

Special Issue: Contributing to a New Energy-Oriented Society

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The fundamental elements that support human activities are probably three materials and one value. Three materials are food, water and energy, and the one value is people's minds. These fundamentals are always the same throughout history. However, the three materials are influenced by technologies and constantly change their forms (this is sometimes called evolution), while the mind is cultivated through growth and its value can be recognized only through interactions between people.

Today, all countries are pursuing economic development and striving to secure energy as a requisite for that. Energy, originating from the knowledge to freely handle fire, developed from fossil fuels to nuclear power, and is now expanding into renewable energy. The background of this trend is the concept of "sustainability," highlighted along with global warming and resource constraints. The rhetoric that change is necessary to realize sustainability is based on the fact that the earth itself is changing. For humans to survive on earth, it is required to properly respond to changes in the three materials, especially energy. Since changes in energy are directly connected to economic growth and deeply related to all aspects of social activity, optimal design concepts and long-term strategic views are necessary.

This issue of SEI Technical Review presents various technologies that can support the changes in energy (centered on electricity) and discusses how the progress in element technologies is affecting the overall energy structure.

1. Structure of Changes

Changes are occurring on both the supplier and consumer sides. The basic tendency on the supplier side is a mixture of dispersion and concentration, diversification, and integrated control while the mentality of the consumer side is shifting from focusing on simple consumption to actively seeking power sources to develop an optimal control system. This shift reveals the limitations of conventional one-sided control by the supplier, which is about to be replaced by control through interactions with consumers. In

short, the overall trend is toward the goal of achieving co-existence of/harmony between partial optimization and total optimization, and we are facing the large, unprecedented challenge of finding who and how, and to what extent to achieve this goal.

These changes, expanding under the great goal concept of sustainability, are certainly aiming in the direction of placing emphasis on efficiency, reliability and safety, and securing optimality by employing IT, no matter what technologies the changes are associated with. Existing systems have complete mechanisms to thoroughly secure their stability. Therefore, to avoid vulnerabilities in the electric power grids that may be caused by changes introduced to these systems, some measures must be taken in some stage to enhance redundancy and flexibility. It is not an easy task to achieve this in light of economic rationality.

What makes the situation more complicated is that electricity is an important part of social infrastructure, related closely to the history, structure and lifestyles of the relevant community. Therefore the models to be applied for electricity are inevitably diverse and it is difficult to determine the business target in view of both the complexity of the system itself and diversity in the targets to which the system will be applied. In other words, however, this complexity provides us with an opportunity to enter the market, demonstrating the saying to the effect that new business chances exist in changes.

2. Business Strategies and Research & Development

Activities of the Sumitomo Electric Group should be promoted aiming at the following:

- (1) Be based on innovative technologies;
- (2) Have a perspective of system design; and
- (3) Acquire the ability to make proposals to the public.

Though expressed with simple words, these aims are actually difficult to achieve. (1) is a core principle of business, based on which the Group has established a solid foundation through its long history. Regarding (2), the

Group has high ability in some areas though its ability is unknown in the energy field. (3) requires the Group to be aware that it is entering a world that it has almost never experienced.

In other words, the notion of B2S (business to society) should be added to the conventional classification of B2B and B2C. While the existing, apparent businesses with individual customers should of course be maintained, it is also required, as its background or preparatory step, to be aware of the importance of seeing society as a customer. This is required of all of our Production, Sales, and R&D Groups. Among these, the R&D Group seems to play the most difficult role. While research is generally conducted under a certain concept, what does research have to do with the ability to make proposals to society?

When the proposal target has diversity, persisting in specific values of individual products may lead to the risk of narrowing the market. Pursuing highly universal technologies from the initial stage, on the other hand, may result in unattractive (lack-of-appeal) products. In short, product development in view of diversity in the market must satisfy two conditions. The first is originality of the product itself. If originality is lost, the product will always be exposed to price competition. The second is to ensure that the product plays an indispensable role for the system to provide customers/society with high value. While these are not new but normal conditions, it is important to have multi-faceted views from the early stage of research and development. To this end, a mechanism to share the viewpoint of B2S with the Production Group and Sales Group is required.

Ensuring consistency between research & development and business strategies has always been an important issue. The key to business strategies in view of the changes in energy structure is to quickly grasp how changes in a business model are related to research & development, and then to design and implement an optimal overall system. Since the conventional, long-lasting optimal structure, in which the customer is positioned at the top, is deeply rooted in existing organizations, it will require numerous adjustment processes and huge internal energy to respond to the new market structure without destroying the current structure (for the time being). Failure to quickly respond to market changes without delay may result in loss of business chances. But if we develop new business strategies representing our Group's comprehensive strengths, this can be a good opportunity to demonstrate our governance capacity.

3. Infinite Possibilities of Technologies and Ideas to Fulfill Them

Technologies presented in this issue are all very unique and expected to be employed for various uses in society. The scale of social changes generated by these new technologies depends largely on innovations on the user side. In the case of electricity as part of social infrastructure, which comprises diversity, there seems to be a high possibility that its values will be amplified by new uses that have not been discovered yet. Meanwhile, the key for the

product supplier side is the ability to propose new applications, as mentioned in section 2 above.

The word "solution" is often heard in businesses recently. What does this word mean and how is it related to research and development? New products developed through research usually offer some new functions, each of which brings some sort of (narrowly defined) solutions. In the case of electricity as part of social infrastructure, however, once a system is introduced into society it will last for about thirty years, which makes the weight of the solution different. In other words, technologies that regulate the lives of many people living in a society for thirty years should be those solutions that design the society in view of the technology innovation cycle of their fields. This requires not only reflecting exact customer needs but also having own social design ideas. Considering that society itself may change/develop over time, solutions are in fact dynamic in that they are aimed to determine how to combine the possibility of changes/development and the flexibility to quickly react to them in a system framework.

In this sense, solutions will probably form a new business concept that is neither technology push nor demand pull. Seeing solutions as a means to maximize the value of technological power of the Sumitomo Electric Group, it is necessary to have ideas to integrate the technology groups presented in this issue and ensure advantages of the systems realized by such ideas. This is the very point where the wisdom to utilize the infinite possibilities of technologies works. When combining external technologies is judged more appropriate to maximize the value, the ability to make a decision to swiftly take necessary action is important.

Such ability to take action requires large internal capacity to form core technologies, and clear goals of enhancing learning capacity by accumulating diverse application experience and, based on the accumulated experience, constantly improving the ability to judge optimality in the target market, as well as programs for their practical implementation. This means to promote research activities and verification/social applications simultaneously and present the mechanism for generating progress through mutual interactions. This seems ultimately the same as the goal of electricity infrastructure of achieving coexistence of/harmony between partial optimization and total optimization.

While every technological development means to realize a specific idea, all these ideas share the same concept of energy saving. Energy saving is important in any area of the electricity industry including power generation, transmission, conversion and consumption, as well as the development of new power cables and devices. Through mutual interaction between and combination of various technologies, this shared concept will offer unlimited possibilities. It is safe to say that the dynamics of research & development is based on such ideas that embrace variety and diversity.

The Sumitomo Electric Group will swiftly respond to changes in the trends of the time and environment by fully utilizing its comprehensive strengths, and solidify its sustainable growth by contributing to the creation of a sustainable society.