enel x

Case Study

TAIKO PAPER

Manufacturing Co.Ltd.

SPECIALTY PAPER MANUFACTURER IN JAPAN LEADS THE WAY WITH DEMAND RESPONSE AND SUSTAINABILITY INITIATIVES

Using in-house power generation equipment to bring about positive environmental outcomes

The paper industry was once synonymous with being energy intensive. This brought awareness of resource and **energy saving**, and sparked efforts to reduce **environmental impact**. These days, the paper industry is known for its high ratio of in-house power generation, including biomass power generation using waste liquid that's discharged from **the paper manufacturing process**.

Taiko Paper Manufacturing Co. Ltd. has strived for more than 60 years to positively contribute to the local community, and has always been an **industry leader**. The company was also one of the first in Japan to participate in **Demand Response (DR)** and said "participating in DR was a natural progression for us."

We spoke with **Toshiki Narabe**, Section Manager of the Power Division and **Katsumi Suzuki,** Engineering Power Division Manager.

Toshiki Narabe
Section Manager of the Power Division

Katsumi Suzuki
Engineering Power Division Manager

IMPLEMENTATION OVERVIEW

Achieving strong DR results from the start

Japan's DR project began in 2014 as an experimental business project by the **Ministry of Economy, Trade and Industry**. Taiko Paper has participated in this project with partner **Enel X Japan** from the beginning. What made the company want to get involved in DR?
"We have long recognised that our business activities have a negative impact on the environment, and have been striving to transition to a more **sustainable recycling-based industry**. DR is aligned with our company philosophy, so we decided to participate because we thought that our existing facilities could contribute to society." (Suzuki)

Taiko Paper is an independent paper maker that handles everything from the production of pulp made from wood chips to packaging paper and various types of industrial paper. It consumes approximately **125,900,000 kWh** of electricity annually. However, the amount of electricity purchased from power companies is **34,600,000 kWh**, about a quarter of its energy use. The remainder is covered by chemical recovery boilers that use black liquor (waste liquor) from the manufacturing process as fuel, and private power generation facilities that use heavy oil boilers.

It was found that if in-house power generation facilities were used effectively, Taiko Paper could adequately respond to DR requirements. The company achieved a DR rate of **130%** in 2015.

Taiko Paper continues to participate in the project and has achieved a DR rate of 100% or more to date, with a **140% achievement rate** recorded in 2018.

Taiko Paper had a strong desire to use the power generated by its own generation facilities to contribute to society. According to Narabe, the company's active involvement in DR came from their experience of the **Great East Japan Earthquake** in 2011. "When there were power shortages caused by the Great East Japan Earthquake, we not only made efforts to save power, but also supplied **TEPCO** with the power generated by our own generation.

Our in-house power generation facilities combine boilers using two types of fuel: black liquor, our own biomass fuel, and heavy oil. This makes it relatively easy to adjust the power generation. In addition, since the generation has a higher capacity than that required for normal operations, it can be supplied outside the company in cases of emergency. For us, DR is an extension of this, and as such it was a **natural progression** for us to participate in the experimental business project." (Narabe)

The experience at the time reminded Taiko Paper of the magnitude of its power adjustment capabilities and its social significance, which is now at the service of the community thanks to their DR participation.

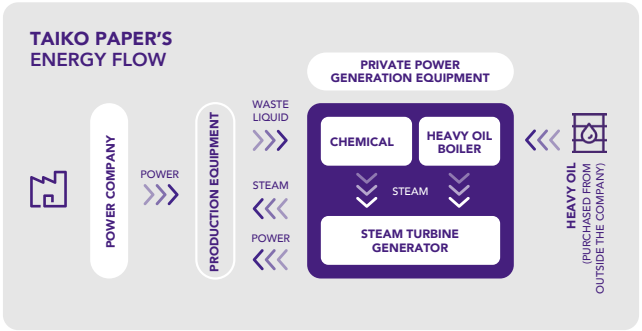
Providing DR by increasing in-house power generation without reducing power consumption

When DR is called on, Enel X Japan receives power saving directives issued by general power transmission and distribution companies, and then shares this message with its customers, who are energy users. These partner companies then receive compensation **(DR reward)** for saving power by following the directive.

Power saving in this context means reducing the amount of power purchased from power companies, not necessarily reducing the amount of power consumed (power demand). For example, there are patterns where the **power demand** is reduced by adjusting the operations of the production lines in factories, and in other cases, where the amount of power purchased is reduced by increasing the amount of private power generation without changing power demand. Taiko Paper with its own in-house power generation equipment falls under the latter.

"Our company uses a steam turbine generator to generate power independently while using two types of boilers, chemical recovery boilers including black liquor as fuel, and heavy oil boilers. If a power-saving directive is issued, we increase the amount of power generated by this steam turbine generator to reduce the amount of power purchased. Although the turbine has an output of **25,000 kW**, it is usually kept at around **20,000 kW** so there is plenty of reserve.

As a result, we have achieved a high DR rate without needing to change our factory operations." (Narabe)



BENEFITS AND IMPACT OF IMPLEMENTATION

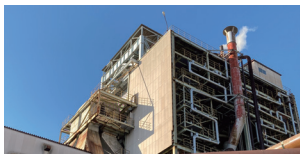
Creating cost benefits with DR Reward

Although DR is a socially significant initiative, it also brings participating businesses rewards. The higher the contracted **power reduction** is, the higher the **reward** is, with power saving efforts directly linked to compensation. For Taiko paper, a key factor in the cost benefit analysis is the cost of heavy oil to power the boilers.

Toshiki Narabe
Section Manager of the Power Division

"Chemical liquid recovery boilers make effective use of waste liquor (black liquor) generated in the manufacturing process. However, there is a limit to black liquor, which depends on the production volume of the product.
We need to pay extra to purchase heavy oil. Heavy oil boilers play an important role in regulating power in order to maintain **stable production**, while responding to power saving directives. In terms of cost benefits, the point is the balance between the price of this heavy oil and the DR reward." (Narabe)

Specifically, if the "DR reward and power bill due to power saving is larger than the "heavy oil bill associated with an increase in private power generation", there will be **financial benefits**.
At Taiko Paper, the ratio of chemical recovery boiler to heavy oil boiler is usually about 7 to 3. As mentioned above, the ratio of private power generation to total power consumption is about three-quarters, so more than **20%** of the total is generated by heavy oil boilers. To prepare for a DR event, the company is working to use both types of boilers efficiently by "improving the load on the chemical recovery boiler when a daytime DR event is likely to be triggered, so as to minimise dependence on heavy oil." (Narabe)



Chemical recovery boiler

Narabe says that this means they benefit from a new source of income that can be obtained simply by making effective use of existing assets without needing to invest in equipment upgrades. Further, the incentive of DR rewards for **power savings** has increased awareness within the company, and resulted in cost reductions.

CRITERIA FOR PARTNER SELECTION

Having the world's best DR performance was a key factor in partner selection

The partnership between **Taiko Paper** and **Enel X Japan** has been in place for six years. For Taiko Paper, as DR was new to them, partner selection was done with care.

Katsumi Suzuki
Engineering Power Division Manager

"The partnership with Enel X Japan began with an introduction from a business partner. At the time there were no companies in Japan with a proven track record in DR. Enel X was the **world's first company** to commercialise the DR business, and already had more than **15 years' experience** across Europe, the US, Australia and New Zealand. That sounded very appealing to our company with our desire to contribute to society through DR." (Suzuki)

Enel X, headquartered in Rome, Italy, is one of the world's largest DR companies with **6.3 GW** of energy under management. Enel X continues to leverage its global experience and know how to develop the Japanese DR market. Taiko Paper is proud to work with Enel X as partners to this day.

A “visualisation” tool supporting usability

One of the reasons Taiko Paper partnered with Enel X Japan was because **Enel X’s system** was easy to understand and to operate. “When we were first introduced to the systems, I was really impressed by the ease of use. Not only was it clear to understand what to do when a DR event occurs, but the usability was also well thought out. This was also clear from their global track record. I knew instinctively what to do.” (Narabe)

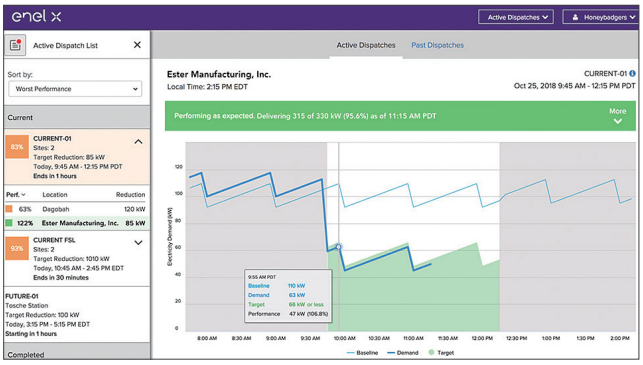
A Network Operations Centre (NOC) was established to support DR operators **24 hours a day**, **365 days a year**. Enel X created an environment where even first-time users could operate safely.

The DR power saving command directive is sent simultaneously by email, SMS, or automatic voice call, and the operator responds within a certain **timeframe** (1 to 3 hours). With the easy-to-understand tools, Taiko Paper has been able to respond promptly without any confusion.

Enel X Japan provides a package of tools necessary for DR implementation. One tool evaluated by Narabe, means they could visualise various information ahead of other companies. For example, a demand data visualisation tool tells you when and how much power you should save, and enables intuitive comparisons with your performance. In addition to cloud-based tools, there is a code that supports **DR operators 24/7**.

“At the time of the experimental business project, there were cases where we responded to the directive **within 10 minutes**. Our company showed a good response rate. In a commercial environment, we can respond within one hour without any problems.” (Narabe)

We plan to continue to work on solving social issues through our business activities.” (Suzuki)



The company will continue to work with Enel X Japan and other partners to solve **Japan’s energy problems**. Enel X Japan continues to be a pioneer in the DR business for customers facing transformation, using innovative solutions that are cultivated around the world.

FUTURE PROSPECTS

Tomorrow: solving social issues through business activities

Taiko Paper is currently focusing on providing **plastic alternatives**. Replacing straws and other plastic products with paper products is an indispensable initiative for future society. The company has recently successfully partnered with a major confectionery manufacturer to create **paper confectionery bags**. They are also conducting demonstrations of reusing plastic waste for another use.

“All of these initiatives are part of our approach to create a **recycling-based society** and are based on the same philosophy as participating in the DR business. Our vision is to see “beautiful areas where people, culture and the natural environment co-exist”. For the paper industry, which would not operate without the use of forest resources, water and electricity, we believe that proactively addressing environmental issues and contributing to society is our duty.