

## Expanded New Business Potential from Demand Response

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Along with population increases and economic growth occurring mainly in emerging countries, the global demand for electricity is expected to continue increasing in the future. In the past, the increase in demand was met by the enhancement of supply facilities to correspond with peak periods. However, in recent years, a mechanism has emerged called "Demand Response" (hereinafter referred to as "DR") in which peak demand is suppressed or shifted by actions such as altering the behavior patterns of consumers. DR-related businesses have been expanding, and the Hitachi Research Institute has been studying these trends.

### 1. DR Changes Electricity Demand Patterns

#### 1.1 Objective is to Suppress Peak Demand

DR is a collective term for mechanisms that change electricity demand patterns. The objective of DR is to suppress and shift peak demand. DR is different from electricity/energy conservation that seeks to reduce the total volume of electricity consumed because DR focuses only on peak demand (Figure 1).

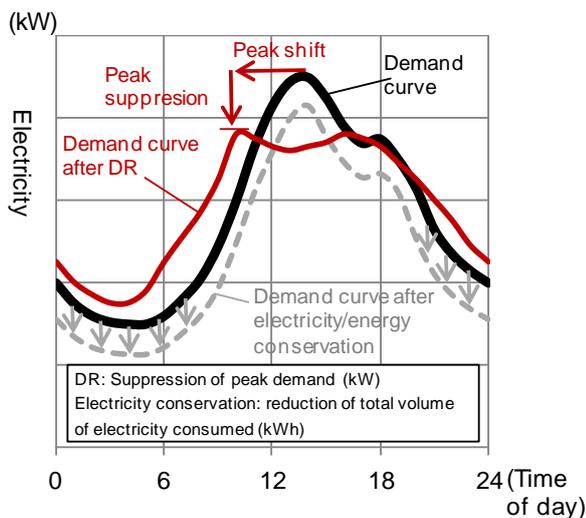


Figure 1 Comparison between DR and Electricity/Energy Conservation

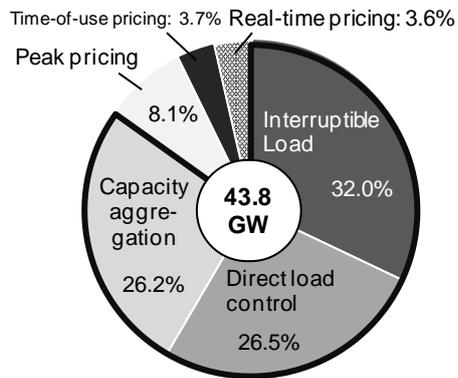
#### 1.2 Diversified DR Methods

Methods to change electricity demand patterns are roughly classified into the time-based programming and the incentive-based DR program (Table 1). In the time-based programming, consumers are encouraged to shift demand on their own accord because prices are set higher during high-demand periods and lower during low-demand periods. Meanwhile, in the incentive-based method, electricity providers conclude agreements with consumers to suppress/interrupt demand when electricity demand is high and the supply is tight. According to research by a U.S. company called Pike Research, a breakdown of the 43.8GW suppressed electricity by DR in the world (2011) reveals that the majority or approximately 85% of suppressed electricity is due to the incentive-based DR program (Figure 2).

Table 1 DR Methods

Classification	Method
Time-based pricing	<b>Time-of-use pricing</b> Different prices are set by time zone (every 3 to 5 minutes). High prices are set for high-demand time zones.
	<b>Critical peak pricing</b> Only for time zones where demand is particularly high, prices which are several times higher than usual are set.
	<b>Real-time pricing</b> The situation of demand and supply is reflected in the price and the price fluctuates every moment. When demand is high, the price is also high.
	<b>Planned adjustment contracts</b> Consumers receive discounts and compensation by suppressing their demand during peak periods/times that are designated beforehand.
Incentive-based DR program	<b>Occasional adjustment contracts</b> Consumers receive discounts and compensation according to the volume they suppress by suppressing their demand during emergencies.
	<b>Direct load control</b> Electricity suppliers externally suppress the volume of electricity used by consumers. Consumers receive compensation for their agreement.

Prepared by Hitachi Research Institute based on various materials



Source: Pike Research

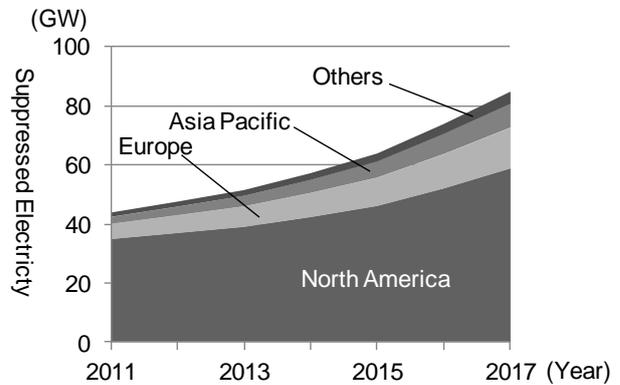
Figure 2 Breakdown of Suppressed Electricity by the DR Method (2011)

### 1.3 Suppression of Investment Costs in New Facilities

As described earlier, in some cases electricity consumers receive financial incentives in the form of discounts on electricity prices and compensation by DR. On the other hand, electricity suppliers also have incentives. As mentioned at the beginning of this article, in the past electricity suppliers enhanced the supply capacity to meet increases in demand. In other words, they needed to increase the number of their facilities in order to secure the extra capacity needed to meet peak demand that only occurs for several hours a day. However, if peak demand can be sufficiently suppressed by applying DR, investment in new facilities to meet peak demand will become unnecessary. In addition, in a scenario where the retailing of electricity is liberalized and a wholesale electricity market is formed, electricity retailers will have to procure electricity at high prices during peak demand. Therefore, if the situation of tight supply for rising demand can be avoided by DR, it will also lead to a reduction in procurement cost.

### 1.4 Global Market is Driven by North America

Suppression of electricity consumption through DR will continue to steadily increase in the future, and it is forecast that the global suppression of electricity consumption through DR will approximately double (compared to 2011) by 2017 (Figure 3). Although electricity transmission and distribution facilities in North America are aging, DR is the most developed there partly due to the impact from intensifying competitive pressure caused by deregulation which has propelled investment in suppression technology.



Source: Pike Research

Figure 3 Forecast of Suppressed Electricity Consumption by DR Transition

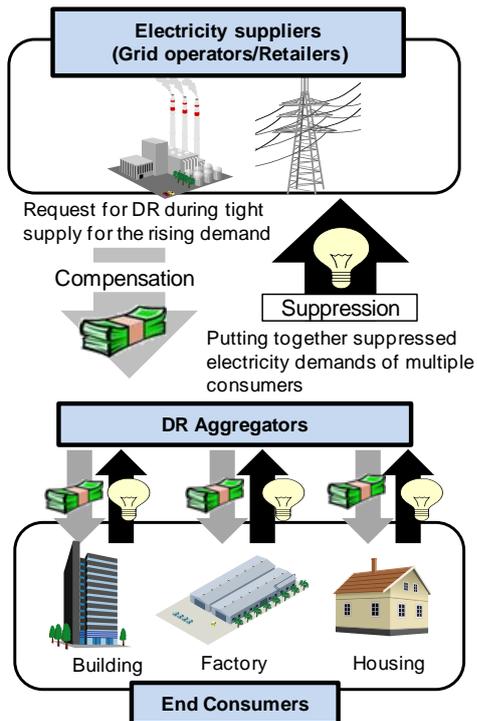
## 2. New Players: DR Aggregators

### 2.1 Acting as Agents between Electricity Suppliers and Consumers

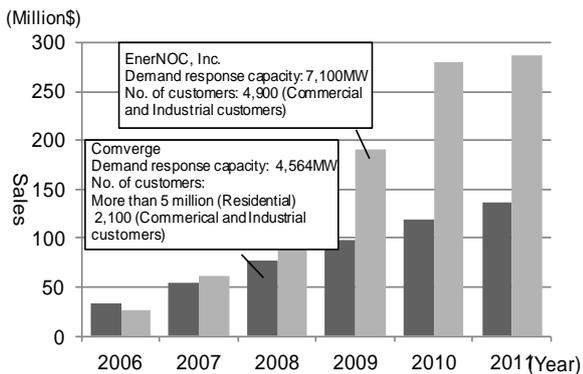
DR aggregators coordinate multiple consumers who are participating in DR agreements and act as agents between consumers and electricity suppliers. DR aggregators conduct various DR-related procedures such as engaging in activities to promote participation in DR agreements, concluding DR agreements with consumers, and providing services on behalf of electricity suppliers. DR aggregators receive remuneration and handling charges according to the volume of suppressed electricity consumption. A certain portion of the remuneration is paid to consumers as a DR agreement joining fee (Figure 4). The advantages of using DR aggregators are that even consumers other than large consumers can enter into a DR agreement through DR aggregators and electricity suppliers can simplify their procedures by unifying the point of contact for their DR agreements and for making requests when DR is invoked.

### 2.2 Rapidly Growing DR Aggregators

EnerNOC, Inc., which is the largest DR aggregator in the U.S., specializes in services for industrial/commercial users who are large consumers. EnerNOC's sales have expanded by a factor of 11 over the past six years. In contrast, another company called Comverge focuses on services for residential customers who are small electricity consumers. Although Comverge has concluded more than five million DR agreements, it has achieved approximately a four-fold growth in sales (Figure 5).



Prepared by Hitachi Research Institute  
Figure 4 DR Aggregator Business Model



Prepared by Hitachi Resource Institute based on publicly released materials from each company  
Figure 5 Changes in Sales of the Two Main U.S. DR Aggregators

The services of DR aggregators have been diversifying and are not limited to acting as agents for DR programs as mentioned earlier. Their services cover providing energy conservation consulting to consumers and wholesalers to the DR capacity securing market. Since a manual operation where a request for the suppression of demand is made to consumers by phone or email is the mainstream, industrial/commercial customers who are large consumers are currently the main targets for DR agreements. In the future, if remote/automatic control

technology in coordination with HEMS and BEMS\* expands, the expectation is for DR programs to develop for small and medium-sized buildings and residential customers, which are small electricity consumers individually but large consumers collectively.

Hitachi Research Institute will continue to keep a close watch on DR-related service trends and corresponding new needs and business opportunities in the future.

\*HEMS, BEMS: Home/Building Energy Management System