

LEADING SMART METERING EXPERTISE

MANAGE ENERGY BETTER

Landis
Gyr⁺

manage energy better

Copyright © Landis+Gyr Oy ja Serus Media Oy

Under Copyright Law, without the permission of Landis+Gyr Oy and Serus Media Oy, it is forbidden to copy the text and images in this publication by printing, duplicating, scanning or by other means. The content of the publication has been carefully reviewed. Despite this, errors are always possible. Landis+Gyr Oy and Serus Media Oy shall not be liable for any direct or indirect damage that any errors may cause to consumers, organizations or third parties.



PERSONAL BOOK
WWW.PERSONALBOOK.FI

xxxx a en

LEADING SMART METERING EXPERTISE

MANAGE ENERGY BETTER



Energy industry on the crest of change

Energy industry in Finland and EU is facing a revolution. Thanks to the impact of legislation passed in 2009, 80% of Finnish electricity users will be transferred to smart metering by 2014. Landis+Gyr plays a significant role in this change: our smart metering solution measures electricity in every three homes in Finland. Of more than one million Landis+Gyr metering points in Finland, the majority is also managed in our smart metering service - we provide the utilities with solutions for their day-to-day smart metering operations and maintenance.



Smart metering revolutionizes energy industry

Landis+Gyr works actively to develop smart metering technology around the world. Finland is a pioneer in the field and is amongst the first European markets in which the full benefit of smart metering will be realized. Finland's legislation is based on the European Union's 20-20-20 goal, which aims to raise energy efficiency by 20%, decrease greenhouse gas emissions by 20 % and increase the use of renewable energy by 20% by the year 2020.

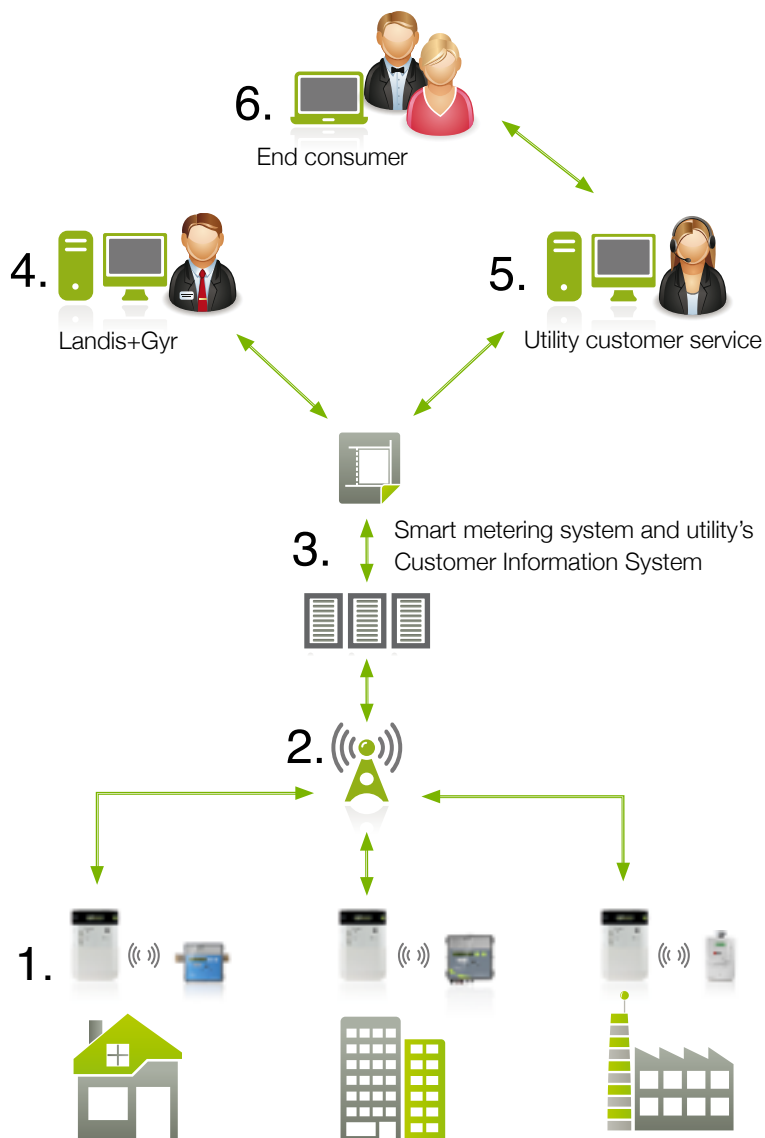
"This change places Finland amongst the world's most developed nations in terms of the uptake of smart metering and load management technologies for electricity distribution networks. The reform will bring long-term benefits and cost savings for electricity producers and consumers alike."

Mauri Pekkarinen, Minister of Economic Affairs, February 5, 2009

Smart energy meters measure consumption on an hourly basis. The data is transferred to the smart metering system and onwards to the utility business systems via communication networks. The meter also provides comprehensive information about the power quality and power outages and enables alarms and system status information for the operator. With smart metering technology, energy consumption is now measured 8760 times per year, whereas manual readings were previously only taken once per year.

The smart energy meters communicate with the smart metering system in two-way mode. The meters gather the hourly information and deliver it to the system, where it can be further processed and transferred to various utility business systems. Information can be quickly acquired on consumption and on the status of the distribution network. Two-way communication enables remote controls: power supply can be managed remotely, as well as selected individual loads in the household. The meter settings and software can also be updated remotely.





How smart metering works

1. Smart meters in residential and commercial/industrial sites measure the energy consumption and power quality of electricity in an hourly basis. Also district heat, gas and water can be measured.
2. The data is transferred via a smart meter to the smart metering system through Power Line Carrier or telecommunications network. In multienergy metering wired or wireless M-Bus is used for the communication between the meters.
3. The Landis+Gyr smart metering system collects and manages the metering data and delivers it once every day to the utility's customer information system.
4. Landis+Gyr can provide the operation and maintenance of the smart metering system as service. Some utilities operate and maintain the system themselves.
5. The metering data is utilised in billing and customer service. Utilities also receive information about the status of the electricity network and power quality reports that help to locate powercuts and identify disturbances and to plan investments.
6. The customer receives bills based on actual energy consumption data from the energy company. Real-time data is also available for the customer service personnel which improves service e.g. in removal situations. Customers can monitor their own consumption through web-service or Landis+Gyr's In Home Display ecoMeter.

THE BENEFITS OF SMART METERING

Benefits for consumers:

- + Transparent, accurate invoicing based on actual consumption
- + No need for annual reporting of the meter reading figures to the energy provider
- + Better customer service, more tailored electricity contracts
- + Energy management tools for keeping track of your own consumption
- + Increased awareness of one's own consumption habits
- + Easier to make changes to your own consumption patterns
- + Shorter power cuts, improved quality of energy distribution

Benefits for utility companies:

- + Up-to-date information on consumption and the network status
- + Efficient, automated processes for billing
- + Better customer service and extended range of products and services
- + Ability to react quickly to problems in the network
- + Optimized network usage, reliable energy distribution
- + More efficient planning for network maintenance and investments
- + Fewer site visits to the meters

Benefits for the environment:

- + Energy savings of up to 10% in consumer energy usage
- + Reduced overall energy consumption
- + The small power plants of the future will increase the amount of renewable energy
- + Less need for peak-load back-up generation which use fossil fuels
- + More efficient usage of materials in the network construction
- + Reductions in the utility company's vehicle emissions

Accurate energy bills

Smart metering enables utilities to switch to consumption-based invoicing, so the consumer only needs to pay for the energy consumed during the billing period. Estimated invoices and balancing invoices will become things of the past. Hourly consumption data is automatically transferred by the meter to the utility's billing system and the consumer no longer needs to report meter readings manually.

"Our customers have become more interested in rationalizing their use of electricity since we switched to consumption-based invoicing." Antti Latsa, Customer Service Manager, Järvi-Suomen Energia

The automated meter reading process means that the utility can cut down on time-consuming manual work. The system can send consumption data according to a schedule or on-demand, and meter readings can be reliably obtained from all metering points. The metering data is validated in the smart metering system. This assures the accuracy and quality of the data. In the event of missing values from a metering point, the system automatically re-reads the meter. The system can also help the utility to keep control

of its accounts receivable, as the remote link enables the company to disconnect electricity supply when needed.

Smart metering creates added value for the distribution company's balance settlement processes. Precise consumption and sales information can be calculated per sales companies and further delivered in the required format. The smart metering system enables calculations and transferral processes to be automated, without requiring any additional systems or licenses.



Prompt customer service

Smart metering speeds up customer service in utilities. Advanced smart metering system applications provide customer service personnel an access to view real-time electricity consumption data along with information on power quality and interruptions for a single metering point, and graphs can be compared for different time periods. Precise information on power cuts can increase the efficiency of processes such as automatic reimbursement for power failure.

Smart metering is changing the nature of customer service. Exact consumption data can be used to explain invoices and the reasoning for the expenses to customers. This enables customer service personnel to focus on analyzing the customer's consumption and providing tailored energy advice. Information on consumption and the power quality can also be delivered to the customer.

Smart metering enables utility companies to offer their customers a wider range of tariffs. When the consumption profile is known, it becomes easier to identify the most suitable energy product for the customer. Scheduled remote relay controls enable certain energy loads to be switched off for a defined period of time. The system supports also dynamic load management, which enables the development of consumer products based e.g. on the market price of electricity. The system can receive pricing information based on the market and manage the household's electricity loads in accordance with the market price and the overall demand for electricity.



Effective contract management

Smart metering makes energy contract management more efficient for utilities and end consumers. It is easy to change from one energy product to another with the same provider because tariff changes can be made remotely. When customers move to a new address, it is not necessary for the utility company to send a representative: meter can be read by the customer service personnel immediately or they can schedule the reading to a defined point in time. The electricity supply can be switched off as soon as a customer's contract expires, and switched back on when the next resident's contract comes into effect. Landis+Gyr's technology ensures that the electricity supply can be safely switched on, helping to avoid damage to appliances that have been left connected to the mains and turned on. Remote disconnections also help to prevent people from using electricity without a valid contract.

The change will bring great benefit to utility companies' daily work: the rush of requests that usually coincides with the turn of the month, when customers move house, can be handled over the phone. The utility company will no longer need to send a representative to take meter readings on-site, nor will customers need to worry about reading the meter when they are busy moving to a new house.



Consumer tools for energy management

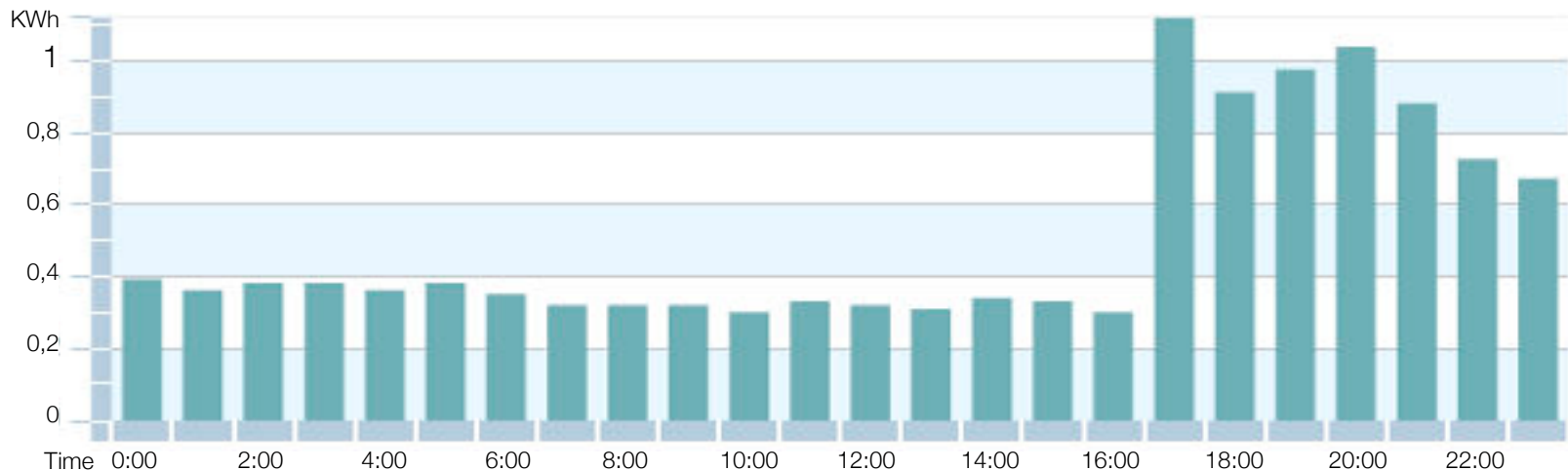
Smart metering will enable the development of various tools to help consumers to manage their energy usage. The availability of up-to-date consumption data via internet services or in home energy displays better enables consumers to make changes to their consumption patterns and, ultimately, to their energy bills and carbon footprints.

Landis+Gyr's system enables consumption data to be seamlessly transferred to a database which can be accessed using a web browser. This enables consumers to use online services to track their energy usage across various time periods and even to compare themselves with other similar energy users. By monitoring consumption, consumers can detect problems such as malfunctioning electrical devices or electricity loads that have remained switched on. Web-based services also enable consumers to remotely track energy consumption at other locations, such as their holiday home. Although the holiday home may be far away, it is still possible to monitor energy consumption, whenever or wherever necessary, enabling

consumers to detect if appliances have broken or even if the building is being used without permission.

Landis+Gyr's smart metering system supports the ecoMeter household display, which gives consumers easy access to information about their electricity consumption. The ecoMeter displays up-to-the-minute information about the household's energy consumption using a traffic-light system, as well as displaying consumption in terms of kilowatt-hours or euros. It is also possible to compare consumption with previous readings.

"Trying to save energy without access to detailed information on energy consumption is just as hopeless as trying to abide by the speed limit without a speedometer." John Harris, Vice President and Head of Regulatory Affairs, Landis+Gyr



Reliability for network management

Exact information on the network status. Smart meters produce real-time data on the status of low-voltage networks and the quality of the electricity supply. In addition to consumption data, the meters provide information about power cuts, under- and overvoltage in the network and ground faults. Problems can be traced to a region or even to a specific metering point. The system can also provide alarms on specified events. This makes it possible to react rapidly to network faults and problems with transmission.

Smart metering increases the dependability of the network and ensures the reliable transmission of electricity. Reacting rapidly to problems in the network minimizes power cuts and also enables utility companies to fine-tune the voltage at individual measurement sites. In this way, blown fuses and flickering lights can be avoided. If necessitated by a major problem such as a ground fault, a customer's house or apartment can be disconnected from the electrical network.

Effectively targeted investments. Real-time information helps transmission companies to plan and target investments in their networks. Substation monitoring provides information about the load on individual substations, which can be used to define the capacity and dimensions of the network. This enables local demand on the network to be taken into consideration, and investment can be channeled using real-time data towards the areas that require development. The correct dimensioning of the network enables the electrical load to be optimized. This ensures the quality of the electricity provided to consumers. Optimizing the voltage of the network also reduces energy losses.

Precise data on consumption patterns will make future energy consumption demands easier to predict. With the help of long-term consumption data and trends for various geographical areas, advance plans can be made for electricity production, load management and network needs.



Smart solutions for load management. The smart metering system enables electrical loads to be managed remotely using relays. Relays enable electricity usage to be shifted automatically from times of high consumption to those hours when demand is low, typically following the tariff structure. Such usage includes e.g. household underfloor heating and water boilers, as well as street lighting.

Using the smart metering system, load controls can be realized according to a schedule or whenever necessary. Load management can be targeted at an individual measurement site, a defined group of measurement sites, or a wider area. Network loads can also be managed using tariff models which shift consumption away from times of peak demand. Relays support tariffs by making it possible to shut certain electrical loads off from a site for a defined period of time, subject to the customer's agreement. The meter can easily be updated using a remote link to use the tariff chosen by the customer.

Load management enables transmission companies to even out peaks in consumption and to balance loads on the network. This helps to extend the useful life of the network and ensures the reliable transmission of electricity. At the same time, remote metering enables electricity producers to better manage their production capacity, reducing the need for back-up power generation during times of peak consumption.



A nighttime photograph of a city waterfront. On the left, a row of trees is illuminated with red lights, and a building with a flag is visible. The water in the center reflects the lights from the buildings and trees. On the right, a large white boat is docked, and other smaller boats are visible in the distance. The sky is dark, and the overall scene is lit with warm, yellow and red lights.

MULTI-ENERGY METERING

Landis+Gyr's smart metering technology can be used to measure the consumption of many forms of energy, enabling also district heating, gas and water readings to be taken remotely. In this way, all utility companies can benefit from smart metering. Timely, up-to-date information on the consumption of various forms of energy helps to form a better overall picture of energy consumption. This is an important step towards comprehensive energy efficiency.

Smart metering for district heating and gas

District heating and natural gas providers can also take advantage of smart metering based on hourly readings. Many district heating and gas providers are in the process of switching to smart metering, even though they are not currently obliged to do so by legislation. They are aiming to bring the same benefits to their own energy sectors that smart metering has brought to the electricity sector.

Transferring from traditional annual meter-reading to billing which is based on actual consumption figures has already improved processes in district heating companies and gas companies. Real-time information on the status of the network and the locations of faults accelerates reaction times when problems occur in distribution networks, which can help providers to minimize service interruptions. Significantly more information about the load on the network is available than previously, which makes it possible to optimize network usage. Up-to-date information enables production and capacity management to be made more efficient. For example, district heating providers can optimize pump management, better forecast the need for

power, and predict power changes which may cause the heating supply to be interrupted.

Smart metering enables district heating and gas providers to offer new tariffs and services. Web-based energy management tools and household energy displays provide consumers with a way of understanding their own energy usage and also of making changes to their consumption patterns. For example, by carefully examining their consumption patterns, district heating users may be able to detect faults in individual heat pumps.

“Improving the efficiency of energy use in the gas sector is an important way of reducing overall energy consumption, even though legislation does not require us to make any changes.”
Ari Suomilammi, Director, Gasum Paikallisjarkelu



Smart water metering

Reducing water consumption can be an important way to save natural resources and improve energy efficiency. In Finland, the first steps have been taken towards raising awareness of water consumption: a law requiring household-specific water measurement came into force at the start of 2011. Technology already exists which will allow the efficient management of water reserves to be taken to the next stage of development. Our remote metering technology also enables smart water metering and the first pilot projects are beginning, which will allow remote water metering.

Smart water metering can help to raise consumers' awareness of their own consumption patterns and better enable them to make changes to their routines. Consumption-based billing, online tools and energy displays enable consumers to examine their water consumption in depth. By keeping track of their consumption profiles, consumers may be able to detect faulty water fittings or piping: continuous water consumption is a sign that there is a leak. Making changes to water consumption patterns can help to reduce overall energy consumption, as less energy is required for heating water.

By introducing smart metering on water distribution networks, water companies gain access to effective tools for managing their water networks. When junctions in the network are fitted with smart meters, leaks and problems in the network can be quickly located and repaired. Furthermore, overhauls and maintenance work can be more accurately targetted. Consumption information on buildings and areas enables networks to better manage their hydraulics and determine the locations of leaking pipes. This helps to minimize the adverse effects of leaking pipes and reduce the chance of pollutants from the soil getting into pipes. Smart metering helps to ensure the reliable distribution of water and the efficient use of capacity. Furthermore, water companies are able to use up-to-date consumption information to provide better customer service, as well as new products and services.





AN ENERGY EFFICIENT FUTURE

As the awareness on consumption grows, individual consumers can assume a greater role in promoting energy efficiency. By making the right choices, consumers can reduce their overall energy consumption. Utilities can also offer their customers tailored products and new services for purposes such as automated load controls. The smart grid of the future will enable consumers' own small-scale renewable energy production to contribute to the wider energy production environment.

A cleaner environment

The objectives of legislation on smart metering are to improve the efficiency of energy consumption and rein in climate change. Thanks to the volume of information produced by smart meters, these objectives are within reach.

Smart metering enables the use of new energy management tools which provide consumers with accurate consumption data and help to raise awareness of the effect of energy use on consumers' bills and on the environment. The availability of up-to-date information on consumption makes it easier for consumers to make changes to their consumption patterns and to their carbon footprints. According to a report by the European Commission, the smart meters that have so far been installed have helped consumers to make energy savings of approximately 10%. By making the most of information and communication technology, a saving of up to 40% could be achieved.

Energy companies can also have an effect on the environment through their own operations. By offering more versatile tariffs and by using load management techniques, energy producers can even out peaks in electricity consumption, during which they would otherwise be forced to rely on imported electricity and energy produced by burning fossil fuels. Smart metering facilitates enhanced network management which prevents the network from becoming overloaded and lengthens its useful life. This enables material efficiency and saving costs, while benefitting the environment. Capability to read and control meters remotely reduce carbon dioxide emissions, as utilities' use of vehicles decreases substantially: Finnish utilities take tens of thousands of on-site meter readings - both for regular billing and when customers move house - every year.

Energy efficiency increases as remote reading is taken into use for other forms of energy besides electricity. For example, smart metering of water can produce significant energy savings. The smooth management of the water network's hydraulics can help to balance out energy consumption, as the amount of energy needed to pump water throughout the production and distribution processes decreases. This also enables a reduction in the amount of chemical additive needed to treat waste water. Regulating the consumption of hot water affects overall energy consumption: up to 30% of the heating energy consumed every year goes towards heating water.

"Human activities attributed to the energy sector cause as much as 78% of greenhouse gas emissions." European Parliament and Council directive 2006/32/EC



Smart grids, smart communities

According to forecasts made by the European Commission, demand for electricity will increase by 38 per cent by 2030. A good balance between the demand for and supply of energy is a significant factor in the reduction of energy consumption and it contributes to the good functioning of society. In order to succeed, it will require new tools. Smart metering technology is the foundation for the smart networks of the future.

One important factor for balancing supply and demand is that demand becomes more flexible, meaning that consumers schedule their consumption to coincide with periods of lower overall demand. This can be facilitated using energy management tools for consumers and flexible pricing models. For example, in-home displays can be used to send information to consumers about consumption peaks, the time periods when electricity is at its most expensive, and interruptions in the service. Increasing home automation has a crucial role to play in the future of energy usage. When energy users receive accurate information about consumption peaks and periods when electricity is at its most expensive, they can control automated systems in their homes using mobile devices or laptop computers.

The energy production environment of the future will be spread across an increasing number of smaller sites and the proportion of energy coming from renewable sources will increase. Business, industry and individual consumers can have their own small-scale energy production facilities which will be connected to the wider energy production environment. Excess energy generated by a small wind turbine or solar panels can be stored or fed back into the grid for sale. This depends on developments in battery technology. As electric cars become more widespread, they will also have a role to play in the development of the smart grid. Flexible methods for recharging electric cars are needed, and it should be possible to make use of the energy stored in the batteries when the cars are not in use.

There are a number of advanced projects currently underway in Finland which aim to develop smart infrastructure. In Hiukkavaara, Oulu and Kalasatama, Helsinki, new residential areas are being created in which energy efficiency is a fundamental factor. Experts from a wide range of fields are involved in the projects, which have featured an increasing number of electric cars, energy-efficient building techniques and the smart metering of various forms of energy.





Landis+Gyr

Landis+Gyr designs and produces smart metering solutions and smart energy devices for electricity, district heating, gas and water utilities. We also provide operating and maintenance of smart metering as a comprehensive service.

Our Finnish offices are in Vantaa and Jyväskylä, where our European smart metering technology center for software is located. In Finland, our company has been operating under the name Landis+Gyr since 2008, when its operations were merged with Enermet Oy. In 2011, Toshiba bought Landis+Gyr to reinforce the scope of Toshiba's Smart Grid and Smart Community businesses. Landis+Gyr is an independent subsidiary of Toshiba.

Landis+Gyr in figures:

- + 5000 employees around the world
- + 150 employees in Jyväskylä
- + 25 years' experience with smart measurement solutions
- + 1000 AMM systems delivered
- + 300 million energy meters manufactured
- + 65 years' experience of direct load management
- + 15 million measurement sites under management via long-term service agreements

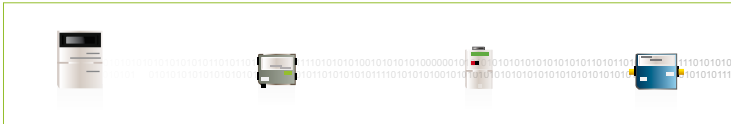
Our offering

Landis+Gyr provides the industry's widest range of products and services for utility companies, including smart metering devices and systems, as well as energy management tools for consumers. Our product and service offering covers the entire lifecycle of a smart metering system, from planning to meter reading services.

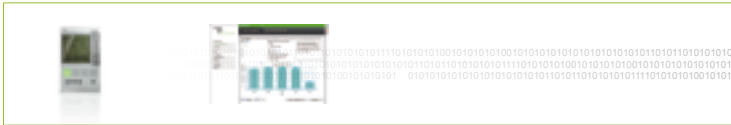
Smart metering software, communications and integrations to utility IT systems



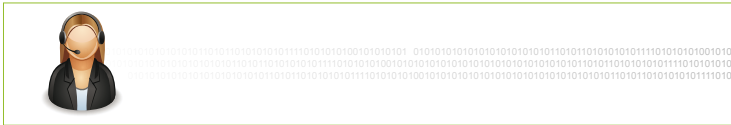
Smart metering devices: electricity, district heat, gas and water meters



Consumer tools for energy management: In Home Displays and online services



Services: expert services, deployment and project management, system operation and maintenance



Landis+Gyr Values

CUSTOMER FOCUS	We are committed to quality and we use our extensive experience to address our customers' needs.
TRUSTED PARTNER	We aim to be a dependable, long-term partner for our customers.
INNOVATIVE SPIRIT	Innovation can be seen across all of our operations - from product development to sales and management.
COMMITTED TO QUALITY	Our products and services have been built around our staff's commitment to quality in every detail, for the entire lifecycle.

A trusted partner

Several Finnish energy companies have chosen Landis+Gyr as their partner to deliver smart metering technology. One in every three households in Finland is home to a Landis+Gyr smart meter. In Europe, we are involved in smart metering projects with major energy companies such as British Gas, ErDF and Iberdrola.

"Using real-time consumption data we are able to further improve the quality of our customer service and provide our customers with tools for making their energy use more efficient."

Arto Pajunen, CEO, Järvi-Suomen Energia

"Landis+Gyr's smart metering solution also provides tools for managing the network and planning investments. We believe that our investment will continue to pay off long into the future and will also enable new energy products."

Kari Väänänen, CEO, Kuopion Energia

"The information produced by the smart metering system raises our customers' awareness of energy. We are also able to make use of the data to improve our internal processes."

Olli Lindstam, District Heating Manager, Lahti Energia

"These energy management tools also have social significance: we can promote a reduction in overall energy consumption and work towards the energy efficiency targets set for Finnish consumers."

Antti Timonen, CEO, Oulun Energia Siirto ja Jakelu

"Smart metering is an important factor in the development of a smart grid. Our technical solutions are well prepared for this forthcoming development."

Risto Harjanne, CEO, Helen Sähköverkko

Landis+Gyr's «update» newsletter puts the most recent developments in smart metering at your fingertips. Subscribe to «update» on our website: <http://www.landisgyr.com/fi/fi/pub/newsletter/subscribe.cfm>.

You can also upload the link with QR-code.

