Our membership, which exceeded 48 organizations by year end 2011, attests to the high degree of interest in our work.

IPA/SEC is the integrator project and embeddedness project viewed from the standpoint of "Software Quality Audit System (provisional name) and Traceability," which aim at the realization of safe and secure smart communities, an endeavor in which Kiichiro Tamaru is participating as the adviser. Because smart houses and communities operate using various interconnected devices provided by different vendors, the need to develop evaluation and certification standards to validate the safety of such devices made this project necessary. As a representative of the Yokohama Smart Community, Tamaru is also serving as a committee member in the SEC's "Software Product Quality Audit System (provisional name)" task force.

5. Past and Current Endeavors

Since its inception, this organization has implemented numerous activities such as seminars introducing products and services utilizing technologies for which we have conducted demonstrations and experiments. Participating mainly in joint seminars with the Fukuoka Smart House Consortium at the Nagasaki Huis Ten Bosch theme park, various trade shows and Yokohama City panel discussions, etc., the Yokohama Smart Community has been active in a broad range of areas. In December 2011, we set up opinion-exchange meetings among Yokohama Smart Community members, local governments, and leaders of the Netherland's 20-year "Solar City" urban design project at seminars given by these leaders in Fukuoka, Osaka, and Yokohama. At these meetings, we were able to garner ideas on how people can live abundantly as well as on urban design using natural energy. On January 27, 2012, at the Fukuoka Motor Show, we together with the Fukuoka Smart House Consortium sponsored a seminar that was jointly hosted by Fukuoka city and gave seminars with Yokohama City /Nagasaki Prefecture Cooperative and the Kyushu Economic and Industry Agency. A day before the seminars, we held Fukuoka Island Brick House discussion sessions and trade exhibitions, and over the course of two days, 30 companies, organizations, and groups delivered lectures, and about 350 individuals participated in opinion exchanges.

6. Future Endeavors

In the future, we plan to continue to conduct seminars and private sessions to allow members to exchange

ideas. We are also currently planning to design and construct a “model house” to actually explain the concept simply. In doing so, we plan to build a house with participating members, undertaking urban design through experimentation and validation. Beginning with mutual collaboration with the Netherlands, we are also planning overseas projects. In addition to requesting your participation in our activities and your support of them, I sincerely hope that Yokohama Smart Community activities will serve as a model for community development.

Inquiries
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Footnote
※1 Fukuoka Smart House Consortium: Established on June 1, 2010, to coordinate the efforts of Fukuoka City, companies, universities and public interest groups researching and developing smart-grid related devices and systems aiming at a sustainable, low-carbon society. Yoshimichi Nakamura of the Smart Energy Research Laboratory serves as the consortium’s representative.