Everything you always wanted to know about DEMAND RESPONSE
**What is demand response?**

Through demand response, final consumers (households or businesses) provide flexibility to the electricity system by voluntarily changing their usual electricity consumption in reaction to price signals or to specific requests, while at the same time benefiting from doing so. This can be done either manually or automatically.

In contrast to energy efficiency, which aims at using less energy while still providing the same service or level of comfort, demand response is mainly about shifting consumption to a different point in time.

This entails temporarily decreasing or increasing normal consumption patterns, which can sometimes lead to energy savings.

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**“Implicit” and “explicit” demand response, what does it mean?**

- **Implicit demand response** (also sometimes called “price-based”) refers to consumers choosing to be exposed to time-varying electricity prices that reflect the value and cost of electricity in different time periods. Armed with this information, consumers can decide – or automate the decision – to shift their electricity consumption away from times of high prices and thereby reduce their energy bill. Time-varying prices are offered by electricity suppliers and can range from simple day and night prices to highly dynamic prices based on hourly wholesale prices. Examples include time-of-use pricing, critical peak pricing, and real-time pricing. In addition, some countries have adopted or are investigating time-of-use distribution network tariffs, which aim at shifting consumption to avoid grid constraints.

- **Explicit demand response** schemes (sometimes called “incentive-based” or “volume-based”) the result of demand response actions is sold upfront on electricity markets, sometimes directly for large industrial consumers or through demand response service providers. Consumers receive a specific reward to change their consumption upon request, triggered by high electricity prices, flexibility needs of balance responsible parties or a constraint on the network.

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*An explanation of the terms in blue can be found in the glossary at the end of this brochure.*
Demand response is already playing an active role in the electricity system for years, for instance suppliers offer time-of-use prices to their consumers. Nevertheless, it is becoming more important today as the electricity system evolves. Historically, matching electricity supply and demand was relatively straightforward, with large and controllable power plants on the one hand and relatively easy to predict demand on the other. But in recent years, smaller, variable and less predictable renewable generation is developing. Moreover, such generation is often connected to the distribution grid rather than the transmission grid.

As a result of these changes, matching supply and demand at all times is becoming more challenging and the electricity system needs more flexibility. On the other hand, smart meters, connected appliances or in-home displays open new possibilities for innovation on the demand side. For instance, empowered consumers can increasingly participate by adapting their consumption habits: demand response is another tool in the flexibility toolbox!

**What is the existing European policy framework for demand response?**

The 3rd Electricity Directive (2009/72/EC) as well as the Energy Efficiency Directive (2012/27/EU)\(^1\) have provided legal basis for the development of demand response in Europe. They require enabling demand response to participate in retail and wholesale markets according to its technical possibilities. Proper transposition of these rules at national level is key to enabling demand response. The European Commission has also recognised demand response as a key tool to better link wholesale and retail markets, as noted in its Energy Union Communication from February 2015.

**At European level, stakeholders are debating flexibility and demand response**

A number of stakeholders have started elaborating recommendations on demand response, among whom EU energy regulators through CEER and ACER as well as TSO organisation ENTSO-E. Meanwhile, the European Commission’s Smart Grids Task Force Expert Group 3 (EG3) has been revived, bringing together a broad range of interested parties with the aim of defining key principles for the development of flexibility and demand response in Europe. EURELECTRIC takes an active part in this process and has also been leading discussions with main stakeholders through its Demand Side Participation Task Force.

\(^1\) The Energy Efficiency Directive includes specific articles on demand response, such as article 15.8
What does demand response for consumers entail in practice?

Demand response may take different forms depending on consumers’ consumption volumes and patterns. For example, industrial or large commercial sites can rearrange their production or operation schedule in order to shift electricity consumption to times when prices are lower. Large sites may even have dedicated staff in charge of optimising consumption and piloting demand response.

For smaller businesses and households, demand response can be about shifting electric heating and air conditioning away from electricity price peaks, charging or discharging an electric car at times of interesting prices or delaying the use of a washing machine while being rewarded for reducing consumption at peak times. Consumers’ flexibility potential strongly depends on the appliances they own and operate, but also on their lifestyles and more generally on their individual preferences. Engaging such smaller consumers successfully requires clear demand response signals and tools that are easy to set and use. Demand response will develop on a larger scale when consumers see a real value in these services and hence wish to engage.

Feedback from an engaged customer in Finland – home with an annual electricity consumption of around 28 000KWh

“I have signed up to a dynamic pricing offer with my supplier combined with an automated system for heating optimisation. Now my electric heating is automatically controlled to run during those hours when electricity is the cheapest: the system takes into account the weather forecast and heats the house according to our needs. I also enjoy the simple and smart solutions. For example, I can monitor my consumption, control the heater, and receive messages about energy prices. It is an easy to use service that I can access to via computer, smartphone and tablet.”

How do consumers benefit from engaging in demand response?

Tailored information and feedback can help consumers better understand their consumption habits. Demand response also brings them more choice through a range of innovative services. Most importantly, demand response allows consumers to value their flexibility and to ultimately reduce their energy bills or be rewarded to modify their consumption accordingly.

However the benefits of demand response must outweigh consumers’ efforts as well as investment costs in e.g. automation equipment or communication tools. It is important to highlight that the benefits brought about by demand response crucially depend on consumption volumes and patterns, and such services may not always be worth implementing.
**DOES DEMAND RESPONSE REQUIRE NEW TECHNOLOGY?**

While demand response has been and could continue to be deployed by suppliers without smart metering or connected appliances, these technologies will facilitate more advanced dynamic pricing and new demand response services.

For households and small businesses for instance, smart meters combined with in-home displays help raise awareness of electricity consumption, while automation technologies make it easier to participate. Open communication interfaces and information exchanges will also be needed to ensure that heating control systems, hot water production units, storage systems, electric cars, cooling systems, household appliances, etc. can participate in demand response.

Further information is available in the EURELECTRIC report:

*“The Retail (R)evolution – Power to the customer”*
December 2013

**AREN’T CONSUMERS WORRIED ABOUT SHARING THEIR DETAILED CONSUMPTION DATA?**

Demand response requires consumers, suppliers, other demand response service providers and distribution network operators to exchange increasing amounts of detailed data. Most consumers will be comfortable sharing their data if they are confident that it is stored securely in a way that safeguards privacy.

Any framework for data exchange must take these concerns into account and ensure that the data are being used only for the purposes agreed. Generally speaking, this means that other parties can only access consumption data with the consumer’s explicit consent.\(^2\)

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\(^2\) With the exception of data that are required to fulfil regulated tasks stemming from the national market model.
**What is the role of suppliers in providing demand response?**

By developing supply offers that reflect the price of electricity in different time periods, suppliers allow consumers to use less electricity at times of high prices and to increase their consumption when prices are low. Suppliers and other balance responsible parties use demand response as a tool to better balance their portfolio and optimise sourcing costs.

As a matter of fact, suppliers have long been key players in the field of demand response. Given their experience, suppliers are well positioned to innovate and to offer the competitive, efficient and simple demand response services that consumers need. This will be further facilitated when regulated prices are phased out and suppliers are allowed to offer more advanced time-varying prices. Moreover, the fact that suppliers are linked with a balance responsible party makes demand response easy as it does not require new operational arrangements and contracts.

**Can consumers also engage in demand response with other service providers?**

Of course, demand response service providers compete to offer the best services and consumers should be able to choose the offers that suit them best. For example, some demand response service providers are demand response aggregators: they contract directly with consumers and then pool together the result of several consumers’ demand response actions to sell it on electricity markets or to other players in the electricity system. In some countries demand response aggregators act as third parties (they are neither suppliers nor do they partner with a balance responsible party or a supplier). There is a need to clarify their role and responsibilities towards other market parties so that all demand response service providers compete on a level playing field. For a sound demand response environment, all market players must bear the same responsibilities, especially in terms of balancing. Going further and in order to avoid any extra costs to consumers, it is important that the valuation of demand response always remains market-based.

A number of open practical questions also remain surrounding this type of demand response. For instance, in order to estimate the amount of electricity that has been shifted, it is necessary to define a “baseline” of how much electricity would have been consumed if no demand response had taken place. Another open question concerns consumption that “returns” after a demand response event. Indeed, a consumption decrease due to demand response may be followed by a load peak in a “rebound effect”. This may lead to extra sourcing and flexibility costs for suppliers and impact consumers – for example if they use more than their contracted load.

Further information is available in the EURELECTRIC report “Designing fair and equitable market rules for demand response aggregation”, March 2015.

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3 Balancing, intraday, day-ahead and/or capacity markets.
**WHAT IS THE ROLE OF NETWORK OPERATORS FOR DEMAND RESPONSE?**

**HOW CAN DEMAND RESPONSE SUPPORT ELECTRICITY NETWORKS?**

While transmission system operators ensure that the electricity system at national (or supra-regional) level is in balance, distribution system operators (DSOs) are in charge of operating local electricity grids and ensuring quality of supply. Both TSOs and DSOs must design their networks economically to meet peak demand. In this context, they can procure demand response, along with other flexibility sources, as it can provide in some cases a cost-effective alternative to grid investments to balance the electricity system (TSO) and to solve local constraints (DSO). In this way, demand response could also contribute to integrating wind and solar power into the system. In addition, some countries have adopted or are investigating time-of-use distribution network tariffs, which aim to shift consumption as a means to avoid grid constraints.

Further information is available in the EURELECTRIC report *“Active Distribution System Management”, February 2013*

**HOW CAN IT BE ENSURED THAT DEMAND RESPONSE DOES NOT HAVE UNWANTED IMPACTS ON THE GRID?**

DSOs must ensure that quality and security of supply are maintained for all consumers. The consumption changes triggered by demand response may sometimes have an impact on the distribution grid operation. Network operators could actively communicate on the availability of the network to ensure that demand response actions do not have unwanted impacts on the grid.

For example, in an area where distributed generation produces a lot of electricity at a certain point in time, a sudden consumption decrease could trigger a local constraint and this should be carefully managed by DSOs.
Demand response from A to Z

**Balance Responsible Party (BRP):** the Balance Responsible Parties are in general at the core of all European wholesale markets. The notion was introduced to encourage demand and supply balancing; unbalanced BRPs are financially penalised. Usually, consumers’ suppliers are also their BRP.

**Critical peak pricing:** when suppliers observe or anticipate high wholesale market prices or power system emergency conditions, they may invoke critical events during a specified time period (e.g., 6 p.m.—10 p.m. on a cold winter weekday), the electricity price during these time periods can spike up by a substantial order of magnitude.

**Demand response (DR), demand side flexibility:** see first question “What is demand response?”

**Demand response aggregator:** a DR aggregator is a company doing DR aggregation. DR aggregation is the commercial function of pooling consumption changes from consumers to provide energy, flexibility, capacity and services to other subsets of the electricity system.

**Demand response services provider:** a company offering demand response services to consumers. This includes suppliers, consulting companies helping consumers to better react to time-varying prices, demand response aggregators partnering with balance responsible parties or suppliers; and third party demand response aggregators.
**Demand response from A to Z**

**Dynamic pricing:** dynamic prices reflect variations in wholesale market prices. They can go to different lengths in terms of granularity, from hourly prices set and announced one day in advance to consumers, to real-time pricing directly tracking wholesale market prices.

**Energy efficiency:** a permanent consumption reduction while keeping the same level of usage and comfort.

**Flexibility:** any modification of generation and/or consumption levels in reaction to an external price or activation signal, aimed at providing a service within the energy system. The flexibility provided by consumers is called demand-side flexibility or demand response.

**Supplier:** company supplying electricity to end consumers. Suppliers also offer flexibility services embedded in supply contracts, for instance through time-varying pricing. Suppliers can also act as demand response aggregators.

**Time-of-Use (ToU) pricing:** instead of a single flat rate for energy use, time-of-use rates change for broad blocks of hours: they are higher when electric demand is higher (as reflected in wholesale prices). The price for each period is pre-determined and constant. **Time-of-Use network tariffs** also exist in some countries to reflect different states of the network.

**Time-varying/time-based pricing:** refers to any pricing rate that is not flat and changes over different time periods.

**Real time pricing:** different price levels usually apply to different time periods on an hourly or sub-hourly basis.
EURELECTRIC in Brief

EURELECTRIC represents the common interests of the electricity industry at pan-European level. Our current members represent the electricity industry in over 30 European countries. We also have affiliates and associates on several other continents.

Our well-defined structure of expertise ensures that input to our policy positions, statements and in-depth reports comes from several hundred active experts working for power generators, supply companies or distribution system operators (DSOs).

We have a permanent secretariat based in Brussels, which is responsible for the overall organisation and coordination of EURELECTRIC’s activities.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

**Economic Development**
- growth, added-value, efficiency

**Environmental Leadership**
- commitment, innovation, pro-activeness

**Social Responsibility**
- transparency, ethics, accountability