

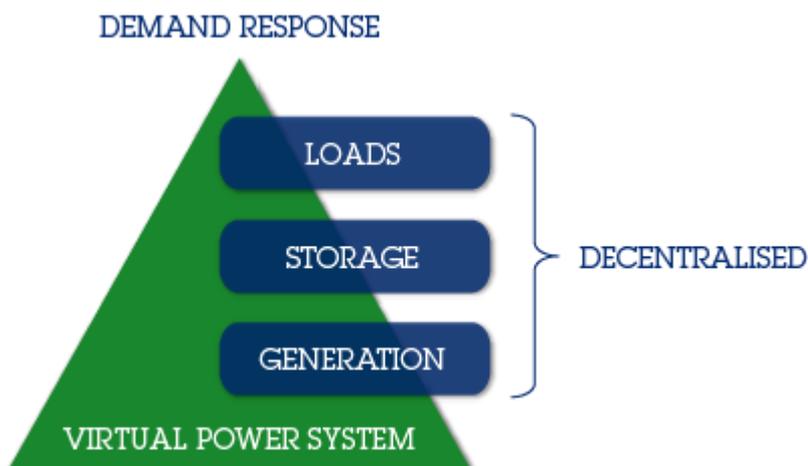
Load shifting

The main effect attained by Demand Response is load shifting or creating flexibility in electricity consumption – consumption is either brought forward or delayed, and thermal storage systems and other commercial and industrial intermediate storage systems are used for energy storage. The best battery is a warehouse full of an energy intensive product. Power generation from emergency generators (CHP), combined heat and power plants or the charging capability of batteries are flexibly integrated, thereby increasing the stability of the System as a whole.

Virtual Power System

The power grid has practically zero storage capacity. Every second, precisely the amount of power must be generated that is demanded by all energy users. Stand-by power stations are available to make it possible to react to short-term fluctuations. The transmission network operators monitor the balance between power generation and consumption and supply stand-by output on demand.

Demand Response offers an innovative, considerably less expensive and more environmentally friendly alternative than previous approaches – namely by making aggregated loads and energy buffer storage available from hundreds - and in the future thousands - of commercial and industrial units. This principle can be described as a “virtual power plant” or “virtual power system”.



The Entelios Network Operations Center (NOC)

The Entelios NOC aggregates interruptible electrical loads and decentralized generation assets belonging to commercial and industrial energy users. Telecommunications, monitoring and control is handled via the Entelios Network Operations Center (NOC). Energy users are integrated by IT systems and receive control signals. Entelios adjusts the power consumption of aggregated energy users to the requirements of the transmission system operator or distribution system operator. Individual participating units are therefore switched on or off depending on availability, thereby balancing out fluctuations between power generation and demand and making demand for power more flexible. We call this approach the Entelios Demand Response Program. The result is the intelligent linking of electrical loads — Entelios brings them together as “Demand Response Participants”.

Entelios thus acts as the “Energy Relationship Manager” between energy provision and consumption. The individual energy user thereby takes on a new responsibility in the power generation system and can actively participate in the integration of renewable energy. To achieve this, Entelios uses intelligent integrated telecommunications technology and creates a practical and inexpensive implementation of the Smart Grid.

Benefits for the national economy

Entelios commercializes the aggregated potential from thousands of flexible interruptible loads, controllable generation, and energy storage in industry and commerce. Entelios creates added value for all market players: power generators, grid operators, power retailers and power customers – in sum the whole national economy.

Why electrical loads are useful and important

All interruptible loads that are relevant for the Entelios Demand Response program or the Entelios virtual power system have flexibility in their operations schedule. They can all store energy in one form or another (heat, cooling, compressed air or production storage). Even seasonal effects can take on great importance.

The qualified energy resources are handled as individual building blocks whose operational parameters and constraints are stored and observed by the real-time rule-based systems in the Entelios Network Operations Center. Customized production schedules can be managed as can physical thresholds values. Entelios' software then aggregates the individual building blocks into pools, optimizes pool schedules, and creates power products, e.g. for the intra-day market or for reserve power. Even while a single building block alone might not be useful, a pool of resources can be powerful and valuable.

Opportunities for decentralized generation

Many commercial or industrial energy customers operate their own generation equipment to reduce their grid charges by lowering peak power demand. These resources are emergency generators or combined heat and power units. In most cases these resources have flexibility potential that is not yet commercialized. Entelios can trade these flexibilities on the power and reserve energy markets.

Why electro-mobility needs Demand Response

Electro-mobility is making considerable headway. The German government would like to see 1 million electric vehicles on the road by 2020 and these would need to be intelligently integrated into the power system. The Entelios solution supports the integration of these decentralized storage units into a virtual power system in an environmentally friendly way. Batteries are charged when more renewable energy is available, and energy can be taken from flexible batteries whenever the power system needs more.

Benefit for the environment and for the wallet.

Demand Response is an extremely capital-efficient and environmentally friendly infrastructure measure. As power supply is balanced with power demand, the efficiency of the overall power system increases. Until now this task has been performed by conventional, fossil power plants. But this will happen less and less. Demand Response is faster and more cost-efficient, than conventional alternatives because existing scalable technologies are being used: telecommunications, cellular telephony, software, and the Internet.

Entelios' technology and service ...

- accelerates the integration of renewable energy sources into the power system
- makes the power system more efficient
- ensures a high level of security of supply
- integrates electro-mobility into the power system
- reduces CO2 emissions

Entelios is contributing to a new and sustainable energy system.