

PRESS KIT



Paving the way
to tomorrow's energy

wattwaybycolas.com

Colas has invented the solar road

in partnership with the French National Solar Energy Institute.

Colas, a world leader in transport infrastructure, created a partnership with INES, the French National Solar Energy Institute, to develop Wattway, a photovoltaic road surfacing trafficable for all vehicles. Thanks to this innovation, existing roads can produce electricity, while preserving their capacity to bear vehicle traffic. Wattway is a major groundbreaking technology, an important building block for projects involving smart roads.

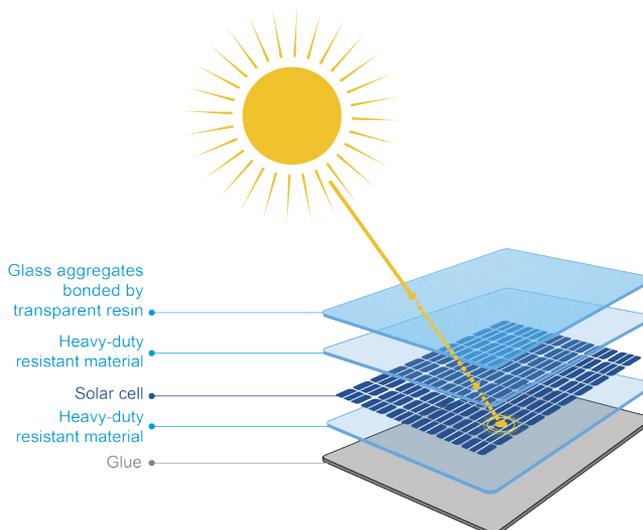
Extra thin and extremely sturdy, Wattway photovoltaic panels provide excellent grip and durable performance. They are directly glued to existing roads, bike paths, parking spaces, etc. without any civil engineering work. This new type of road has been successfully tested in cities, on parking spaces, and on country roads. Today, the electricity it produces can be used to power charging stations for electric vehicles, to improve safety by lighting a semi-pedestrian zone, as well as for self-consumption. To supply an average single home (excluding heating), only 20 m² of Wattway are needed.

Wattway technology

Thanks to groundbreaking solar collectors, the Wattway panels are surprisingly thin (just several millimeters thick). There is no glass, and yet they give off an overall impression of sturdiness. Their size can be adapted to fit any kind of road around the world.

Each panel contains 15-cm wide polycrystalline silicon cells that transform solar energy into electricity. These extremely fragile photovoltaic cells are coated in a multilayer substrate composed of resins and polymers, translucent enough to allow sunlight to pass through, and resistant enough to withstand truck traffic. The surface that is in contact with vehicle tires is treated to ensure skid-resistance equivalent to conventional asphalt mixes.

In this perfectly watertight layer cake, the electrical system is designed to ensure that the entire system does not short circuit if one cell is down.



Responsive industrial organization

Up to June 2016, Wattway panels were supplied by the FabLab at CEA Tech. However, at the end of 2015, Colas had already started out on a new path, with the help of experts from INES. The goal: to identify and select a French company able to meet the challenge of industrial scale production of Wattway photovoltaic panels.

VMH Energies, a single-member company, is a subsidiary of Holding FBJB located in Châtellerault, France. Created

in January 2013, the company manufactures high-performance photovoltaic modules. In June 2018, it acquired SCOP SCNA Solar, based in Tourouvre-au-Perche in Normandy, where Wattway photovoltaic panels have been manufactured since June 2016.

Thanks to a high quality industrial tool and proven expertise in photovoltaics, VMH plants produce some 300,000 m² a year. It remains possible to consider increasing these production figures to meet future needs.



Many applications

The energy transition is under way and self-consumption is becoming an increasingly important part of the French energy landscape. Against this backdrop, Wattway provides a local energy production solution. Many applications can be envisaged to boost energy autonomy and pave the way to the intelligent, environmentally-friendly road of the future.

Today, Wattway's trial sites already supply power to:

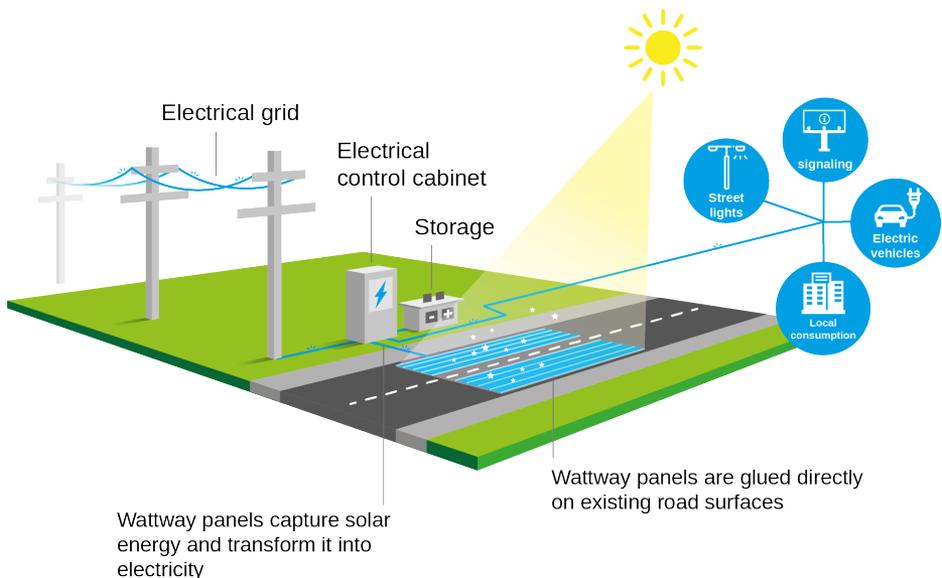
- Charging stations for electric vehicles;
- the electricity network;
- variable message panels;

- buildings;
- public lighting, thanks to a storage system;

without encroaching on available land, and while integrating perfectly into the surrounding environment

Tomorrow, Wattway will pave the way for smart roads by:

- powering of sensors and equipment for autonomous vehicles;
- providing dynamic induction charging of electric vehicles;
- eliminating black ice.



2016-2018 : trial sections in real conditions

In June 2016, Colas unveiled its first trial section. Others have followed both in France and around the world. They are designed to test the different usages of Wattway under normal conditions, responding to specific energy challenges (powering road equipment in urban or rural environments, charging electric vehicles, panels for green buildings) around the world (different levels of solar irradiance, temperatures) with a variety of road conditions (heavy, low traffic).

Wattway is being offered for pilot sites ranging in size from 25 to 100 m² with

public partners (local authorities) and private companies wishing to play a role in fostering the energy transition.

Each site is tracked with in situ IT equipment to monitor photovoltaic energy production across a full range of weather conditions, and to confirm Wattway's ability to withstand all types of traffic. Data is compiled and analyzed by Wattway teams. Their findings are shared with public and private partners.



Wattway trial sites around the world



Vendéspace
Mouilleron-le-Captif, France

50 m² power a charging station for electric vehicles



Lidl supermarket
Moult, France

The electricity produced by the 50 m² is used to provide power to the supermarket.



DIRMED
Septèmes-les-Vallons, France

The electricity produced by the 100 m² is used to provide power to a building housing the DIRMED (Road Directorate for the Mediterranean zone)



The Ray
West Point, Georgia, USA

The electricity produced by the 50 m² is used to provide power to Tourist Bureau of the State of Georgia



Route RD 5
Tourouvre, Normandy, France

The electricity produced by the 2,800 m² is reinjected in the Enedis network.



Private office building
Le Port - Reunion Island, France

25 m² powers an electric vehicle charging station and any surplus help power the building.

Wattway trial sites around the world



SEM Normandie
Epron, France

A 50 m² section powers a display panel
(with battery)



Greater Paris Seine-Ouest
Boulogne-Billancourt, France

The electricity produced by the 100 m² is
used to provide a source of power to the
municipal swimming pool.



Paris La Defense
Courbevoie (92), France

A 54 m² section is used to improve safety
by lighting up a semi-pedestrian zone.

How the innovation came to be

It all started in 2005

At the Colas Campus for Science and Techniques, teams were hard at work imagining how they could broaden the functions of roads, beyond being simple vectors for vehicle traffic. Roads cover tens of millions of kilometers on the surface of the globe. Jean-Luc Gautier, then manager of the Center for Expertise at the Colas Campus for Science and Techniques, began by reflecting on the fact that “roads spend 90% of their time just looking up into the sky. When the sun shines, they are of course exposed to its rays. It’s an ideal surface area for energy applications.”

An intuition, a simple hunch that the engineer confirmed with calculations. It quickly became clear that photovoltaic collectors on the road could be an excellent way to transform solar energy into electricity both in terms of yield as in terms of technical feasibility and economic efficiency. Alone in his garage, Jean-Luc Gautier continued his research. To test the idea,

he bought solar cells and used them to build a solar panel, 40-cm in width, able to supply electricity to some one hundred LEDs. This experiment, which dates back to 2010, immediately showed that photovoltaic collectors had good yield, even when applied flat on the ground.

In the wake of his positive findings, the Campus for Science and Techniques launched an initial series of tests, while identifying the primary technological obstacles:

- How can cars and trucks drive over fragile solar cells?
- How can cars and trucks drive safely over smooth glass?



To respond to these two challenges, Colas formed a project team and proposed a partnership to the French National Solar Energy Institute (INES)

INES is a public research organization near the French Alps in Chambéry, where 250 research specialists from the CEA, CNRS and CSTB and the University of Savoie work together. Franck Barruel, then head of the INES photovoltaic systems laboratory, found Colas' project to be utopian at the best when it was presented to him during the summer of 2011.

Today, he still smiles when he thinks about his initial reaction. *"Trucks driving over solar cells? It's like asking a cracker to hold up under a 10-ton load!"*

Then, he thought about it for a couple of days, and changed his mind. *"With our cutting-edge expertise in the field, it is also our role to support companies as a public research body. So why not have a look at the idea?"* Franck Barruel decided to meet the project team as quickly as possible.

Wattway is unveiled in October 2015

Unveiled in October 2015 at a press conference, Wattway is presented at the COP 21 Global Climate Conference in

Paris the following December, where the innovation won a Climate Solution Award



Colas, a world leader in transport infrastructure

Colas, a subsidiary of the Bouygues Group, is a world leader in the construction and maintenance of transport infrastructure, whose mission is to promote infrastructure solutions for sustainable responsibility.

With locations spanning more than 50 countries on five continents, the Colas Group operates via a decentralized network of 800 construction business units and 2,000 material production units.

The 55,000 employees at Colas undertake 80,000 projects each year. In 2017, the Colas Group posted consolidated revenue at 11.7 billion euros (of which 48% outside of France) with net profit attributable to the Group at 328 million euros



Business

Roads account for 80% of the Group's total business activity:

- the construction and maintenance of roads, highways, runways, ports, industrial platforms, logistics facilities, city streets, urban development, reserved-lane public transport networks (tramways, buses), bike paths, automobile racing circuits, environmental projects (wind parks, retention basins), etc., as well as civil engineering and building in certain regions;
- upstream activities involving the production and recycling of construction materials (aggregates, emulsions and binders, asphalt mixes, ready-mix

concrete, bitumen) used on Group projects or sold to third parties via an international network of 714 quarries and gravel pits, 129 emulsion plants, 553 asphalt plants, 197 concrete plants and one bitumen production plant.

Colas also operates in Specialized activities: Railways (Colas Rail), Waterproofing (Smac), Road Safety and Signaling (Aximum), Networks (Spac), thus enabling the Group to offer a full range of products and services to all its customers – both public and private.

Global network

Founded in 1929, Colas progressively expanded out from its solid business platform in France, moving on to international markets, first in Africa and in the French Caribbean in the 1930s, then North America at the beginning of the 1960s, and over the last 30 years, the Indian Ocean, most of Europe, Asia and Oceania.

In 2017, Colas recorded 52% of its revenue in France, 22% in North America, 17% in Europe, excluding France, and 9% in the Rest of the World.

People at Colas

The Group boasts a total workforce of 55,000 people, 61% in France and 39% outside of France.

The 5 cornerstones of the Group's human resources policy are:

- safety and health (work accident and traffic accident prevention programs),
- recruitment that is open to diversity,

- training (Colas Campus, Colas Universities),
- mobility and internal promotion,
- decentralized management based on respect and trust.

Colas and Innovation

Colas was founded in 1929 to ensure the development of a newly patented technical process called Cold Asphalt. As such, innovation has been at the heart of Colas' strategy from the very start.

The Group's international technical network boasts 2,000 research experts, engineers and technicians, who work in close synergy with operatives in the field.

The network's flagship is its Campus for Science and Techniques, the road industry's premier worldwide private research and development center located near Paris, France, along with some 50 regional laboratories and 100 engineering design offices worldwide.



In line with the Group's strategy, research at Colas focuses on:

- Environmental protection:
 - saving resources (energy, natural materials) by recycling asphalt mix and reducing carbon impact using solutions such as warm mixes. Green Chemistry principles are used to provide techniques that substitute oil-based ingredients with plant-based components or recycled household waste;
 - producing clean, renewable electricity, thanks to Wattway, a photovoltaic road surface that can be applied on existing pavement.
 - improving safety and providing a better share of public space with the dynamic signaling solution Flowell.
- Road surface performance in terms of safety, comfort and noise: heavy-duty skid resistant pavement, retro-reflective road marking paints, aesthetically pleasing light colored binders, noise-reducing mixes;
- Controlling road infrastructure maintenance costs, by proposing durable crack-resistant products and surface dressings that can be used even under heavy traffic;
- Preserving road assets, using imaging based inspection technologies;
- Managing mobility, using sensors that are integrated into the infrastructure.





by



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