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The world's thriftiest traffic light

A shake-up in transportation systems: Siemens engineers have managed to reduce the power consumption of a traffic light to just one to two watts. This achievement, made possible with "1-watt technology", has enabled Siemens to revolutionize the market and improve the energy efficiency of standard 230 V LED technology by up to 85 percent, a huge benefit for tight city budgets and for the environment. Equipped with the new technology, a typical intersection with around 55 traffic signals (red - yellow - green) avoids more than 960 kilograms of harmful carbon emissions a year. The first pilot projects are up and running in Bolzano, Italy and in Bietigheim-Bissingen, Southern Germany.

More than 100 years ago - on August 5, 1914 - the first electric traffic light went into operation, a milestone for traffic control. Today, it is hard to imagine a world without the red-yellow-green signals. And the success story of the traffic lights is continuing with "1-watt technology". But how is this huge energy savings possible? The answer is clear: digitalization.

1-watt technology...

- Uses digital LED driver modules. This eliminates the need for load resistors and switching elements in the signal light units, which until now have consumed most of the energy.
- Uses state-of-the-art LEDs with extremely low power consumption while still retaining full light intensity.
- Uses innovative technology to monitor traffic lights and safely prevent undesired simultaneous green signals for cross traffic and other road users with minimal energy consumption.

The traffic light - a small energy wonder

The participants of the 2015 UN Climate Change Conference in Paris resolved to limit global warming to a maximum of two degrees. To reach this goal, highly energy efficient innovations in road traffic are needed. Siemens wants to reduce the energy consumption of the more than 60,000 intersections equipped with traffic lights in Southern Germany. With a low energy consumption of just one to two watts per light signal, about 1,600 kilowatt-hours (kWh) can be saved per year at a typical intersection. By way of comparison: A single-person home consumes just over 1,000 kWh a year.

When conventional LED signal systems are retrofitted with the 1-watt technology, a large city like Berlin can avoid ¹ some 2,000 tons of carbon emissions and save 500,000 euros in energy costs every year. If these efficient traffic lights are not used, a city like Berlin would have to plant around 2,000 deciduous trees every year to compensate for the resulting carbon emissions. The typical life of a traffic light is more than ten years. That means that to offset the harmful emissions of an intersection with conventional lights, a forest of 20,000 trees would have to be planted. In cities that use old light bulbs instead of LEDs, the potential savings for energy costs and emissions are significantly higher. With installed traffic signals with 1-watt technology at an intersection paying for itself in as little as five years.

SIL3 certified: Safety first

Safety is a key issue in road traffic. Traffic lights are the primary safety factor for all road users; they must never give green signals to crossing traffic at the same time. To ensure this doesn't happen, Siemens is the first ever manufacturer to monitor not only voltage and current but, using its own specially-designed photo sensor, also whether the LED signal light units are actually illuminated. With this multi-layered monitoring concept, the 1-watt traffic light achieves the highest level of safety in road traffic (SIL 3), a world first.

Rock-solid – even in the era of fluctuating power networks

Increased feed-in of renewable energy sources has resulted in more frequent fluctuation in the power supply. In old traffic light systems, these voltage and frequency fluctuations were transmitted to the lighting signals, causing lights to fail in the worst case. With the 1-watt technology, the power supply for signal light units is decoupled from the grid. The power supply takes a kind of detour through a special circuit in the traffic light controller located in gray roadside cabinets. This creates a sort of buffer between the grid and the traffic light which can offset enormous fluctuations. The 1-watt technology solution in combination with an optimized heat management system in the LED signal light unit ensures traffic lights that are considerably more rugged and which have substantially higher availability.

A glimpse into the future

In addition to power costs, the 1-watt signal light units also reduce service costs, thanks to digital LED drivers. Optical monitors continuously check the state of the LEDs. It is conceivable that in the future it may be possible to predict when units will fail to enable preventative maintenance of signal light units, thus reducing the risk of chaos caused by a traffic light failure during rush hour.

¹ With 2,100 intersections