

Launch of Power & Energy Solution Business - ENERGY CLOUD™ Service -



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While the market conditions related to energy and the environment have been changing drastically, such as low-carbon energy use and the widespread use of renewable energy, Mitsubishi Heavy Industries, Ltd. (MHI) has begun offering the ENERGY CLOUD™ Service, a solution that will help increase the enterprise value of our clients through optimized energy use. This service is realized by applying MHI's analytical prediction technology utilizing AI & IoT.

This report will explain the outline of the ENERGY CLOUD™ Service and introduce some actual solutions to which this service has been applied as described in the following technical reports.

1. Introduction

From the perspective of global economic growth, as presented in **Figure 1**, it is expected that the capacity of power generation facilities and the amount of electricity generated will continue to increase worldwide⁽¹⁾. At the same time, there is also a social need for low-carbon energy that has been rapidly growing due to climate change issues. It is believed that the plant capacity of renewable energy such as solar PV power and wind power and related power generation output will continue to increase.

However, renewable energy has characteristics that are heavily susceptible to weather conditions and location. In order to expand its use, there are still some issues to overcome, including dealing with the imbalance between supply and demand in electricity and the distance between suitable locations for generation and consuming areas.

Although these are mainly issues for power suppliers to deal with, in order to achieve sustainable economic growth, even at the consumers' end, it is necessary to effectively use various energy sources including ever-growing renewable energy with its fluctuating characteristics.

Japan has set up the "S + 3E" basic principles as part of the government's energy policy, which satisfy Safety-orientated, Energy security, Economic efficiency and Environmental compatibility.

While the needs for dealing with future energy/environmental issues are increasing at both of the suppliers' and consumers' ends, the role MHI is expected to play in the future will become even more important, not only as a manufacturer with a wide range of products and services, but also as a provider of advanced energy utilization technologies.

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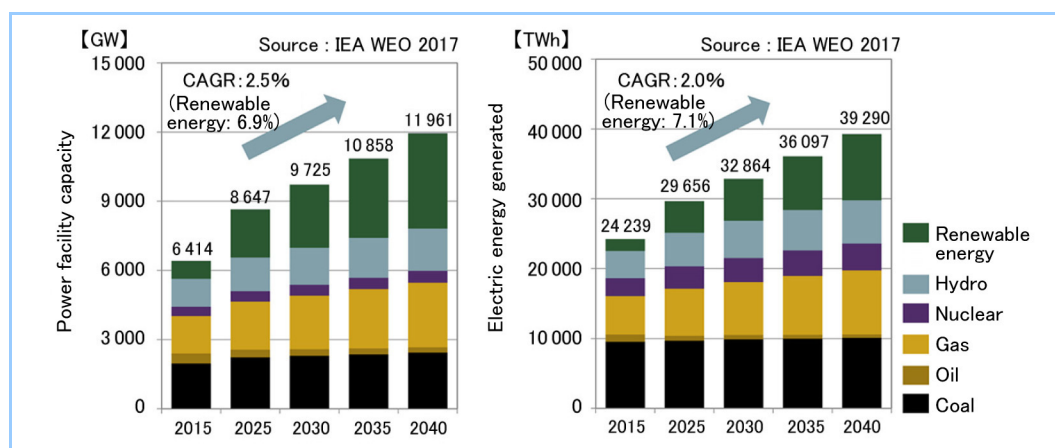


Figure 1 Expected power generation capacity/energy (Source: IEA WEO 2017)

2. MHI's approach

MHI has manufactured various power generation facilities and provided them to our clients both in Japan and overseas, in response to the diverse needs and changes in society. Furthermore, we have accumulated a wide range of technologies related to power generation facilities through operation and maintenance services after delivery.

On the other hand, as explained in Figure 2, MHI is a large-scale energy consumer as well, with multiple offices and plants both at home and abroad that use a large amount of energy. Therefore, as a manufacturing company, we also accumulate expertise on the operational optimization of production facilities, as well as technologies and knowledge on energy creation, energy storage and energy saving at the same time. This is the most important point in terms of how a consumer optimizes energy usage.

In this regard, we focused not only on power producers, but also on large-scale energy consumers, while working on the verification of various energy solutions in multiple offices and plants in Japan. As a result, we saw the bright prospect that MHI's technologies and expertise on power generation, energy use and facility operation would lead to the possibility of offering new values on top of solving energy-related problems for consumers by applying our unique analytical prediction technology utilizing AI & IoT.

Against this background, MHI started offering the ENERGY CLOUD™ Service, an energy solution service for energy consumers, in April 2017.



Figure 2 MHI's position in the energy sector

3. MHI's energy solutions

The recent development of digitalization has enabled us to not only collect various data such as facility operation, facilitated by IoT technology, but also to quickly analyze the obtained big-data by using AI. Subsequently, in addition to the conventional engineering approach, the statistical approach has become one of the leading data analysis methods. Against this technical background, MHI has been working vigorously on technology development for providing solutions to energy consumers.

Through the ENERGY CLOUD™ Service, we are now able to provide support for optimizing facility operation and business administration via guidance achieved by “facility monitoring (visualization technology)” utilizing our IoT technology, as well as “future forecast (analytical prediction technology)” utilizing AI. Accordingly, as one example, we have become able to predict energy demand with greater than 90% accuracy, which allows us to better understand a facility’s operational status and provide new services to energy consumers such as support for improved energy procurement and production efficiency.

As depicted in **Figure 3**, by combining the ENERGY CLOUD™ Service with MHPS-TOMONI™*, which is already on the market, MHI Group is now able to offer a one-stop solution service for the energy supply chain, covering the entire process from power suppliers to consumers under the slogan of “POWER & ENERGY SOLUTION PROVIDER.”

* MHPS-TOMONI™ is a solution service that MHI Group company Mitsubishi Hitachi Power Systems, Ltd. (MHPS) provides to power producers⁽²⁾. MHPS offers a range of services for energy businesses, including support for operational improvement utilizing IT technologies based on various data obtained in demonstration facilities for gas turbine-combined cycle power plants.

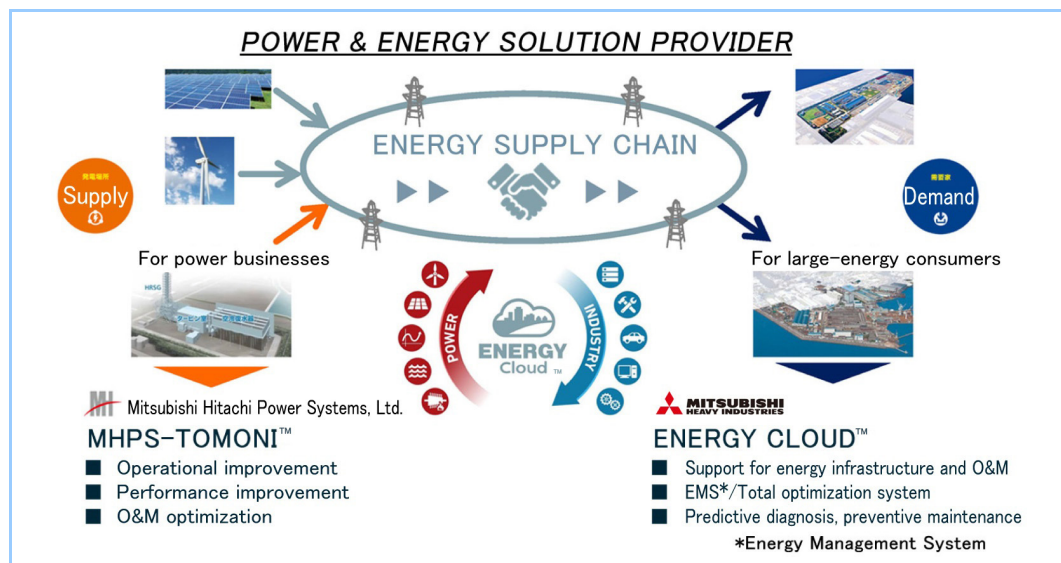


Figure 3 Energy solutions offered by MHI

4. Development of power and energy solution business

In the ENERGY CLOUD™ Service, in order to respond quickly to the diverse values and choices which consumers demand from energy, as indicated in **Figure 4**, we support improved energy procurement and production efficiency through future forecasting based on “data analysis utilizing AI” while grasping the customers’ actual energy utilization through “visualization achieved with the use of IoT.” The key to the success of this service is the ability to come up with great solutions, and, if necessary, IT systems or information platforms are provided as measures to realize the solutions. With this in mind, the service features “Customer contents first” as a basic philosophy where we address the issues and needs specific to individual customers.

We aim to develop the ENERGY CLOUD™ Service into a comprehensive energy solution service by extending its application process, under the basic concept, to cover new fields such as support for the Operation & Maintenance (O&M) of facilities, energy supply, and equipment proposals for the improvement and the renewal.

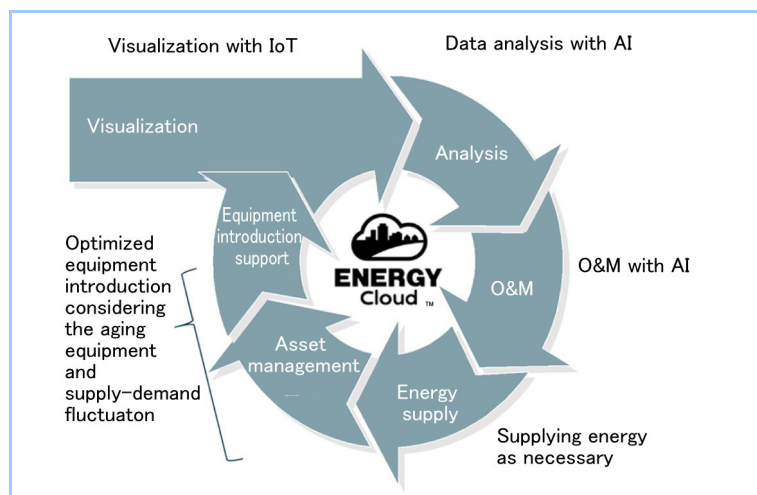


Figure 4 Application process for ENERGY CLOUD™ Service

5. Conclusion

The ENERGY CLOUD™ Service was created based on MHI's comprehensive strength with its unique visualization technology and analytical prediction technology. The new solution technology was established through the integration of our technological capabilities in the power generation facilities business and our wide range of plant operation expertise including knowledge on energy utilization accumulated through more than 500 products and projects across the entire group.

This service has demonstrated both internally and externally that it contributes to the optimum utilization of energy and production facilities as can be seen in Figure 5, the details of which are described in the other reports in this edition of the technical review.

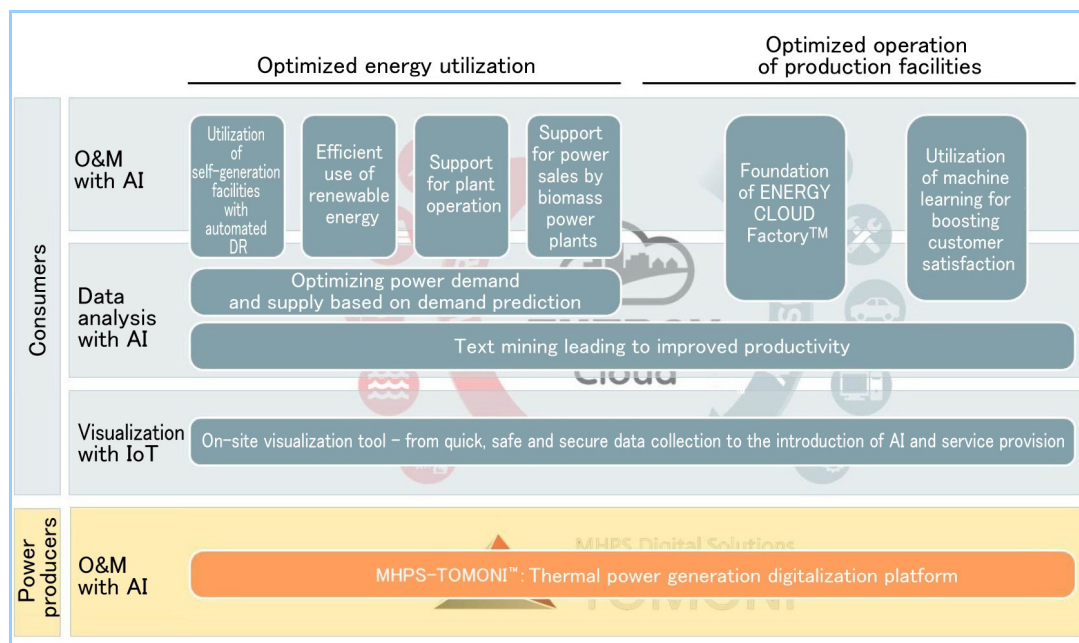


Figure 5 Solutions described in this report
(The numbers with white characters correspond to the reports in our latest technical review.)

We will strive to develop various different businesses in collaboration with renewable energy, which will be widely introduced and utilized in the future, by offering the new technologies and services described above. As shown in Figure 6, we will continue to work on the establishment of “Energy infrastructure that contributes to maintaining the global environment” to achieve reduced environmental impact and secure economic efficiency, while solving various issues relating to the increased use of renewable energy.

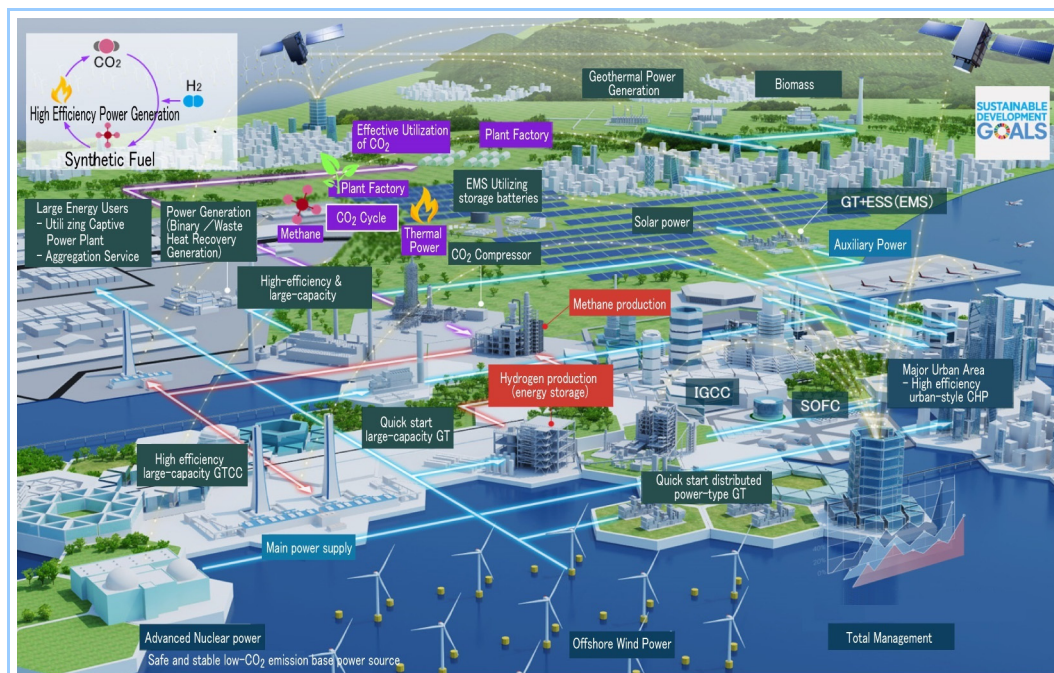


Figure 6 Ultimate energy infrastructure contributing to maintaining the global environment

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References

- (1) International Energy Agency, World Energy Outlook 2017
- (2) Mitsubishi Hitachi Power Systems "MHPS-TOMONI" Unlocks the Advantages of Digital Power Plants by Leveraging Customer Collaboration
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