



**The Fair Meter Initiative**  
**Circularity Innovations**  
**in Smart Meters**

# How to improve circularity of smart meters?

**Author:**  
**Joe Andrews**  
**Senior Product Manager, Landis+Gyr**



## Contributing to sustainability

Activities devoted to creating a sustainable future take numerous forms all around the globe and within all industries. The energy and electronics industries are also attempting to solve the critical challenges of energy consumption, material utilization, e-waste, suppliers' sourcing and labor conditions. The Fair Meter Initiative introduced in the Netherlands, supports this goal by creating a framework with standards describing socially responsible work practices in addition to researching, developing and producing a fair smart meter.

*Solving the challenges of materials, labor conditions, energy and toxicity are key goals.*

As a vendor for smart energy solutions, the major contribution of Landis+Gyr towards a more sustainable world originates from the technologies and solutions provided. Smart meters enable considerable energy efficiency gains and the integration of renewable resources from decentralized generation into the energy network. This in turn, makes it possible for utility organizations and end-users to substantially reduce their CO<sub>2</sub> emissions.

Landis+Gyr has been continuously committed to strengthening its corporate social responsibility, with customers and partners as well as internally and throughout society. For decades, the company has undertaken major efforts to meet the highest standards in environmental awareness as well as in business ethics concerning all of its corporate activities and along the entire value chain. With its commitment to the Fair Meter Initiative, Landis+Gyr even further focuses on how its smart energy technology is being produced.

*Smart meters enable considerable energy efficiency and the integration of renewable resources from decentralized energy generation into the energy network, resulting in substantially reduced CO<sub>2</sub> emissions.*

## The Fair Meter Initiative

A consortium of four network companies signed a “Fair Meter Green Deal” with the Dutch government in 2013 to investigate the possibility to develop a Fair Meter together with the meter suppliers. Participants in the consortium include Liander, Stedin, Delta and Westland Infra, managing electricity and gas supply for about 65% of households in the Netherlands.

Following the Green Deal, the Fair Meter requirement was integrated to the tender process of the consortium. As a smart meter vendor in Liander and Stedin’s AMI project, Landis+Gyr joined the initiative in 2015 by signing the smart meter delivery contract. As part of its commitment, Landis+Gyr agreed to develop its operations and products according to the fair meter principles.

In order to define what exactly was fair in regards to a smart meter, the consortium created a Fair Performance Ladder. The ladder distinguished between the production process and the actual product’s lifecycle, and considered the critical responsibility and sustainability challenges. These were categorized as labor conditions, conflict minerals, scarcity and waste. Some specific issues were CO<sub>2</sub> neutrality, circularity, no conflict metals or raw materials, good working conditions and no hazardous substances. Overarching themes were transparency throughout the supply chain as well as software and data, including the security and privacy of it.

### WHAT IS A FAIR SMART METER?

*Stedin & Liander*

- It is produced using circular materials and labor processes which are fair
- Minimal energy consumption
- Contains no hazardous materials and conflict minerals
- Complies with the Fair Performance Ladder of Stedin & Liander

**The Fair Meter Initiative:**  
**Circularity Innovations in Smart Meters**

Energy & Emissions	...over the entire supply chain
Fair materials	...avoidance of conflict minerals
Labor	...managing an ethical and responsible supply chain
Transparency	...ability to disclose and deliver transparency
Energy use	...of the meter itself in use
Resources / Raw materials	...avoiding the use of hazardous substances and materials
Software & Data	...demonstration of data protection and protection of privacy

Process

Product

*A Fair Performance Ladder was created by the consortium to define exactly what is fair regarding smart meters and their production process and the product lifecycle.*

Using the Fair Performance Ladder to select a supplier ensured that the chosen supplier's production process and products were fair, in addition to the actual procurement process. The ladder was used to measure and track improvements and even compare and rank suppliers. Suppliers were required to conform to stringent fair performance ladder factors. As a supplier, Landis+Gyr was more than happy to follow these guidelines for its own improvement as well as a sustainable energy future.



The Fair Meter Initiative:  
Circularity Innovations in Smart Meters

# The Fair Meter Pilot Project focus: Circularity

Landis+Gyr's commitment to the Fair Meter Initiative included a pilot project to develop the circularity in smart meters as well as being dedicated to improving its operations and product according to the Fair Performance Ladder and regularly reporting the progress.

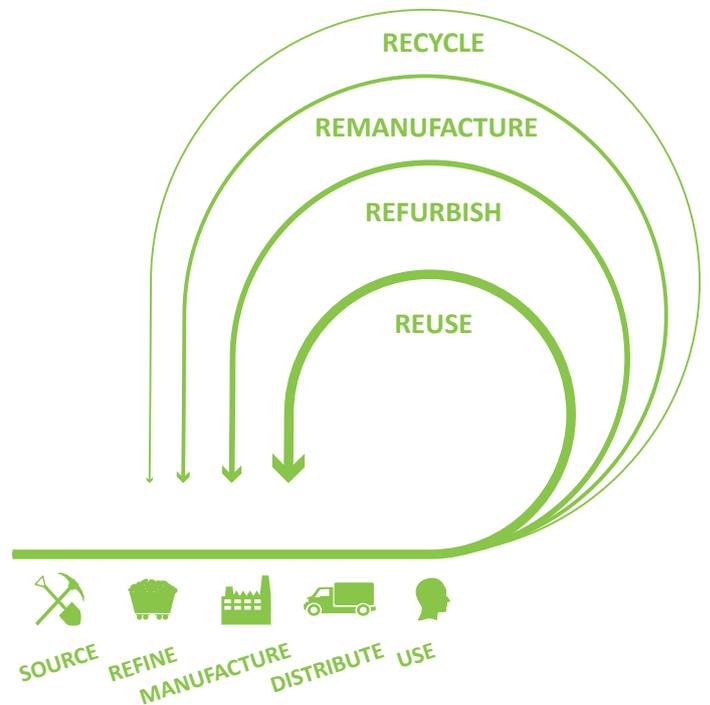
The principle objective of the Fair Meter Pilot was to pursue a process of analysis and experimentation to identify "fair" smart meter characteristics. These characteristics would then be translated to next generation meters and their production, operation and use, as well as the recycling processes associated with smart meters. With a particular emphasis on circularity, the primary focus was the use of resources and raw materials in the lifecycle of a smart meter.

Circularity focuses on attempting to circulate the resources of both raw and used materials to reduce waste by reusing, refurbishing, remanufacturing and recycling. Thus, the value once created from raw materials and resources is preserved at the highest level. In general, the target is also to use less materials.

In the pilot project, Landis+Gyr's team concentrated on the "cradle-to-cradle" perspective, which means considering circularity from the very beginning of the product lifecycle of procurement to the very end of recycling and reusing parts.

*Circularity = circulating both raw and used material resources to reduce waste by reusing, refurbishing, remanufacturing and recycling.*

The pilot project was carried out in close collaboration with Liander and Stedin, and among the various departments within Landis+Gyr. With the goal of focusing more on a circular economy, a circular business model and a circular value chain, the team also joined CIRCO (with the organisations, Circle Economy,



ClickNL | Design, Reversed Concepts and Nuovalente) in facilitated seminars and workshops in order to stimulate new ways of thinking and problem solving, moving the thought process towards a more circular economy.

The fair performance ladder provided the foundation for analyzing the entire supply and service chain and to determine areas for development. The aim was to gain insight into the processes, form hypotheses, conduct tests, gather data and draw conclusions that would lead to actions for circularity development and improvement.

*The E360 smart electricity meter includes the new and improved circularity design features.*

During the project, Landis+Gyr decided to agilely pioneer the design features that were identified as improving fair meter circularity in its new fair meter, the E360 smart electricity meter.

## Benchmarking and baseline

At the beginning of the pilot project, Landis+Gyr benchmarked and subsequently created a baseline utilizing the existing SMR 5.0 electricity meter for the Dutch market with a 20-year technical lifetime. The goals of this in-depth benchmarking were to produce a baseline against which to measure the outcome of the pilot. Each part and component of the SMR 5.0 meter were gathered and catalogued, including a drawing, description, part number, material and weight. Hundreds of materials were analyzed and monitored, including plastic parts, metal parts and electronic parts. The use of conflict minerals (minerals extracted in a conflict zone) was also analyzed, as well as the use of recycled and reusable content. The benchmarking also covered the meter's "self-consumption" energy usage.

As the result of the benchmarking, a baseline for 1 and 3 phase SMR 5.0 electricity meters was created, including Energy and Resource Usage, Bill of Materials and Circularity.

The Energy and Resource Usage category included metrics like CO<sub>2</sub>e(kg/unit) of production, renewable energy and chemical usage in production, and the value of each. The Bill of Materials included a comprehensive listing of materials and their concentration (g/unit). For Circularity, metrics consisting of recycled material % (excluding and including packaging), reusable material % (after a 20-year lifecycle) and recyclable material % (represented in percentages).

### BENCHMARK & BASELINE IN BRIEF:

- Over 30 pages of detailed product and process disclosure
- Full material declaration down to <1 mg / 0,00005% material concentration
- >245 different materials, compounds and substances identified
- Energy and resource footprint per unit and for total contract volume

## Setting priority for action

After the baselines were determined, Landis+Gyr concentrated on conducting feasibility studies and analyzing the characteristics of a fair meter focusing on circularity and reducing the embodied carbon value. The pilot focused on specific materials and components which were selected based on the following criteria:

- use of Critical and Scarce materials as defined by the EU (*European Commission List of Critical Raw Materials*)
- materials at highest risk of utilizing conflict minerals
- highest values for embodied carbon

The goal was to reduce, avoid or exchange the material whenever and wherever possible in order to create a new and improved smart meter design. In addition, it was important to minimize the use of conflict materials and critical and scarce materials, as well as materials with high embodied carbon values. Naturally, compliance with EU directives was not to be compromised; the material properties had to meet the characteristics required and pass the tests defined in the type approval standards.

Another goal of the pilot was to make the end-of-life processing as easy as possible by simplifying the materials (reducing the number of different materials) and the product assembly (avoiding additional screws, glue or other types of fastenings of a different material). The end-of-life recycling process of an electricity meter is operated by a 3rd party and follows a regulated process, including collecting, sorting, crushing, cleaning and drying.

From the point of view of prioritizing reduction of materials with the most intensive embodied carbon value (prioritising by total CO<sub>2</sub>e in tonnes), the “top ten” materials are:

10% Glass Filled Polycarbonate (PC GF10%)

Polycarbonate

Copper

Zinc Plated Steel

Aluminium

Phenol

Cardboard

Nickel

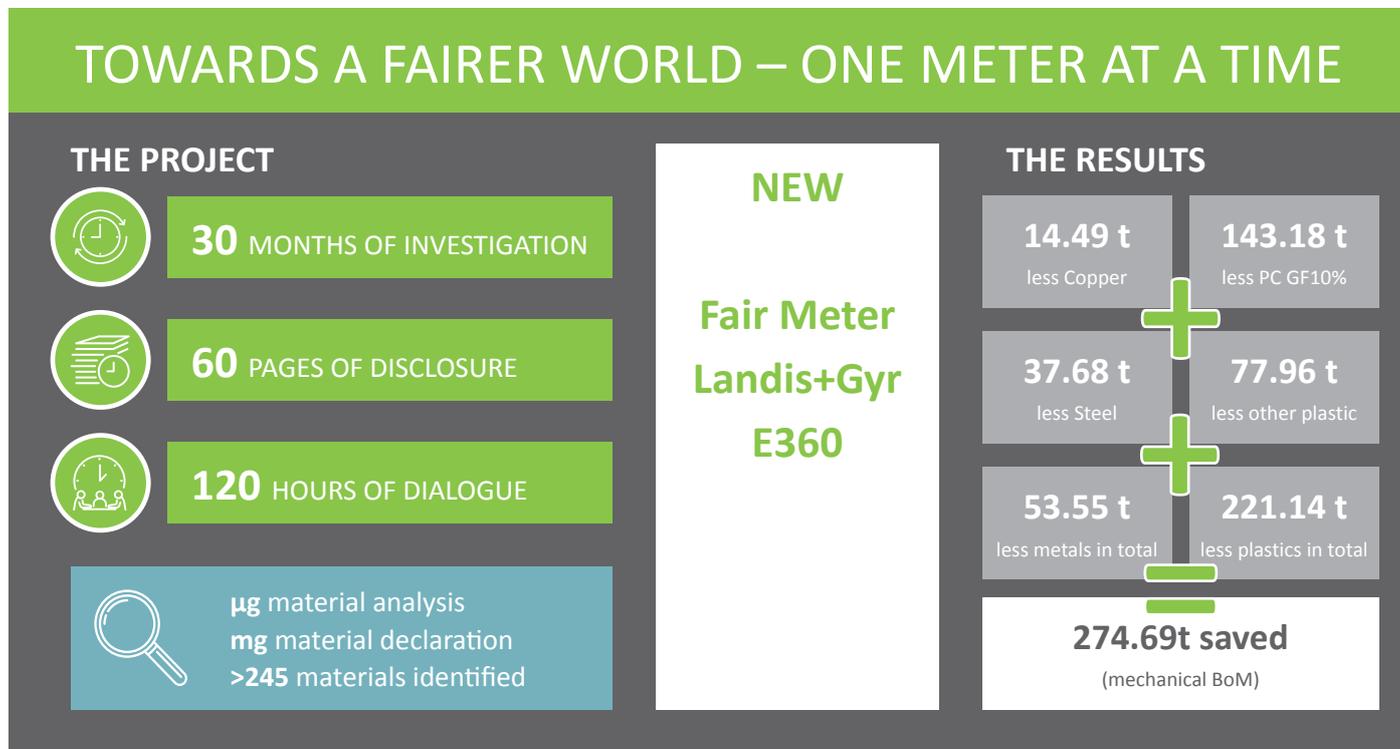
Nylon 66

Tin

### IN THE SCOPE OF THE PILOT, THE FOLLOWING FAIR METER DESIGN REQUIREMENTS WERE DEFINED:

- Reduce material intensity, especially for materials with high embodied carbon cost
- Facilitate optimal material recovery at the end-of-life stage
- Identify components suitable for increased recycled content

# Results



The Fair Meter design was implemented in the development of a completely new smart meter, the E360 smart electricity meter. The new meter was actually developed in parallel with the pilot, and the improved design features were first introduced in the E360 1 phase meter and continued in the development of the 3 phase meter.

*Metals were reduced by 58%, plastics by 33% and the overall mechanical Bill of Material overall by 38%. The total number of different materials was cut in half.*

### Significant improvements in the E360 1 phase meter

In the design of the new 1 phase smart meter for the Dutch market (1PH E360 SMR 5.0 CDMA), the reduction

of the metals sub-total was 10%, the reduction of plastic materials 21% and the reduction in the mechanical BoM overall was 20%. Some materials were eliminated completely. A marked improvement was shown even during this first round.

### Radical innovations in the E360 3 phase meter

During the next development round, the 3 phase E360 meter, metals were reduced by 58%, plastics by 33% and the mechanical BoM by 38% overall. The number of materials was cut in half, from 14 different materials down to 7. One major step which contributed to the reduction in steel usage was the elimination of screws in the assembly process. Not only did it reduce the metal materials, but it made the end-of-life material recovery process much more streamlined.

**The Fair Meter Initiative:**  
**Circularity Innovations in Smart Meters**

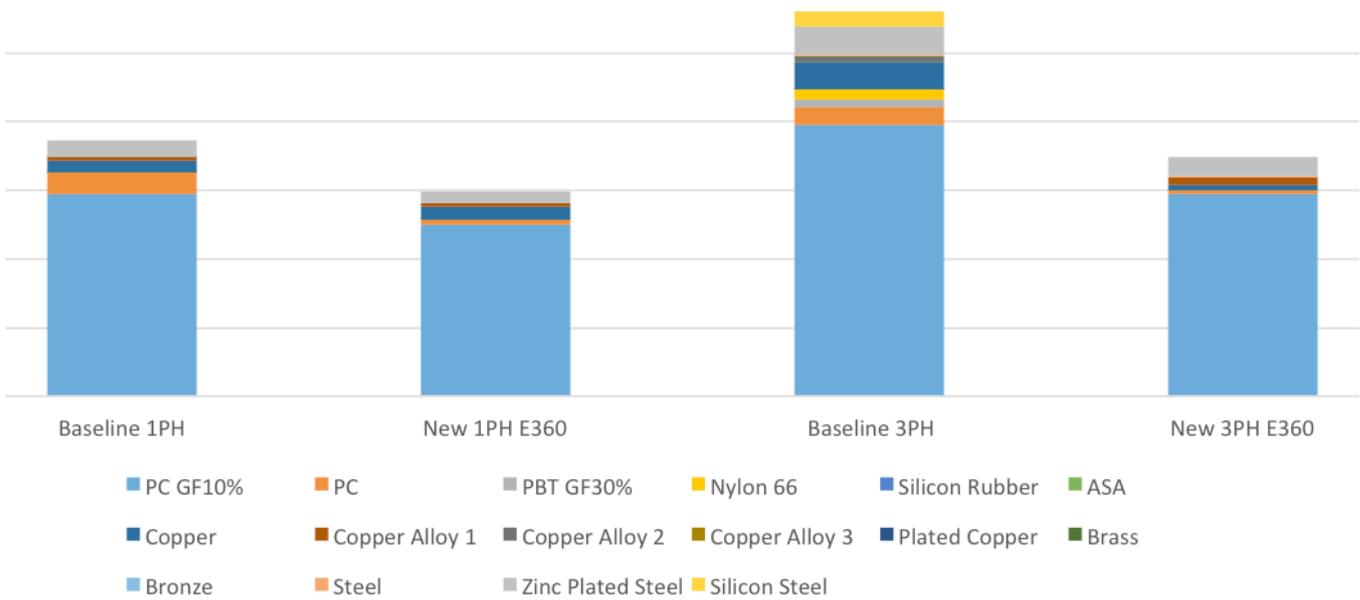


Chart showing the radical reduction in material intensity of the new E360 meter design

Achieving the results in the graphic above was the sum of many individual design steps and principles. For example, a contributing factor to the reduction of plastic materials was the reduction in plastic part thickness, specifically wall thickness, that had to be done in such a way that it did not reduce the integrity or robustness of the wall. Molding tools might be harder to create for these parts, but the result was a reduction in material. Another contribution was a different method of molding which made it possible to combine two previously separate plastic parts into a single molding. Unifying the piece eliminated the need for additional fastening and strengthening features.

Some savings were compound. For example, after assembly screws and nuts were removed from the design, naturally reducing metal content, plastic content was also reduced. This was because no additional plastic was needed to support or give strength to the areas where the screws and nuts would have been located.

*Screws and nuts were completely eliminated, correlating in a reduction of metal and plastic material.*

Simultaneously, there was a direct correlation to the reduction in the electric Bill of Materials. For example, there was a 14% reduction in the number of components in the 1 phase meter, purely because the design was simplified.

*Using the results for the new E360 smart meter*

The Fair Meter Pilot project had overwhelmingly successful results which could be immediately implemented in the new E360 smart electricity meter design. Landis+Gyr quickly integrated the design improvements in order to start providing customers with the most cutting-edge smart meter on the market. The E360 smart meter is robust enough to handle the fully-fledged IoT communication network. E360 fair smart meters are already being delivered and installed in the Netherlands, saving hundreds of tons of raw material in this Dutch project alone. The reduction in use of the PC GF10% plastic type solely represents nearly 1,100 tons of CO2 savings.

The pilot is now finalized and the extremely positive findings encourage Landis+Gyr to continue the work in developing new design features for an “even fairer” meter and thus pursue the company’s vision for a sustainable future.

## About the Author



### *Joe Andrews*

Joe Andrews is a Senior Product Manager at Landis+Gyr and has been with the company for over 15 years. At a portfolio level, he is responsible for DSMR4 and SMR 5.0 electricity meters. Joe Andrews is highly experienced in Product Development and Project Management and has worked on products and projects throughout the EMEA area. He has taken on a second Project Manager role for Landis+Gyr's Fair Meter project because the topic is exciting and engaging. He looks forward to improving sustainability in meter design and production.

## About Landis+Gyr

Landis+Gyr is the leading global provider of integrated energy management solutions for the utility sector. Offering one of the broadest portfolios of products and services to address complex industry challenges, the company delivers comprehensive solutions for the foundation of a smarter grid, including smart metering, distribution network sensing and automation tools,

load control, analytics and energy storage. Landis+Gyr operates in over 30 countries across five continents. With sales of approximately USD 1.7 billion, the company employs c. 6,000 people with the sole mission of helping the world manage energy better. More information is available at [www.landisgyr.eu](http://www.landisgyr.eu).