

# PLANET

#July 2019



# INNOVATION: from ideas to action

## Forum

Collaborating to bring innovation into business reality

## Frontline

Rookery South: A new model for clean energy

## Outfront

Innovation, a key driver of growth and creativity

## Explainer

VIA by Veolia: Open Innovation, a solutions accelerator

## CONTENTS

# JULY 2019

### 03 THE POST

by Antoine Frérot

### 04 CONTRIBUTORS

Richard Kirkman, Tim Rotheray, Neil Hargreaves, Sylvain Granger

### 06 TRENDS/INSIDE/ DATAVIZ

The news in brief.  
An infographic: Imagine 2050!

### 12 FORUM

Gavin Graveson, Neil Hargreaves and Tim Rotheray  
Collaborating to bring innovation into business reality

### 16 #WEARERESOURCERS

Marine Avisse, Dorothée Lenès

### 22 FRONTLINE

FRANCE Nuclear waste: Veolia and EDF pool their expertise  
UNITED KINGDOM Rookery South: A new model for clean energy  
JAPAN Hamamatsu: Boosting the local social economy

### 34 GALLERY

Christophe Petit-Tesson, "Aglaré" or cutting-edge technology on behalf of heritage

### 42 OUTFRONT

Innovation, a key driver of growth and creativity

### 47 COMMUNITY

Colombia: environmental conservation and retraining go hand in hand in Veolia's "observer" scheme

### 48 EXPLAINER

VIA by Veolia: Open Innovation, a solutions accelerator

### 50 FUTURIST

Air'volution: the compressed-air multiservice vehicle

Cover photo: Shutterstock

# THE POST



Antoine Frérot  
Chairman and CEO  
of Veolia

**April 18** Veolia presents its Purpose to the General Assembly. "Contribute to human progress by firmly committing to the Sustainable Development Goals set by the UN..." This extract from our Group's Purpose states the core meaning behind what we do, in line with the mission Veolia has set itself of resourcing the world. It is both the direction in which the Group is heading and a means to give its actions a firmer long-term foundation. It was drawn up in consultation with our main stakeholders and approved by our Board of Directors, which will take it into account in its decision-making. A stakeholder committee will follow up the fulfilment of Veolia's purpose. Relying on an array of economic, social, societal and environmental indicators, it will draw up a multidimensional performance review of our Group each year and demonstrate its usefulness. This is a critical point, because our company's usefulness is what makes it attractive to clients, creates shareholder loyalty, and fosters employee engagement. It is because Veolia gives their work meaning and they share its values that people get involved.

**June 5** Indoor air quality: a little-known but key issue. When we think of air quality, we usually think of outdoor air. This is an oversight as indoor air is even more polluted than outdoor air and we spend most of our time inside buildings. There are many sources of indoor pollution: paint, wall and floor coverings, household cleaning products, poor ventilation, etc. In France, 60% of houses have deficient air quality. Our Group is now applying its expertise to indoor air quality to improve public health and quality of life, just like it did a century and a half ago for the drinking water supply. To mark World Environment Day

on June 5, Veolia revealed its indoor air quality offering, with a guarantee of results. Today, Veolia is the first global group to offer integrated solutions across the entire indoor air quality chain, from audit and analysis through solutions management to occupant awareness in buildings. In this sector, as in most environmental sectors, nothing is set in stone: effective solutions exist to avoid breathing polluted air!

**June** Veolia is armed and ready to fight single-use plastic pollution. Plastic is everywhere: in products and packaging, of course, but also unfortunately in the environment, where it slowly breaks down and contaminates ecosystems. Living without it is unrealistic, but we can restrict its use to when there is no substitute. Many countries are introducing an increasing number of regulations to tackle single-use plastic. By taking a holistic view of the plastic cycle, we will extend plastic's useful life as a resource and reduce its lifetime as waste. This is what our company is striving to do, making the plastic circular economy one of its priorities. Since 2016, we have increased our plastic processing capacities fivefold and will double them over the next two years. Following on from Europe, Veolia is now reinforcing its plastic recycling facilities in Asian countries such as Korea, Japan, Indonesia, and soon China. At the same time, our company is part of international groups including Our Oceans and the Alliance to End Plastic Waste. It is also establishing a growing number of partnerships with consumer goods giants such as Danone, Unilever, Tetra Pak and Nestlé, as well as petrochemical companies, to improve the management of the plastics sector and increase the share of recycled plastic in industrial processes.

AUGUST 25-30, 2019 - STOCKHOLM, SWEDEN

WORLD WATER WEEK - SIWI

WATER FOR SOCIETY - INCLUDING ALL!

2019'S EVENT IS TAKING AN INCLUSIVE APPROACH: HOW CAN WE PROTECT AND IMPROVE RURAL ECOSYSTEMS AND LIVELIHOODS? HOW DO WE CREATE JOBS FOR YOUNG PEOPLE? HOW CAN WE ENSURE THAT THE POOREST HAVE BETTER ACCESS TO DRINKING WATER AND SANITATION? HOW CAN CIRCULAR ECONOMY SCHEMES CONTRIBUTE TO INCLUSION?



[HTTP://WWW.WORLDWATERWEEK.ORG/TAG/2019/](http://www.worldwaterweek.org/tag/2019/)

## CONTRIBUTORS



**Editor-in-chief**  
**Richard Kirkman**

**External Affairs Director,  
Chief Technology & Innovation Officer,  
Veolia in the United Kingdom & Ireland**

The pressures on businesses and communities today are enormous, both financial, environmental and political. Plus we are experiencing a tumbling convergence of technology, digitization, globalization and climate change, all focusing their effects on the environment with an expectation of immediate solutions. That is the purpose of Veolia, which itself requires a constant and accelerating pattern of change in the way we deliver our answers. This issue of Planet is dedicated to the rich tapestry of interconnected solutions for waste, water, energy and air at the heart of Veolia's innovation universe. For us, innovation is not just a process, neither is it research, technology, ideas or thinking. It is all of these combined to tailor a solution for each of our customers and citizens that facilitates sustainable growth. We are not short of ideas and we are using them today to achieve real results.

### Also in this issue

**Tim Rotheray**  
**Director at The Association  
for Decentralised Energy  
(ADE)**

Tim gained experience in the sustainable energy sector at the National Assembly for Wales before joining ADE as Head of Communications in 2010. He was appointed Director in 2013 and has since been in charge of developing and implementing the organization's strategic vision for the energy system. An ADE Board member, Tim supports the international organizations Euroheat & Power and Cogen Europe in defining European guidelines.



**Neil Hargreaves**  
**Managing Director at  
Knauf Insulation Northern  
Europe (KINE)**

Neil gained experience in auditing and consulting with KPMG. He joined KINE as Finance Director in 2011, before being appointed Managing Director in charge of the United Kingdom and Ireland, Scandinavia, and English-speaking Africa in 2019. The objective is to strengthen KINE's leadership position in the mineral wool insulation sector.

**Sylvain Granger**  
**Deconstruction and Waste  
Projects Department Director  
(EDF)**

Following an initial career as a researcher that earned him the CEA's applied research award for his work on fluid-structure interactions in a nuclear environment, Sylvain Granger has held different posts at EDF. After heading the nuclear fuel division, in 2015 he restructured the "deconstruction and waste management" business line and launched international development with the creation of the Cyclife subsidiary.



**A Veolia publication (30, rue Madeleine-Vionnet – 93300 Aubervilliers – France)**

Publication and Editorial Director: Laurent Obadia. Editorial direction: Clément Barry, Étienne Collomb, Feryel Gadhoum, Caroline Geoffrois. Editor-in-Chief: Richard Kirkman. Image content: Laure Duquesne, Gilles Hureau. With special contributions from: Inès Aloui, Claire Billon-Galland, Caroline Cole, Lidia De-Stefano, Tania Kieffer, Eric Lesueur, Blandine Mann, Kathryn Moore, Amy Morgan, Mathilde Nithart, Sindy Perez Nieto, Romain Prudent, Carole Ribardière, Nicolas Routier, Eliane Teixeira. Copyright: July 2019. ISSN Number: 1761-4996. Veolia photo library: Panayis Chrysovergis for Agence VU, Christophe Daguët, Rodolphe Escher, Alexandre Dupeyron, Christophe Majani d'Inguibert, Jean-Marie Ramès, Justin Sutcliffe-Polaris/Interlinks Image. Covanta, Hamamatsu City, Hiroshi Watanabe/Sebun Photo/Amana Images, Getty Images/Stockphoto, Getty Images/Digital Vision, Getty Images/Hoxton, MDI, Christophe Petit-Tesson, Jacques Witt/Sipa.

Published by Bords de Loir Art Director: Jean-Jacques Farré. Editorial team: Lydie Bahjejian, Clément Barry, Anne Béchiri, Gabrielle Carpel, Virginie Little, Cécile Martin, Paul Sanderson. Illustrations: Mariette Guigal. Coordination: Sylvie Roussel. Production Manager: Caroline Lagailarde. Printed by: Electrogeloz Packaging, sorting and mailing by Staci.

# TRENDS



## Low-tech: sustainable innovation

Often associated with technological advances, the concept of innovation must take sustainability principles into account. In a world of limited resources, in which raw materials are starting to become scarce in several regions of the globe, low technologies\* — bio-constructed houses, battery recovery, ceramic water filters, etc. — allow innovation on a local scale to the benefit of many. Low technologies usually seek to meet vital human needs, such as access to water, energy and food. Unlike high technologies, they can be applied by everyone with no cutting-edge technical expertise required, such as the modern-day cloud-enabled electronic notebook. In line with a long-term approach with an emphasis on repairing accommodation, facilities and objects, low technologies embody innovative solutions that are truly sustainable and environmentally friendly.

The Brittany-based organization “Low-tech Lab” has highlighted a number of these innovations applied in different countries. In Senegal, for instance, wind turbines have been produced using old printer motors. Tutorials explaining these simple yet resilient innovations have been shared in 10,000 towns worldwide by this organization over the past five years.

\* A simple technology, often of a traditional or non-mechanical kind, such as crafts and tools that pre-date the Industrial Revolution. Low technology can be fabricated with a minimum of capital investment by an individual or small group of individuals.

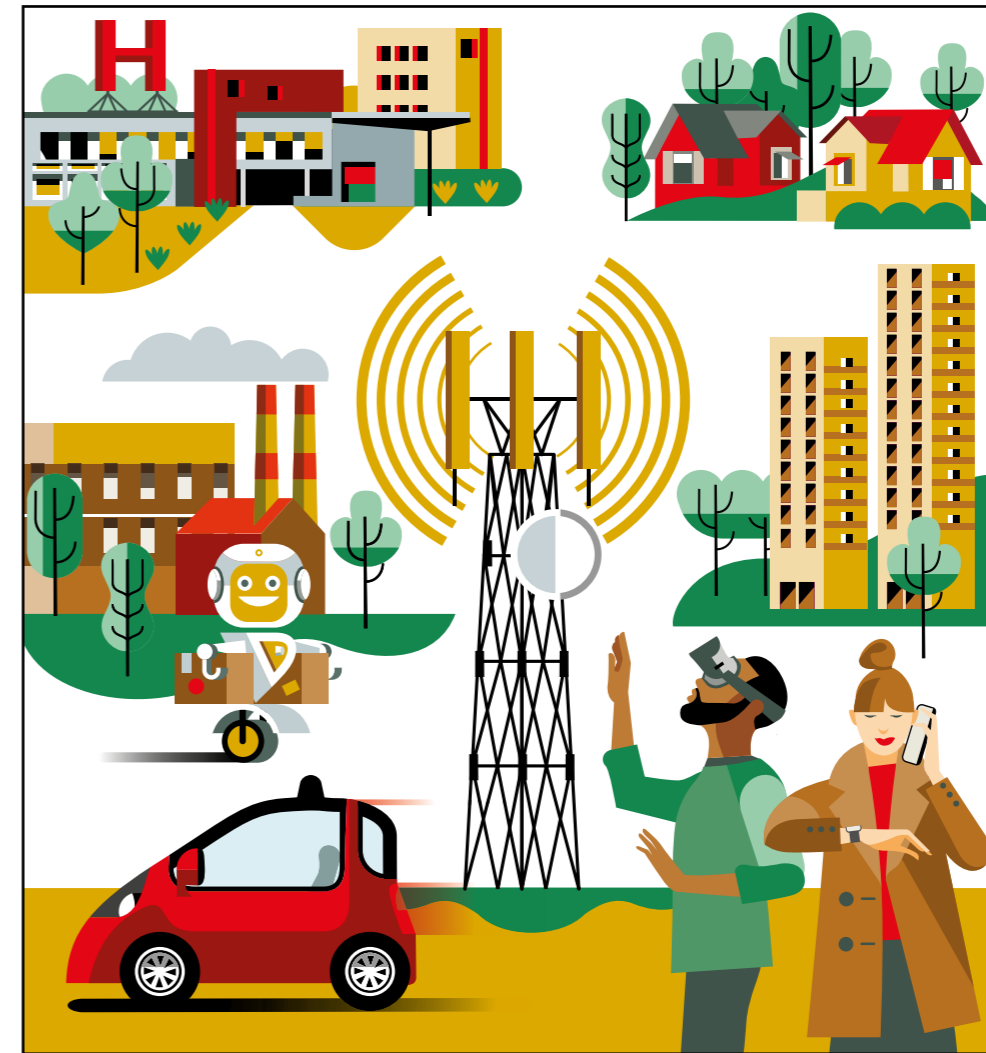
## Artificial intelligence and algorithms: toward the fourth industrial revolution

Many everyday objects — from virtual assistants through autonomous vehicles to connected wearables like watches and fitness devices — are transforming the way we live and monitor our lifestyles, which in turn is changing our consumption habits, paving the way for the fourth industrial revolution\*.

Governed by artificial intelligence (AI) and its hidden algorithms, this pool of innovations represents a key challenge for several sectors of activity, such as heavy industry, food and beverages, manufactured products, transport, and leisure.

However, the big data collection required for global algorithmic machine learning raises the question of privacy. This is a real concern, as this endless data must be specifically protected so as not to be used to the detriment of the owners and consumers of the information. The figurehead of this technological revolution, the Silicon Valley giants must set the example. The ethical dimension cannot be avoided, along with other major questions that are sure to be raised: how can we compensate for the loss of certain jobs that will soon become obsolete due to automation? Will that indeed happen or will the co-bot (collaborative robot) be the more realistic outcome? How can we guarantee the safety requirements essential to the development of driverless vehicles? How can we determine liability in the event of an accident? Or what limits should be set on the use of AI to improve certain military systems or influence democratic elections?

\* First industrial revolution: steam; second: mass manufacture; third: computerization; fourth: digitization and the integration of everything



## 5G: a new network, tailored for the Internet of Things

By 2020, 5G will make its appearance in several large European cities, along with the United States and Asia. As the first smartphones and connected devices compatible with this technology come on the market, 5G will allow the Internet of Things to develop at lightning pace, offering an Internet connection potentially ten times faster than 4G. With all these advancements on the horizon is 5G ready to deliver?

## Drones and innovation: the sky's the limit

Restricted to state-of-the-art technologies for the aerospace and military industries until the late 2000s, drones have taken off in a big way in the space of a decade. With constantly upgraded technical capacities, they nowadays meet different commercial needs and offer a variety of uses that can be applied in diverse sectors of society.

Very much in the spotlight due to its mainstream application, drone package delivery to people's homes has been the subject of heavy investment and in-depth research projects on the part of e-commerce giants. These new flying robots are also widely used for taking photographs for various purposes: site operations, crop optimization, or sensitive site surveillance. In the United States, the Naviator — an aerial and underwater drone — was used in 2017 to perform an inspection on the Delaware Memorial Bridge in New Jersey. Last but not least, the humanitarian sector is also an extremely promising avenue of development. In Rwanda, a delivery drone could be operational as of 2020 to distribute drugs, food and blood in rural areas that cannot be reached by road.

# INSIDE



## IN THE UNITED KINGDOM, SELCHP CELEBRATES TWENTY-FIVE YEARS OF ACTIVITY

In the south-east of the British capital, SELCHP (South East London Combined Heat & Power Ltd.) energy recovery facility celebrated twenty-five years in operation on March 1, 2019. This Veolia-run site produces electricity and heat from household waste for 2,600 households in Southwark. Replacing the use of individual gas-fired boilers, this solution avoids the emission of almost 8,000 metric tons of CO<sub>2</sub> equivalent per year. It is also helping meet the 2020 target set by the European Union of reducing the amount of municipal biodegradable waste sent to landfill by 35% compared to 1995 volumes. 22 years into the contract, in 2016 the district heating scheme has taken off, demonstrating that innovation continues throughout long-term contracts.

### VEOLIA AND NESTLÉ join forces to fight plastic waste

On March 18, 2019, Veolia and Nestlé signed a cooperation agreement for plastic waste collection, sorting and recycling, particularly flexible plastic packaging. The projects will focus on eleven priority countries in Asia, Africa, Latin America and Europe. This partnership will also explore various technologies to set up viable recycling models in each country. These include chemical recycling technologies, such as pyrolysis, which may be able to produce a plastic of a similar quality to virgin plastic. These technologies will help Nestlé increase the share of recycled material in its packaging, which will reach 35% for plastic bottles and 15% for all packaging produced by 2025.

### Telex

**Veolia Energia Łódź (Poland) has signed five contracts to connect the district heating to the future real estate complex in the new city center, where nine buildings are due to be built. The thermal power ordered for all the facilities amounts to 13 MW, and the first heat deliveries are scheduled for 2019-2022.**

**On behalf of Águas do Porto, the water utility company for the city of Porto (Portugal), Veolia will control the quality of the water distribution networks, in order to study the behavior of residual chlorine in an area covering 97 km<sup>2</sup> where around 15,000 of its customers live.**

### TARA AT THE ORIGINS OF PLASTIC POLLUTION ON THE EUROPEAN COAST

The schooner Tara left its home base in Lorient (France) on May 27 on a new mission, "The origins of plastic pollution," with the Veolia foundation's support and an interdisciplinary team of some forty scientists on board. From June to November 2019, this 2019 microplastics mission will make eighteen stopovers in Europe to identify plastic accumulations and their impact, searching for the land-based origins of this plastic. The samples taken will measure the concentrations at ten European river mouths — the Thames (England), the Elbe and the Rhine (Germany), the Seine, the Loire, the Garonne and the Rhône (France), the Tagus (Portugal), the Ebro (Spain) and the Tiber (Italy) — from the North Sea, the Baltic Sea, the Atlantic Coast and the Mediterranean Sea.

## ENEFFCO® SOFTWARE WINS OVER DAIMLER AG

Ökotec, Veolia's industrial energy efficiency specialist, has signed an agreement with the car manufacturer Daimler AG for the installation of EnEffCo® control software on its sites. On the market since 2013, EnEffCo® has been installed on over 800 sites for clients such as BASF, BMW, Bumüller Back, Mondi Gronau, Kerrygold and Nordenhamer Zinkhütte. The software is of particular interest to companies with several sites and different user groups, as it boasts multi-client functionality for optimized management. Moreover, energy reports can be automated and customized per site, for defined units or the entire group. Daimler AG has decided to install EnEffCo® in over fifteen plants worldwide, with an emphasis on Europe.

## VEOLIA COMBATS INDOOR AIR POLLUTION

To mark World Environment Day on June 5, Veolia launched an integrated offering to guarantee air quality inside buildings. Air pollution is the fourth mortality risk factor in the world, according to the WHO. However, the air inside buildings is no less polluted than outdoor air, even though we spend over 85% of our time in enclosed spaces. The general public is largely unaware of this fact, as demonstrated by the study conducted for Veolia by the Elabe institute in France, Belgium and China (Shanghai). For this reason, although the Group has made access to drinking water a public health driver, Veolia is now putting its expertise and solutions to use to improve indoor air quality. This is a field for which it has long been developing solutions, whether involving audits, diagnoses and recommendations (incorporating the audit of air treatment facilities), the implementation and rollout of action plans (including an equipment improvement program), crisis management mechanisms or reporting.

## NÎMES METROPOLIS CHOOSES VEOLIA AND ITS CIVIC WATER OVERSIGHT IDEA

As part of this contract (2020-2028), Veolia has committed to making Nîmes Metropolis' water and wastewater utilities a service of excellence. This contract stands out with its modern approach: a single public service concession encompassing water and wastewater, shared governance including civil society representatives, a dedicated incorporated company, and a fresh take on consumer relations. The stated aims include a clear improvement in the network's efficiency, which is set to reach 82% with over 15 million m<sup>3</sup> of water saved in total, i.e. the equivalent of a year's consumption. Further measures entail the deployment of over 2,500 connected objects in the network to track down leaks and the integration of the Hypervision 360 control system.



## INNOVATION BY VEOLIA AT THE VIVATECH TRADE FAIR

Last May, the VivaTech trade fair brought together 9,000 startups, 1,900 investors and 300 major groups to discuss open innovation, Tech for Good, female entrepreneurship and Europe. It was an opportunity for Veolia to present its connected technologies and digital services for local authorities, industry and individuals and for visitors to discover or test digital solutions that benefit the environment, including waste-sorting robots, drones to prevent pollution, and smart citizen apps. Veolia also showcased its open innovation actions — a partnership with BPI Le Hub to identify startups, as well as the Happy'n'nov challenge with HR startups — and revealed initiatives arising from Birdz's partnership with the blockchain specialist Ledger or the collaboration with French Tech Côte d'Azur. The group made the most of this opportunity with Emmanuelle Wargon, French Minister of State attached to the Minister for the Ecological and Inclusive Transition, who went to meet the startups Somei, Birdz and FluksAqua, represented on the Group's stand.

### Telex

**A strategic partnership has been created between Veolia and the Dutch firm LC Packaging to reduce residual waste linked to flexible packaging, first of all in the Netherlands and then on a global scale, by optimizing its recovery and recycling after use, thus reducing the amount incinerated or buried.**

**At the G7 Environment meeting held on May 5 and 6 in Metz (France), Veolia advocated in favor of better integration of biodiversity at a local level, by means of development levels and extremely heterogeneous environmental standards. The Group has two tools to this end: a territorial guide and a 2015-2020 biodiversity commitment, combined with action plans on 200 sites identified in partnership with the International Union for Conservation of Nature (IUCN).**

### IN GHANA, THE MINING GIANT ANGLOGOLD ASHANTI WANTS TO OPTIMIZE ITS PROCESS WATER

As water is essential for processing ore, removing dust, transporting sludge, and meeting personnel needs, the world's third-largest gold producer has tasked Veolia with operating and maintaining all the water treatment plants at its Obuasi gold mine for three years. In a tropical climate where heavy seasonal rains often complicate this type of operation, the Ghanaian gold mine manages its wastewater and process residues in accordance with the Environmental Protection Agency's requirements concerning discharge into the ecosystem. Veolia is increasingly working with the water-intensive mining sector to respond to the issues it must address in Africa and worldwide.

## MILLENNIALS AT THE VEOLIA DISRUPT PROGRAM IN BOSTON AND AMSTERDAM

Specially designed for millennials (born between 1981 and 1996), DISRUPT is a skills development tool launched by Veolia to encourage networking and accelerate the empowerment of all. After Boston (United States) in April, Amsterdam (the Netherlands) hosted 2019's second event in May. In each session, some fifteen participants from all over the world racked their brains over a local issue and then presented solutions and recommendations to the host country's management. All agreed that the experience proved enriching, refreshing and intense. The ideas put forward are subsequently examined on a global scale with a view to their possible development.

## VEOLIA SUPPORTS DANONE IN THE USA AND THE NETHERLANDS

Since their alliance in 2016, Danone and Veolia have been implementing projects designed to help Danone create value and integrate economic, social and environmental changes into its processes. For the Jacksonville (Florida) and DuBois (Pennsylvania) sites in North America, Veolia is developing water and wastewater treatment projects, including a pH neutralization system and an effluent pretreatment system. In the Netherlands, the Group is assisting with the design and construction of the infant nutrition product site, Nutricia Cuijk, one of the largest in Europe. Veolia guarantees the plant the availability of its industrial utilities — air, steam, ingredient and process water — thanks to a Hubgrade™ hypervision center optimizing water and heat reuse and reducing the CO<sub>2</sub> footprint.

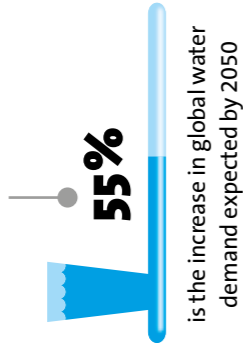
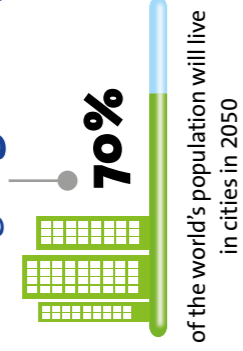
# IMAGINE

## 2050

In its *Imagine 2050* report, Veolia in the United Kingdom highlights the innovative economic models required to address two global megatrends. On the one hand, continued population growth, which will lead to environmental degradation and change how we manage and consume energy, water and food. On the other hand, the acceleration of transformations, the development of new uses, and the appearance of unprecedented business models, which make innovation a key issue for companies.

### VEOLIA IMAGINES A FUTURE IN WHICH INDUSTRY IS REDESIGNED TO TAKE UP THE CHALLENGES OF THE WORLD OF TOMORROW

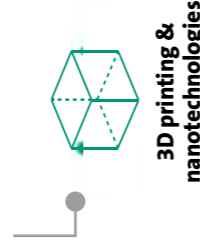
## Demographic pressure resulting in growing needs



## 2050

## Acceleration of the race for ever more advanced technologies

### CHALLENGES



## VEOLIA TAKES UP THE CHALLENGE OF TURNING INDUSTRIAL WASTE INTO RESOURCES

**KEY SECTORS TO BOOST**  
(\$5.16 billion of hidden value in underutilized resources)



**MANUFACTURING INDUSTRY**

**\$3.55 BILLION**  
unutilized waste streams

### INNOVATION DRIVERS



**Move closer to raw materials** to secure their supply chains (local loop).  
**Turn waste** into tradable products, to obtain 100% recovery rates.  
**Integrate nanotechnologies** and 3D printing into supply chains, for greater flexibility in production and more efficient use of resources.

**58%**  
of British manufacturers have invested in automation and/or robotics and  
**68%**  
see future investment potential in these areas.

### VEOLIA'S ADDED VALUE



**Companies must think about how they intelligently generate, use and recover energy and water.**

- Reduce energy consumption: Hubgrade centers continually optimize real-time monitoring of heat, electricity, and gas consumption.
- Optimize waste recovery: achieve 100% recovery.
- Sell the recycled materials: recover precious metals or turn sludge into plastic.



**PHARMACEUTICALS AND CHEMICALS INDUSTRY**

**\$1.02 BILLION**  
unutilized water and waste resources

**Incorporate product efficiency** at the design stage.  
**Come up with dynamic new systems**, including new financial models, for more efficient drug production.  
**Choose 3D printing**, encouraging the local production of drugs on a large scale.

**25%**  
increase in the annual number of biotechnology patent applications since 1995 in the United Kingdom.

**The regulations governing how these industries use and dispose of resources will become increasingly strict.**

- Co-design products: include waste management from the design stage.
- Recover the resource: extraction of compounds from organic waste such as glucose and reinjection into the production loop (saves costs and reduces crop farming).
- Control wastewater discharges: use the latest sensor technologies to monitor municipal wastewater treatment plants for signs of drug pollution.



**FOOD AND BEVERAGE INDUSTRY**

**\$590 MILLION**  
unutilized water and waste resources

**Take advantage of pressure on food** production costs to rethink by-products that are currently wasted and thrown away.  
**Rely on new technologies** for better energy use in the sector and cost reduction.  
**Without changing our diet**, radically rethink where it comes from and find other sources of protein, encouraging lab-grown meat and giving greater importance to insect cultivation.

**30%**  
of the world's population already has insects in their diet.

**Cost pressures and food production concerns are leading to major changes in the food and beverage sector.**

- Turn biomass into a marketable product: - ash is processed into a phosphate-rich fertilizer;
- water recovery, anaerobic digestion, and combustion processes make it a source of energy able to supply a plant and even thousands of the homes nearby.

### REDESIGN INDUSTRY SO THAT:

- products and manufacturing processes no longer generate waste;
- facilities' energy needs are met on site using renewable sources, rather than taken from the national grid;
- we stop seeing waste as a cheap commodity and begin to give it a new lease of life.

By combining these three elements in a water, energy and materials network, Veolia saves resources and supports industries that are well prepared for 2050.

# Collaborating to bring innovation into business reality

## Gavin Graveson, Neil Hargreaves and Tim Rotheray debate the question.

12/13



**Gavin Graveson**  
Executive Vice President  
at Veolia in the United Kingdom



**Neil Hargreaves**  
Managing Director at Knauf  
Insulation Northern Europe



**Tim Rotheray**  
Director at The Association  
for Decentralised Energy  
in the United Kingdom

*Innovation has almost become an obsession of our time. It is commonly associated with new technologies. Gavin Graveson, Neil Hargreaves and Tim Rotheray show us how, in a constantly changing world, innovation starts with people and is now more than ever about collaboration.*

### ADE

► The Association for Decentralised Energy (ADE) is a trade association representing more than 140 interested parties from the industrial, commercial and public sectors. Decentralised energy is energy based at or near the energy user and it has an integral role to play in the creation of a flexible, smart energy future. The ADE works to create a sustainable environment for a range of technologies including combined heat and power, demand side energy services, energy efficiency and heat networks.

### Knauf Insulation

► The family-owned multinational manufacturer Knauf Insulation is one of the world's largest manufacturers of insulation products and solutions, with more than 37 manufacturing sites in 15 countries. In the light of climate changes, insulation has become a crucial aspect of the construction sector, fostering to create innovative solutions that make buildings more energy efficient. In 2017, Knauf Insulation and Veolia have initiated a comprehensive partnership enabling to produce mineral glass wool from recycled glass.

### What does innovation mean to you?

**Neil Hargreaves:** Innovation is about leading change, about doing things differently and challenging the status quo. It not only involves new product development, but finding solutions for our customers and stakeholders.

**Gavin Graveson:** Innovation is essential to achieving success in an organization. And because the world is rapidly changing, our clients want and demand innovation. These are the people we work with every day and we have an obligation to think about what they want and help them move forward. Innovation is about delivering change, not just thinking about it.

**Tim Rotheray:** Innovation is about finding the same or a better outcome, a more efficient way, and being cost- and environmentally efficient.

### What approach are you taking to innovation in the United Kingdom at the moment?

**G. G.:** Innovation can be delivered at different levels. At Veolia, a lot starts with our Touch Programme. We meet clients regularly to discuss what market pressure and cost problems they are having. We analyze their needs to create a mix between short-term and long-

term innovation. Long-term innovation is slightly more difficult because it is prediction. Innovation for us is about the three thirds: the first third is where we think the market is headed, the second is about legislation that is changing and the third is about our customers' feedback. We take a mix of those and try to speculate on the right move.

**N. H.:** Generally speaking, innovation starts with people. Knauf is a very customer-centric organization. A significant proportion of our innovations start by listening to our customers to understand their issues, concerns and ultimately how we can support them to be more profitable. However, not all our innovations are driven by our customers. Sometimes it is a question of circumstances and the way the people in our organization challenge the status quo to do a better job and create a better world.

**T. R.:** When it comes to the energy sector, we are moving away from the old centralized energy system – where power was centrally made and then delivered to customers who simply consumed energy when they needed it – to a world where energy customers generate their own energy and even provide energy security services to the power grid. Decentralized

••• energy is not about scale, it represents greater involvement of the energy customer in the system. So rather than just paying for energy, the energy customer is paid to help keep the system secure and running smoothly.

#### Where are you headed next?

**G. G.:** There are many financial and political pressures. Financial pressure is about creating solutions that save money for our clients and make them more profitable. That is about zero waste to landfill, lower cost treatment of hazardous waste.... Political pressure on the other hand is all about carbon reduction, climate change and clean air. In the United Kingdom, as Veolia, we are carbon neutral – we not only understand that, but we also try to provide this understanding to our clients in district heating, direct energy and low energy usage. At the start of this year, we took over a contract to manage waste and recycling collections in London's Square Mile. We will be implementing a fully-electric fleet of refuse collection vehicles. It is a first in the UK. We not only are a solution provider for them but also a partner in the long run.

**T. R.:** I think two really big things are happening in the energy sector. The first is the electrification of transport. We are already seeing electric delivery vehicles and electric-assisted bikes in London, and we expect this to continue with cars. This means that transport will become part of the electricity system with a huge impact on its size and how it is managed. Second, heat represents about 50% of energy demand and one third of greenhouse gas emissions and the increasing urgency of climate change means the next challenge will be decarbonizing heating.

#### How can we create value and change through innovation?

**G. G.:** It's a matter of direct and constant collaboration with our customers. They come to see us with a problem and we help find the solution in order to restore their productivity, help them perform better and sometimes overcome a crucial crisis. Innovation is not a view of mind. It's directly linked to their daily business. With some of our major customers, we have embedded some Veolia guys within their own team in

**“Innovation in business, finding a better way to deliver what our customer needs, is going to determine who wins and who loses in energy.”**

**Tim Rotheray**

head offices. We have a kind of help desk that they can come and see to share whatever problem and we'll find a solution. We try also to advise them, inform them on what is coming in terms of legislation... We treat every customer uniquely. For us, it's not only about making money in the short term, but it's about building a long-term relationship in a changing world.

**N. H.:** We must stay close to our customers, ask the right questions and understand what we can do to help them become more profitable and more sustainable in the medium and long term. Internally, it also involves creating the right resource with the toolset to make sure we have the right focus on those projects that will ultimately help us attain our overall strategic goals and our vision, which is to create a better world.

**T. R.:** Innovation in business, finding a better way to deliver what our customer needs, is going to determine who wins and who loses in energy. Embedding innovation means having a clear focus on what the customer wants. I think the other priority is collaboration. Innovation certainly means looking outside of your team and company to find the best players and establish collaborations with them. The scale of the challenge in carbon is huge. We will only meet it if we collaborate across sectors and learn from others.

#### How can we foster an innovative culture within the largest organizations?

**G. G.:** We are a large organization, but we will not be large forever unless we continually respond to the market. We have a number of resources in the United Kingdom and throughout the Group to make sure our people are constantly listening to our clients and market, and move fast. We take risks and we sometimes accept to be ahead of the market or the policy to be prepared when the environmental legislation arrives. This was the case with our facility in Rainham where we recycle plastic into food-grade polymers. It took us three years to get it right and for the legislation to push and the market to accept the integration of recycled plastic into food packaging. It was a three-year learning curve, but now it's a success.



**N. H.:** At Knauf Insulation, we spend a lot of time communicating to our people to make sure our strategy is effectively disseminated. So, everybody from the top of the organization all the way down to the factories feels connected to the vision and understands the contribution they are making. We have a wide range of communication channels: letters, email, video content, the website and a mobile application. Of course, we value the power of face-to-face communication too. We have regular conferences and team meetings to make sure communication penetrates throughout the organization. Secondly, we have a global set of values. One of Knauf's core values is entrepreneurship. The Knauf family has grown from a small German organization into a ten-billion-euro global enterprise. That growth has been driven by a customer-centric and entrepreneurial approach.

#### What role can citizens play in the energy debate?

**T. R.:** Energy consumers can contribute to the smooth running of networks, both in power and heat networks. Heat networks present a real opportunity, especially for large networks such as hospitals, schools or data centers. Waste heat from these sources can be supplied in those systems. Even homes with solar water panels can supply heat into local heat networks. In power, customers provide flexibility through smart charging

**“Innovation is about leading change, about doing things differently and challenging the status quo.”**

**Neil Hargreaves**

of electric vehicles and use of domestic storage with solar panels. Industrial customers provide flexibility through smart managing of their processes. All have the ability to provide services back to the system, and they are paid for these services. For a company like Veolia, the ability to navigate the flexibility of the energy system so the customer can receive this benefit without having to deal with the complexity of the regulated system is of absolute importance.

**In 2017, Knauf and Veolia initiated a partnership that resulted in the construction of a dedicated glass cullet processing facility adjacent to the Knauf manufacturing facility in St Helens. What was the impulse behind this development?\***

**N. H.:** There were some key drivers behind our decision to work together. Previously, we bought glass from a number of suppliers who were operating as intermediaries between glass collectors like Veolia and manufacturers. We discussed with Veolia about developing a different kind of model where Veolia, the glass collector, and Knauf, the glass user, could come together to build a cullet processing facility close to one of our plants in the United Kingdom to deliver a long-term sustainable solution. Our organizations have been discussing several possibilities for cooperation since 2014 at a high level. We visited a number of





**“For us, it’s not only about making money in the short term, but it’s about building a long-term relationship in a changing world.”**

Gavin Graveson

- Veolia facilities across the UK and Veolia came to our location, so we could really understand each other’s business, our mutual cultures and shared values. This stage was very important in building a really good relationship and trust, which are the foundations of this kind of partnership.

**Does a partnership that incorporates both innovation and sustainability allow you to ensure better development of your company?**

**N. H.:** Absolutely! We have always wanted to showcase this partnership we’ve developed with Veolia to our customers so they can see the full end-to-end process. Veolia collects the glass from its nationwide network of Material Recovery Facilities for transport to its cullet processing plant that is situated a stone’s throw from our site. This reduces transport costs and the carbon footprint from additional transport. Once the glass cullet is transferred to our production site next door, it is fed into the furnace and melted. Using a higher percentage of recycled glass in the process generates considerable cost and environmental savings. The quality of the glass cullet allows up to 80% content in the final product – which is energy-saving glass mineral wool insulation. I think in terms of a sustainable, circular economy story, you will not find a better example.

**Could you name your favourite innovation in the past few years?**

**T. R.:** Recently, I bought an electric car. Before people own an electric car, they talk about range anxiety: will my car run out of electricity? But when you actually own one, you realize that it is genuinely innovative. It gives you exactly what your old car did, transportation from point A to B, but it is silent. Rather than worrying about range or where you are going to fill up, you just plug it in at night. You no longer have to waste time in queues at the gas station. And on cold mornings, the car is warm before you get in because it is pre-heated for you.

**N. H.:** I do take particular pride in our collaboration with Veolia to build a processing facility adjacent to our production facility. I was personally involved in the delivery of the project along with other key members of our team. I think it is a really fantastic example of how businesses can work together and also how we can deliver a great example of sustainability and circular economy.

**G. G.:** I will mention two examples involving the full circular economy and using waste to make other products: using glass to make insulation, and turning plastic back into milk bottles. We’re stopping the waste of natural resources, while saving carbon and recycling. People have been talking about the circular economy, but we’re actually achieving it. ■

\*See a brief video showcasing this partnership (link: <https://www.youtube.com/watch?v=sZTkDQgzCPC>)

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*In the United Kingdom, Marine works on developing new business models for Veolia. In France, Dorothee finds solutions for turning waste into a resource in the Group's Research & Innovation division.*

# Above and beyond

Meeting Veolia employees from all over the world

## Marine Avisse

Corporate Development Executive  
London, United Kingdom

**Marine Avisse has always wanted to be involved in nature conservation and help combat climate change.**

On completing her studies, her desire to take sustainable action for the planet naturally led her to work in the environmental sector. As a young graduate, Marine joined Veolia in the United Kingdom in 2011 for an internship in the public procurement development team. Thanks to six years' solid experience with Veolia in Great Britain in waste management activities, Marine took up her post as Corporate Development Executive in 2017. A Mergers & Acquisitions specialist, she embodies the Group's resourceful and innovative spirit on a daily basis.

She is tasked with finding and bringing in the external expertise required to develop new contracts, by acquiring companies or assets, while consolidating Veolia's geographic presence and existing know-how in the United Kingdom. When she is not at her desk juggling new M&A projects, Marine is traveling around the country to identify future gems for the Group, meet the operational teams, and find partners and investors for infrastructure development projects, etc.

In her view, this drive for innovation primarily implies anticipating the future needs of Veolia's clients and almost instantly putting in place new business models that are radically different from "traditional" contracts and services. She is particularly proud of securing the future energy-from-waste merchant plant\* Rookery South, whose development phase she led for two years.

"We have to be much faster when it comes to decision-making, and how we think, act and train people. We have to be able to reinvent ourselves and change the way we work to always keep one step ahead of emerging needs. It's a real race," she explains.

To keep up the pace, Marine relies on her team and her ability to unite, mobilize and motivate her colleagues. A keen runner, she displays this team spirit and tenacity not only among her co-workers but also for the rugby teams she passionately supports from the stands! ■

*\* Plant developed based on a new business model. Unlike long-term contracts with local authorities, an agreement is first signed with commercial clients. Veolia must then turn to investors for funding.*





**Dorothee Lenés**  
Program Director  
Veolia Research & Innovation

**Dorothee Lenés has been a Program Director at Veolia's Research & Innovation department since 2014.** Her role is to define and head up research projects on the theme of "turning waste into a resource."

With her team of six project managers, she works to develop the solutions of tomorrow from a circular economy perspective (materials recovery, energy or agronomic recovery): formulating new materials to increase the lifespan of facilities, using artificial intelligence resources to improve sorting, coming up with innovative solutions for recycling complex waste, and putting in place expert tools to strengthen Veolia's position in selling secondary raw materials such as composts and plastics. The aim of the program that she oversees is to effectively meet the Group's needs, whether this involves Veolia's business units or clients.

"Over and above the technical aspects, it is essential to anticipate and manage the changes associated with implementing each innovation, in terms of organization, activities and new skills for Veolia employees," she remarks.

Having joined Veolia in 2002, working in Veolia's technical division in the United Kingdom from 2010 to 2014 and then the Middle East from 2016 to 2018, Dorothee's solid international experience is a real asset in her current position. She places particular importance on this multicultural and versatile approach, shaped by her career path within the Group:

"At Veolia, we may be faced with widely different local contexts and issues. This represents a real challenge — both global and local — that we have to rise up to. Being on the ground allows us to become aware of the specific needs of each region of the globe. The environmental challenges in the United Kingdom & Ireland and Africa Middle East zones are very different. We must therefore find solutions that meet each of these needs."

"Innovation," she emphasizes, "consists in turning an idea into a solution that has to create value. This value must not only be economic but also environmental and social. I believe that that we have to strengthen these three inseparable elements when it comes to sustainability."

Proud of contributing to the Group's innovation, the director reminds us of the strengths of Veolia's Research & Innovation department: scientific and technical excellence, high-quality laboratories and test pilot schemes, and professional project management. Not to mention an Open Innovation approach and a robust network of internal and external partners (academics, industry, etc.). And, above all, the passion and creativity of the researchers! ■



# France

## Nuclear waste: Veolia and EDF pool their expertise

*EDF and Veolia have entered into a partnership to co-develop innovative solutions for nuclear power plant decommissioning and radioactive waste treatment*

**In June 2018,** France's leading energy supplier EDF and Veolia entered into an unprecedented partnership to develop technologies to improve the treatment and management of waste from nuclear power plant decommissioning. The partnership subsequently launched a first joint venture in summer 2019.

### A shared industrial culture

A pioneer in treating the most difficult pollution, Veolia believes that a paradigm shift can now be made in managing

and treating radioactive waste. One way to achieve this is to use existing, proven industrial technologies and adapt them to nuclear applications.

This approach has won over EDF, which has waste feedstock for which these technological developments could be of use, research capabilities, and recognized nuclear expertise that could accelerate Veolia's approach.

"With EDF's nuclear engineering and Veolia's expertise, we both wished to look at how we could use our complementarities to jointly create value in decommissioning or radioactive waste treatment," explains Sylvain Granger, Deconstruction ...



#### Issue at stake

› Handling the many nuclear power plants reaching the end of their useful lives worldwide

#### Objective

› Decommission a nuclear plant without risk to personnel or the environment and optimize the management of the resulting hazardous waste

#### Veolia solution

› In partnership with EDF, standardize two Veolia solutions: GeoMelt® waste treatment technology and Dexter robotic arm technology



GeoMelt® has treated nuclear and hazardous waste since the 1990s and has produced over 26,000 metric tons of glass for storage.

24/25

... and Waste Projects Department Director at EDF. As such, the two companies decided to study a possible convergence in two areas: decommissioning graphite gas reactors using robotic techniques and treating radioactive waste from nuclear activity using the GeoMelt® vitrification process.

## The continually surprising potential of vitrification

“We do not destroy radioactivity,” explains Jean-Christophe Piroux, Director of Technologies and Innovation at Veolia Nuclear Solutions in Continental Europe, in charge of the GeoMelt® project. “The challenge of waste treatment is therefore to package it in a stable and safe vitreous matrix, which has exceptional confinement properties, while

reducing the initial volume of the waste, thereby maintaining storage capacities compared to commonly used processes such as cementing, which increase the volume of packaged waste.” “The choice of glass is crucial,” continues Jean-Christophe Piroux. Glass has excellent long-term behavior with respect to the release of radionuclides into the environment. It takes short-lived low- and medium-level waste about 300 years before its radioactivity declines below the natural background. “Our GeoMelt® technique also offers a solution for special waste for which there is currently no treatment process,” concludes Jean-Christophe Piroux. There is no treatment or storage process to treat certain waste from the deconstruction of nuclear power stations, for example. GeoMelt® is an interesting solution, both in terms of performance and cost. This technology has already been tried and tested. The UK Atomic Energy Authority and the US Department of Energy have

...

### 3 questions for

**Jean-Christophe Piroux,**  
Director of Technologies and Innovation at  
Veolia Nuclear Solutions in Continental Europe

#### What is GeoMelt®?

It is a set of technologies based on a common platform to process a large amount of hazardous waste. GeoMelt® has treated nuclear and hazardous waste since the 1990s and has produced over 26,000 metric tons of glass for storage in the United States, the United Kingdom, Australia, Japan, and other countries.

#### How does GeoMelt® vitrify waste?

We use an oven, an enclosure composed of metal walls with a refractory coating, which is filled with a mixture of waste and glass frit\*. Electrodes, inserted in the oven, allow the fusion process to begin by raising the temperature to around 1,200 degrees. Once the package is vitrified, it can be sent to the disposal facility.

We need to know the physicochemical composition of each type of waste as well as its activity. Based on this, we can order them to adjust the composition and make packages that meet the disposal facility criteria. The French National Radioactive Waste Management Agency (Andra) operates the disposal facilities and defines acceptance conditions based on the safety demonstrations validated by the French Nuclear Safety Authority (ASN).

#### What are the advantages of GeoMelt®?

This technology allows us to vitrify large volumes of waste with a wide variety of physicochemical properties. As waste is directly vitrified in the final storage container, there is no transfer or casting, which increases the safety of the operation. In addition, GeoMelt® can halve — on average and up to 100% in some cases! — the initial volume of the treated waste, whereas it is generally increased five- to tenfold in a cement matrix. The reduction in the volume of waste to be stored, the exceptional performance of the glass produced, the very flexible process, the ability to process waste of very varied composition and shape, and a solution for waste with no existing treatment channel are all plus points that make GeoMelt® a real alternative to existing processes.

\* Frit is a vitreous mixture obtained by fusing and grinding various components (primarily sand and soda).

... used it to treat nuclear waste. 200 metric tons of glass was produced on the Hanford site in the USA using this technique.

## Robots in the decommissioning arena

“The current challenge of decommissioning nuclear power plants is optimizing and standardizing processes to prepare for scaling up,” says Sylvain Granger. This may concern UNGG (graphite gas) reactors, already shut down in France and Great Britain, as well as PWRs (pressurized water reactors) in the future.

“Decommissioning graphite reactor cores is exceptional in every respect,” explains Sylvain Granger. “The equipment is encased in a very thick concrete structure that is extremely dense and very complex to access.

Overall, the mass of material to be decommissioned is about twenty times greater than the mass of equivalent equipment for a light water reactor. In addition, we need to handle, cut, and package a very specific material — graphite, while in more conventional operations, the material concerned is essentially metal and concrete.” EDF and Veolia have joined forces and pooled their skills to meet this challenge. Remote operation solutions incorporating all these constraints will be studied under this partnership. The studies are expected to take about twenty years.

The Dexter remote handling system (see boxed text), among other solutions developed by Veolia, has the specificity of allowing great dexterity and instant force feedback\* for the operator. With remote decommissioning and vitrification, the Veolia and



EDF joint teams are gradually overcoming the technical obstacles they face. “Through the creation of joint ventures, we aim to go beyond the technical discussion stage. These partnerships should allow the emergence of innovative industrial models for the most complex projects,” concludes François Parot, Head of Continental Europe at Veolia Nuclear Solutions. ■

\* Force feedback: the remote-controlled robotic tool exerts a force on contact with an item that it picks up and then handles. This force is fed back to the operator. Force feedback mechanisms are computer operated to reproduce the force feedback that would be felt if the operator were using their own hands.

## Dexter: a remote handling system

Dexter is a robotic arm, developed internally by Veolia, which replicates the movements of a human arm in real time. The arm’s remote control by the human operator, via a secure Internet connection, provides access to environments inaccessible to humans, such as reactor cores being decommissioned. It is the only system of its kind that has more than 15,000 hours’ operation under real-life conditions.

The operator views the place to inspect, which can be several kilometers away, on their screen. To effectively deal with the unexpected in an inaccessible environment, more than 2,000 tools have been adapted for Dexter. Both robust and easy to handle, it can manipulate objects from 10 kg (for an arm) to 100 kg (two arms attached to a crane) and pick up objects as small as a pencil. Its incredible sensitivity allows it to “feel” a strip of adhesive on a flat surface.

Under the EDF and Veolia partnership, Dexter could be used to sort, identify, and package radioactive waste from graphite stack decommissioning. The remote operation platform will therefore be much more technologically sophisticated than the various existing robotic systems currently used in many operations.



# Rookery

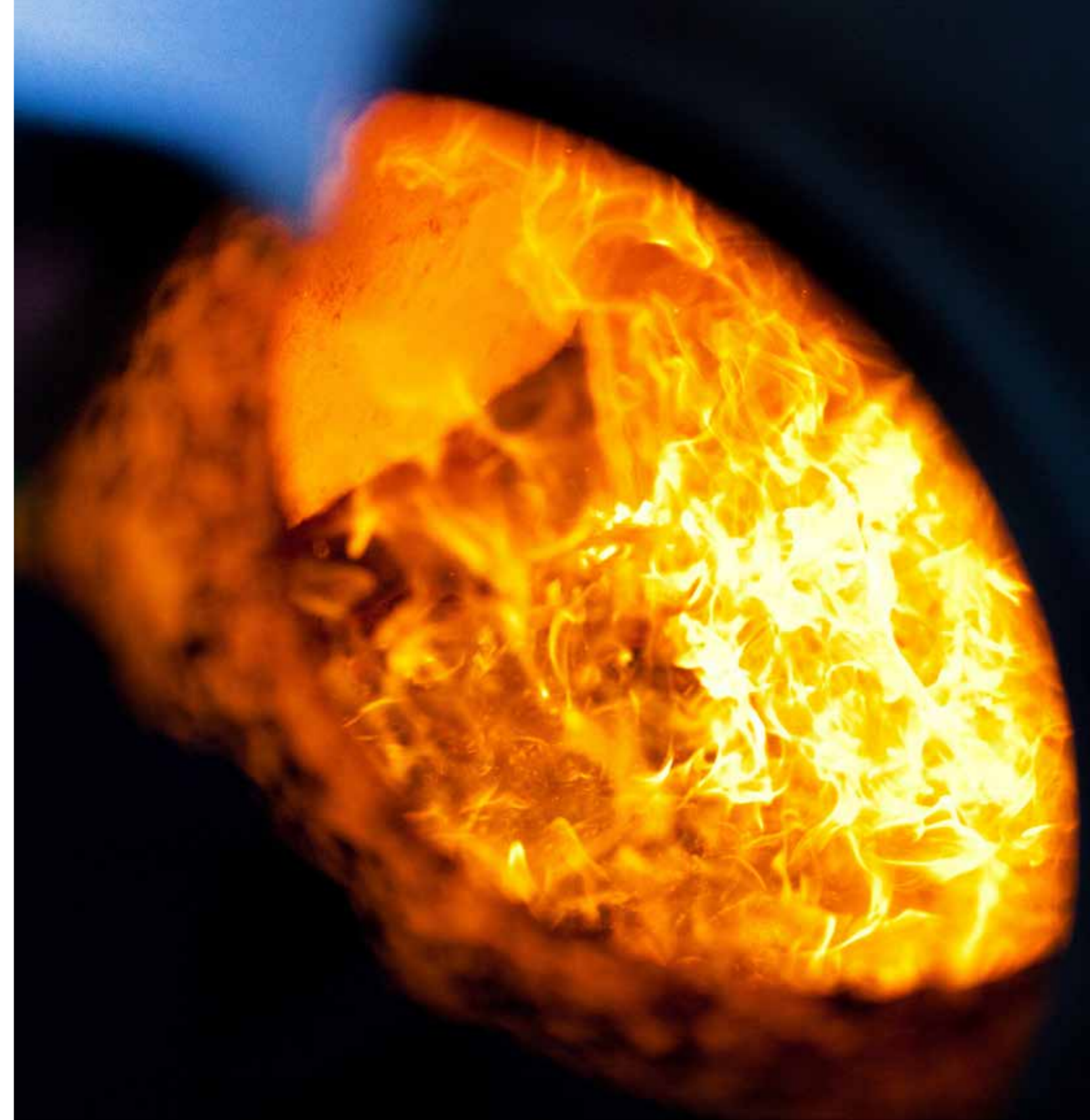
UNITED KINGDOM

# South

## A new model for clean energy

*A clay pit where material was once extracted for making bricks is set to house the foundations of a facility that represents a completely innovative business model for Veolia.*

*The Rookery South Energy Recovery Facility will be situated within the former clay pit in the county of Bedfordshire – a semi-urban and semi-rural county that ties London to the industrial midlands of England.*



### Issue at stake

› Limiting waste landfill sites in the United Kingdom

### Objective

› Find a new way to process non-recyclable waste

### Veolia solution

› Build a power plant as part of a business contract

## Veolia has had plenty

of experience building energy-from-waste plants, but this one required a completely different way of thinking. It required transforming practices within the company. It required changing the status quo within Veolia and successfully delivering something that the company was not previously able to deliver. It required changing mindsets and teamwork to achieve financial growth in a market that Veolia had not previously been involved in.

## New partners

The key difference with Rookery South is that Veolia is a partner company working with American energy-from-waste specialists Covanta and British financing firm Green Investment Group (GIG). All but one of Veolia's ten energy recovery facilities (ERFs) were built as part of local authority contracts. Typically, these facilities would process municipal solid waste from households that had been collected as part of council integrated services. This meant that Veolia would also be responsible for services such as materials recovery, recycling and waste reduction. The other facility, SELCHP in South London, treats local authority waste but under various commercial partnerships between the public and private sectors. With Rookery South, the ERF will be a merchant plant, primarily treating commercial and industrial waste, but potentially some household waste, too.

## New models

"Most of our plants so far have been built under a local authority contract," says Veolia in the United Kingdom & Ireland Corporate Development Director, Christophe Bellynck. "On the back of these contracts, the plants have been financed and operated by Veolia. Then, at the end of the contract, these

### ROOKERY SOUTH IN FIGURES

**545,000 metric tons** per annum of waste processed

**60 MW** of electricity generated

**112,500** homes could be powered by the facility

**24/7** operations to begin in 2022

**50** new permanent operational roles will be created from 2022

**300** jobs created in construction of the ERF

plants revert to the local authority. The difference with Rookery South is that it will be fed by residual commercial and industrial waste collected by Veolia, plus any local authority contracts that we might win that come to tender."

Unlike a local authority contract, Veolia, Covanta and GIG will co-own the plant with 30% funding from equity and 70% coming from bank finance. "Veolia will provide the vast majority of the waste," says Bellynck. "Covanta will operate the plant, while GIG has been the investment partner."

## Exemplary teamwork

This business model of developing a merchant facility with external partners required completely innovative thinking at Veolia. Teams that were used to delivering local authority contracts had to entirely rethink their ways of working. "The merchant plant model was completely new to Veolia people here," says Chief Technology & Innovation Officer at Veolia in the United Kingdom & Ireland, Richard Kirkman. "Even in the wider market, most merchant plants had failed. Rookery South is a particularly large and complex project. To see it through successfully, we had to re-orientate all the internal 'people machinery' of the company and external collaborators in order to deliver something different to how things were done before. This is the most important type of innovation for Veolia, since it delivers growth in a way that we had not previously been involved in." "There were around 50 people involved in this project, and for each of them it was completely different than their normal day job. It required constantly thinking in a different way, whether it was the commercial team needing to find multiple commercial or municipal contracts when they might only be used to one local authority contract, or needing to share financial information with banks that we might not have previously. It was a great example of a large team working together to make a new project work successfully," explains Richard Kirkman.

## Global project

As well as feeding the plant with residual waste from its commercial contracts, Veolia will also be responsible for handling the disposal of air pollution control residue (APCr) and managing the power purchase agreement arrangement for the sale of electricity generated by the facility.



Once completed and operational in late 2021/early 2022, the ERF at Rookery South will generate electricity that will be sold into the grid. Over time, the land around the facility will allow for construction of data centers, for example where a private wire can be used to give consistency of energy supply. Alternatively, if any factories are built in the area, heat and electricity could be provided to them.

"Covanta has recognized Veolia's competences and reputation in the United Kingdom when it comes to recycling IBA (incinerator bottom ash) and selling electricity to the grid, showing that the commercial interests of Covanta and ourselves are aligned," says Christophe Bellynck.

Situated in a central location close to major towns such as Luton, Northampton, and Milton Keynes, Rookery South will handle over 545,000 metric tons of waste per year, generating 60 MW of electricity – enough to meet the needs of 112,500 homes.

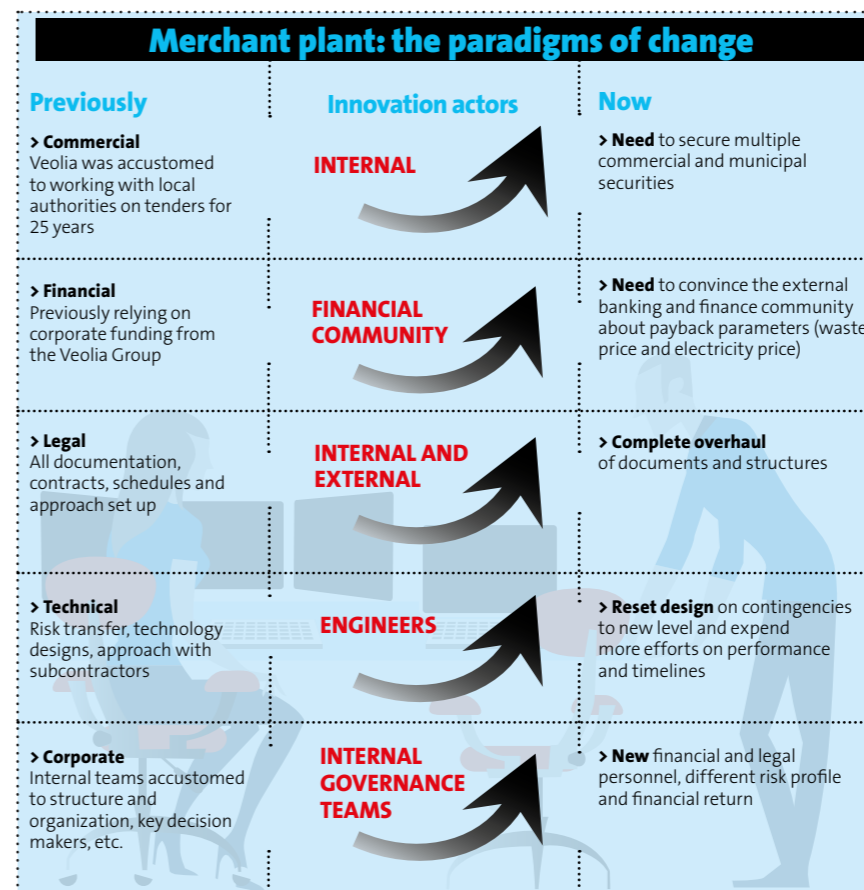
## Long-term projects

It is also a model that Veolia is looking to replicate with other ERFs in the United Kingdom.

"Rookery South will be the first, but others are being developed," says Christophe Bellynck. "This model of Veolia as co-owner of the facility, providing the waste and operating the plant, with funding coming from third parties, is a good and innovative one for us."

"Eventually, we plan to build three more plants. One has had planning permission submitted, and we have identified a further two projects. In one of these, we are preparing the planning application. This is a model that we are sure is going to be very successful." ■

\* <http://www.centralbedfordshire.gov.uk/planning/minerals-waste/rookery/overview.aspx>





# Hamamatsu JAPAN

## Boosting the local social economy

*In Japan, the rural exodus continues. Many people leave to work in large cities such as Tokyo and Osaka. To strengthen its appeal, Hamamatsu is looking forward to the Pop Up by Veolia program. The aim is to provide social entrepreneurs with the tools to shape and develop their business.*

The Japanese population is declining, especially in rural areas, and the trend is clear<sup>1</sup>. With an aging Japanese population and a relatively stable, but low, birth rate<sup>2</sup>, the generation gap is widening. Another consequence is that pressure on public finances and those of local communities to meet the care and housing needs of this elderly population remains strong. Hamamatsu, a coastal city of 800,000 inhabitants situated 250 km south of Tokyo, is no exception to the rule. However, it has implemented an innovative strategy to finance its vital

infrastructure: twenty-year wastewater management concessions with some original terms. This duration is new in Japan, where contracts are traditionally granted for one to three years, and includes an additional requirement: bidders must put forward innovations to re-energize the city. "The contract is for operating, maintaining and renewing the facilities at the city's largest wastewater treatment plant. Each bidder had to suggest innovative solutions, for instance, revitalizing the city by encouraging the development of an ecosystem of social startups," states Shiori ...



### Issue at stake

› Strengthening the city's appeal for current and future residents

### Objective

› Boosting the local economy

### Veolia solution

› Helping local socially and environmentally responsible startups shape their business via the innovative Pop Up by Veolia initiative



••• Sekiguchi, Concession Project Coordinator for Veolia in Japan. The project presented by Veolia was chosen in March 2017. Veolia proposed to implement an innovative Pop Up initiative to boost the local social economy by involving the city's population. "During the diagnosis, we realized that there was no existing network of entrepreneurs in Hamamatsu. So it is difficult for them to get advice and feedback. We therefore put forward the concept of an incubation scheme allowing social entrepreneurs to develop their ideas and their business," recalls Satoko Ibi, Assistant Manager of the Technical Department. The program submitted to Hamamatsu is based on the Pop Up by Veolia program, which began in 2014 and has already been deployed in several countries by 2EI Veolia (see boxed text). "We worked with the 'Impact Hub Tokyo' incubator to identify the existing local players and needs. We also set up a partnership to provide an excellence program for local entrepreneurs," continues Satoko Ibi. A call for applications will be launched in September 2019.

## An intensive six-month program

"Our plan is to choose eight to ten entrepreneurs, who will then be trained from December 2019 to May 2020," explains Nina Cambadelis, Evolution Director - Japan, Head of CSR and Sustainability for Veolia in Asia. The program will allow the social entrepreneurs to

- 1) clarify their projects, goals and clients,
- 2) define and develop their business model,
- 3) prepare their marketing and financing strategy, and
- 4) prepare themselves for a pitch event.

"Veolia has committed to supporting the program and the process. This process will be repeated every year or every other year," states Nina Cambadelis. This represents a highly innovative approach. Traditionally, the Japanese support the local economy via occasional financial aid or sponsorship actions, for example, for annual events. "We suggested

### KEY FIGURES

- Some 100 social enterprises incubated by Pop Up by Veolia
- 5 years' experience
- 14 programs worldwide
- Some 20 collaborations (partnership between targeted social enterprises and Veolia)

a very different approach to structure the local players and produce a social economy ecosystem," explains a delighted Kazuhiro Uchino, Vice-President of Veolia in Japan. The idea of a social economy is also something very recent in Japan, where actions of this kind are primarily carried out by NGOs and charitable programs. A twenty-year concession awarded to a global player, a host of innovative solutions, and a long-term scheme for developing local initiatives: "Japanese local authorities will be keeping a close eye on this project's implementation, as many cities are facing the same problems. The market will understand the added value that we can bring," Kazuhiro Uchino enthusiastically observes. ■

1- Japan's population decline accelerates despite record immigration, *Financial Times*, April 2019.  
2- op. cit.



**Benoît Ringot**  
2EI Project Director,  
Innovation division, Veolia

## Co-creating innovative local solutions with social startups

It all began in 2008, when we set up a partnership with the microcredit group Grameen, whose Managing Director Muhammad Yunus was awarded the Nobel Peace Prize. Its aim is to produce affordable drinking water in rural areas where the groundwater tables are naturally contaminated with arsenic. As such, we created a joint venture with the Grameen group to produce and distribute drinking water. We innovated, tested several economic strategies, supported local populations to facilitate their understanding of the issues, and we are, today, very satisfied with the social and economic results. Following on from this experience, in 2014 we launched the social open innovation project Pop Up by Veolia. Through this program, we want to help local entrepreneurs flourish and co-create innovative solutions to meet the social challenges faced by our stakeholders. The initiative is offered as an option to local authorities whom we feel are interested in this type of social solution. The Pop Up by Veolia program starts with a diagnostic phase carried out by 2EI to identify the most pertinent local issues to be addressed. Veolia then launches a call for applications and the winners are supported free of charge in incubators for several months. This allows them to more effectively shape their approach and business model. Veolia will rely on 2EI to co-construct innovative solutions with the most promising entities, for instance by providing funding, professional expertise or a business opportunity.



## Two co-construction examples

**INDIA.** Incubated in 2018, FORCE (Forum for Organized Resource Conservation and Enhancement) is a non-profit, non-governmental organization. It focuses on solving community-level sanitation problems. Veolia worked with the organization to reinforce the Nangloi Water Service's social welfare team. The teams will meet 300 households weekly over a six-month period in Nangloi (in the New Delhi agglomeration) to raise awareness about the importance of drinking water and legal water connections.

**FRANCE.** Incubated in 2016, La Cravate solidaire is an organization based in Lyon. It supports entry into employment by providing men and women with professional clothing free of charge and offering job seekers the opportunity to sit practice interviews. Veolia worked with the organization, running three clothing drives at Campus Veolia, hosting the entity at its Campus, and holding mock interviews for beneficiaries.

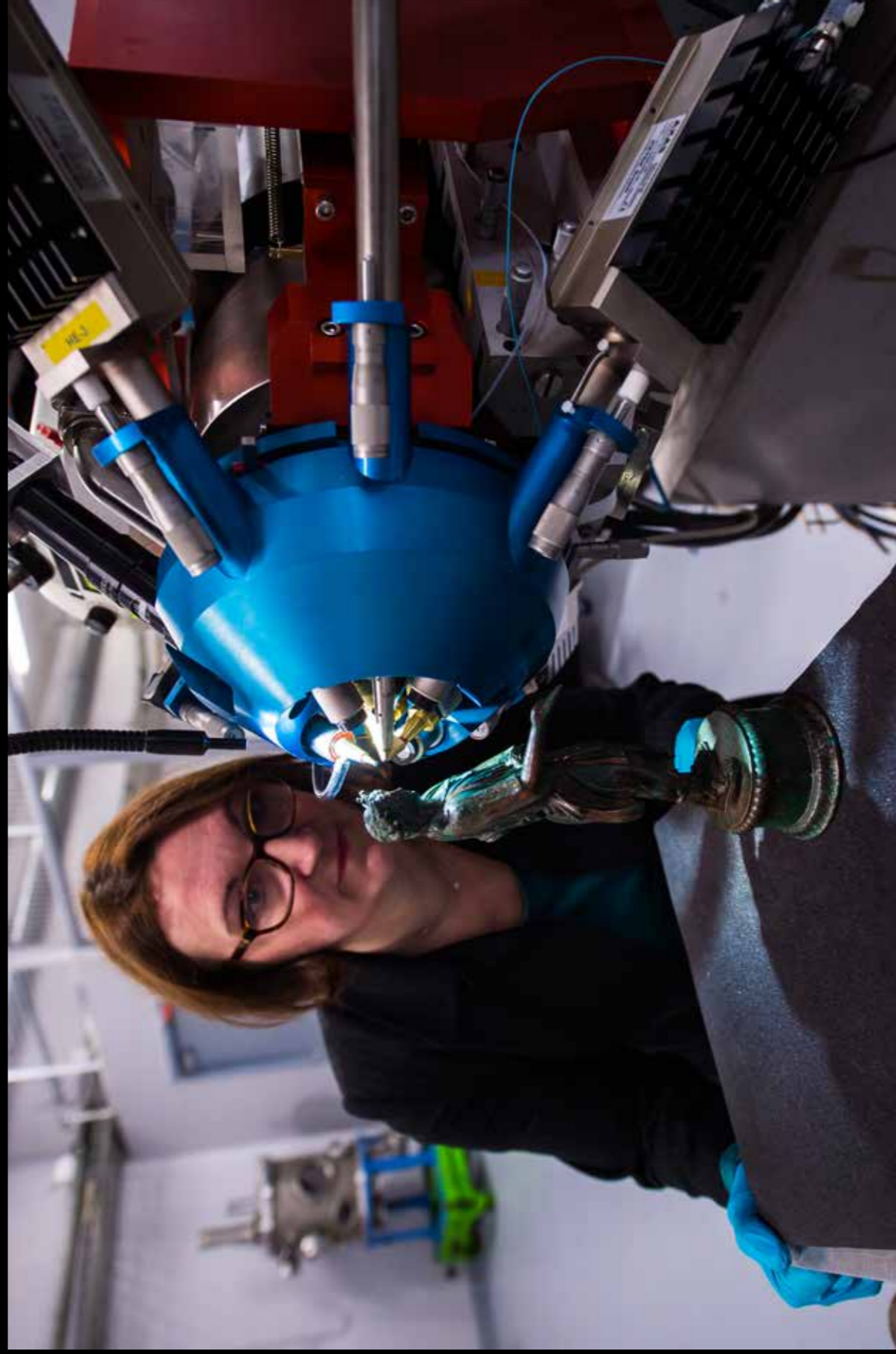
# “Aglaeé” or cutting-edge technology on behalf of heritage

Its stones are over nine centuries old and it is home to works that have been around for millennia, but this doesn't mean that the Louvre museum isn't fully in step with the 21st century. As demonstrated by the Aglaé (Accélérateur Grand Louvre d'Analyses Élémentaires) particle accelerator. Inaugurated in 1989 and upgraded to “New Aglaé” with the “Equipment of Excellence” label in 2017, this one-of-a-kind, state-of-the-art instrument makes it possible to study works of art and antiques without damaging them. A particle accelerator that propels ions onto works of art at 20,000 kilometers per second, Aglaé seems to belong more to the realm of science fiction than museology. These ions interact with the material, giving rise to luminous radiation that varies depending on the type of atoms present. Researchers can thus explore the upper layers of the objects studied in detail, identifying not only their chemical nature but also their location. Statues, paintings and other works of art still have secrets to reveal...



**The Aglaé particle accelerator** points its beams at a bronze Gallo-Roman statuette buried in the late 3rd century AD, discovered in Bavay in Northern France.

**Located under the Louvre museum at the heart of Paris** in the Center for Research and Restoration of the Museums of France (C2RMP), Aglaé is a particle accelerator that propels ions onto works of art. The analysis of the resulting radiation provides information about the work's chemical composition.



**The aim of the study conducted by Aglaé on the Bavay bronze** treasure discovered in Northern France is to find out the internal structure of this statuette and deduce its production methods in the Gallo-Roman period.

**Researchers look** at the X-ray of a painting by French artist Nicolas Poussin (1594-1665) presented at the Center for Research and Restoration of the Museums of France. This X-ray analysis makes it possible to discover the painting's internal structure



**Using 2D fluorescence**, a non-invasive imaging process, the researcher can analyze the pigments in Nicolas Poussin's painting: iron indicates the presence of white, mercury corresponds to vermilion, etc.

An employee installs a painting by French artist Nicolas Poussin in preparation for its analysis at the Center for Research and Restoration of the Museums of France.



An ancient item of Gallo-Roman treasure from Bavay is analyzed at the Center for Research and Restoration of the Museums of France.

A few signs warn of the dangers of radiation, reminding us that we are in a scientific laboratory and not a museum open to the public, despite the presence of magnificent artworks.

## Christophe Petit-Tesson: reportage first and foremost

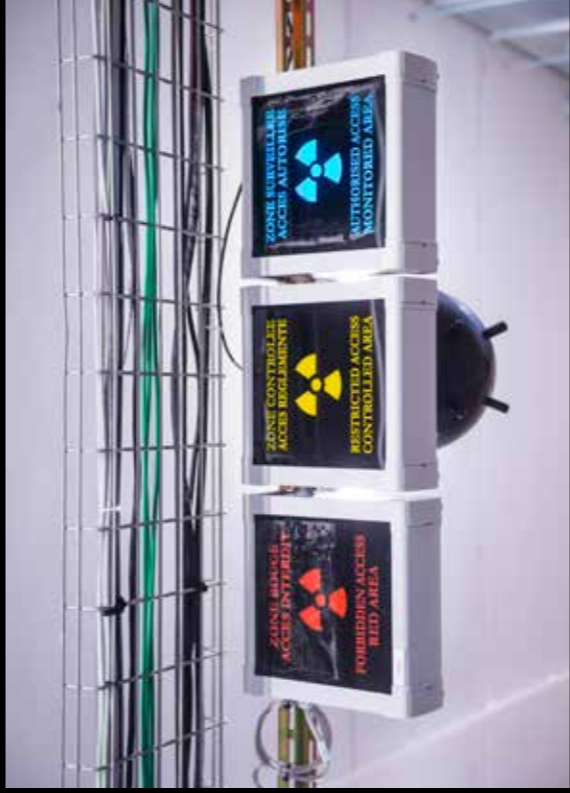
The Louvre, its paintings, sculptures... and state-of-the-art stones... and state-of-the-art analytical devices! It was this contrast between the past and modernity, art and technology that fascinated Christophe Petit-Tesson during his report on the Accélérateur Grand Louvre d'Analyses Élémentaires (Aglae) in the museum's basement. "You go down hidden little corridors, like in a mysterious den with a concealed door, and arrive bang in the 21st century in a room with machines and pipes," he recalls.

At the Louvre, he appreciated working with researchers and technicians. Some study Roman statuettes. The inspection is so advanced that it reveals what quarries the stones come from. In other laboratories, paintings are analyzed using a raking blue light to discover if the painting conceals another one. To reflect the studious mood of the setting in his photos, Christophe Petit-Tesson works using natural light, occasionally relying on a simple flash. "I like to shoot in reportage mode, without reworking the light," he states. "I want to be aesthetic without being artistic. I want to bear witness, convey the subject with my sensibility, but without transforming it."

While reportage is his trademark, his subjects vary widely. They are sometimes scientific, like this report on Aglaé or the one he has just finished on the Sanctuary project, which involves sending knowledge and works engraved on sapphire disks to the moon. But he remains first and foremost a generalist press photographer, covering a wide range of topics from the conflict in the Middle East through sports to French politics.

## Bio

Christophe Petit-Tesson got his passion for photography from his father. His hobby became a profession at the age of 25, after working in a Parisian photo laboratory. Originally self-taught, he subsequently trained at the Iris center for photography. A press photographer for twenty years, he regularly travels to Georgia, Armenia, Turkey, Kurdistan and Iraq.



# INNOVATION, A KEY DRIVER OF GROWTH AND CREATIVITY

Now more than ever, for both new and established businesses, innovation is crucial to consolidate positions and open up new markets. It is also an essential lever to keep a step ahead of the changes and needs that will shape the future. To achieve this, Veolia strives to develop a culture of innovation within the Group by relying on technological, human, and digital axes that facilitate dynamic change.

## No sustainable

business without innovation. Antoine Frérot, CEO of the Veolia Group, continually reminds us that “opening the way, making a mark, being one step ahead, creative, and bold, and taking the risk of novelty is the role of a world leader that wants to be the benchmark in its industry.” Technological advances are the first things that come to mind when beginning this journey to innovation and change, but innovation does not just concern machines: innovation also affects business models, governance and our people. At Veolia, what began as a simple yet vital need for clean drinking water for all grew into creating wastewater treatment solutions, then developing facilities that produce energy ...

... and can extract nutrients to be used in farming from wastewater: showing that the Group's history can be told through its 165 years of innovation.

Veolia wants to pave this continuously renewed path leading to a world that not only respects nature but also creates wealth: the Group continues to pursue links between established activities – such as water access, and emerging activities that will be crucial issues for the health of the planet in the future – like air quality, issues that need strengthened solutions for the benefit of as many people as possible.

### Innovation or the ability to turn constraints into opportunities

Any conditions can foster innovation. Firstly, regulations impose new requirements by enforcing environmental obligations on businesses and local authorities. Customer demand also provides a rich source to foster innovation. Social pressures to meet community expectations drive companies like Veolia to design services that alleviate impacts. Finally, climatic and demographic changes, and more generally, environmental constraints are becoming increasingly important, revealing the crucial need for alternative environmental

services, such as wastewater recycling in the Middle East or Asia. All these circumstances require businesses to adapt, evolve, anticipate... and, in short, innovate.

### Established markets, a regional mindset, and new business models

Innovation at Veolia aims to meet the needs of the Group's markets and propose solutions where new issues emerge. In a Group where businesses are at different stages of maturity from one region to another or one industry to another, innovation is created on a case-by-case basis.

An example of this is energy recovery from waste, a mature business for Veolia: "We are more in a regional mindset," states Jean-Christophe Taret, Head of Corporate Strategy at Veolia. "The waste treatment needs of what used to be one large customer has become many customers. For this to work commercially, we must have an innovative approach to markets or contractual models with customers (see Frontline Rookery South). In this complex ecosystem, Veolia intends to play a key waste management stakeholder role, with all this entails in terms of the design and financing of recycling facilities, the search for waste feedstocks upstream – via digital platforms – and downstream opportunities for recycled products."



**"For each activity, we ask ourselves, 'How can we go further to anticipate customer needs and market trends?' We need to be agile, keep on the lookout for new ideas to keep ahead of the competition. Whatever the activity, innovation is part of strategic thinking."**

**Jean-Christophe Taret,**  
Head of Corporate Strategy at Veolia

In the spirit of asset pooling, which is a major trend in industries that outsource ever more environmental services, Veolia is developing more operational efficiency projects with assets designed for several customers rather than one facility per customer: a new business model that combines technical performance with economic productivity. For example, in Indonesia, Veolia is building a plant primarily intended for Danone's recycled plastic needs. However, Danone will not make full use of the recycled food-grade plastic that the plant will produce.

Therefore, Veolia needs to find other customers to sell the surplus. "We will own the plant and, as such, we are taking the industrial risk," explains Jean-Christophe Taret. "We are responsible for sourcing the volumes of plastic to be processed and finding customers for our recycled plastic." Similarly, in the historical water market, Veolia has gained the competitive edge through contractual innovation. For example, in Nîmes (France), the Group has won a contract partly thanks to a mode of

...

Continued on page 46



**Claire Falzone,**  
CEO of Nova Veolia

### "With Nova Veolia, we are developing digital innovations"

Nova Veolia was created in 2015 to offer innovative digital services. Through its subsidiaries, it markets solutions for its customers serving the environment and smart regions. It takes stakes in startups and partners a number of local business incubators and economic development bodies, with the aim of ensuring that Veolia becomes a smart city operator and not just an operator in a smart city through these investments.

### What services do you provide?

We focus on local authority support and the creation of new services for citizens. For local authorities, we recommend improving their urban services management; we work with them on defining firstly a digital strategy for the region: identifying areas with local stakeholders, and leading innovation initiatives via our subsidiary Abylon. Birdz, another of our subsidiaries, offers Internet of Things solutions to measure and take action on the environment and resource consumption (water, waste, energy, air, etc.). We also offer to optimize equipment and operations management (through our subsidiary Majikan) to decompartmentalize services, increase efficiency and create new services for the local population. This last subject is at the heart of our concerns as we work to build stronger links between the local population and public services. For instance, we enable people to ask questions about waste via a chatbot on the city's website or report an incident, like bulky waste left on the street. Veolia's services can help resolve these issues, which guarantees better responsiveness.

### Can you share other Nova Veolia achievements?

HomeFriend, another of our subsidiaries, develops digital applications for cities. It has designed a chatbot that answers questions from residents and gets more accurate as the conversation goes on. Initially created for water issues, this chatbot can now answer questions on a variety of topics. Such as in Deauville (France), with Sophie the chatbot, who helps with the city's waste management. In Lyon (France), Homefriend and SOMEI have developed the app Togeth'air, which provides the population with information and advice and allows them to share their opinion on the city's air quality. We also have more forward-thinking projects, like the one Birdz has developed in partnership with Ledger to secure water quality data through blockchain technologies.

... governance where all the stakeholders (local authorities, consumer associations) are not just involved but also make decisions. Veolia is also developing social innovation in the water sector (see Frontline Hamamatsu).

Cross-fertilization

To meet climate change and economic sobriety issues, some hot topics need quick deployment. One solution Veolia offers is an innovative digital technology service, called Hubgrade, to monitor and manage energy consumption. Hubgrade is a 4.0 platform that identifies energy consumption anomalies for real-time response. With almost thirty Hubgrade centers worldwide, the Group plans to expand this solution and create synergies between its activities. Similarly, Veolia provides novel solutions and original business models in its new indoor air quality offering and use of waste heat from wastewater networks. Veolia targets the most promising topics and encourages the sharing of existing facilities and cross-fertilization between the head office and business units, between the business units themselves, and outside the company through open innovation to ensure that these new areas of development become sustainable solutions.

Instill a culture of innovation

Encouraging employees to share their ideas helps instill a culture of innovation within

the Group: implementing a reward system for those who put forward and develop innovations fosters this culture. To be bold, we need to accept failure and know when to stop. "Behind technical, economic, or social innovation, there is always managerial innovation," emphasizes Jean-Christophe Taret. "We need to give all hierarchical levels an opportunity to speak out so that all ideas are expressed." Incremental, gradual, locally developed innovation is widespread. The sum of all these small improvements has a big impact. When the process is successful, the challenge is to extend innovation to the whole group, worldwide. "An innovation that works is developed through a preliminary collective selection of good ideas, then co-worked with the various operational entities involved, both participating from the beginning in the design of the offering and the business model," explains Jean-Christophe Taret. "We are always at the service of the business units, to meet their innovation needs," adds Christophe Nebon, Technical and Performance Director in charge of Veolia's Research & Innovation department. Veolia is increasingly developing these innovations with its stakeholders, whether customers, employees or startups. "Co-development is always the aim: we create an innovation with our partners and customers, which is then replicated and adapted for each customer," says Jean-Christophe Taret. ■



**Christophe Nebon,**  
Technical and Performance Director in charge of Veolia's Research & Innovation department

**"Veolia has two innovation development strategies: consolidation of offers and new market development"**

"The first strategy strengthens the existing business, making it more efficient. For example, in the field of energy recovery from waste, refractory material is expensive. Research focused on making it more durable over time. Thus, an innovative refractory tile with a longer life was developed to reduce maintenance costs and reduce downtime in energy recovery processes.

The second strategy concerns innovations that enrich existing offerings or develop new ones: in water resource management, modeling tools have been developed to better plan the use of these resources according to their availability. In water treatment, new solutions have been developed to meet increasingly demanding quality standards.

For waste recycling and recovery, much research concerns the development of the Materials Recovery Facility 4.0, which integrates artificial intelligence (AI) technologies capable of analyzing waste streams and controlling automatic sorting. We are currently developing a gantry, placed over the sorting lines, which continuously analyzes the waste stream and assesses sorting quality, using AI. This automatic quality control tool is currently being tested in France and the United Kingdom.

We support and accompany new areas of activity with strong growth potential, such as activities related to plastics formulation. For recovery, we sort plastics according to their type and sometimes their color; then we design recipes, notably adding additives that modify the properties of the plastic to meet customers' needs. This is called formulation or compounding. We work closely with plants to model and industrialize this expertise. The aim is to promote the integration of recycled materials into manufacturers' products and innovate by designing new uses or new designs of material produced by Veolia.

Innovations are developed thanks to the skills of R&I teams and an open innovation approach (see Explainer) with innovative young companies. For air quality, we assess what exists on the market and, if necessary, we improve it with our partners. Innovation, yes, but pragmatically!"



Creating a new job that promotes both an environmentally friendly approach and a return to work: this is the idea put forward to Veolia by employees on the ground to support several of their colleagues unable to resume their original position after health problems. The initiative has been in place since 2016 in Cartagena in northern Colombia, where the Group manages urban cleaning services. It received Veolia's 2019 HR Initiative Award in the "Social responsibility, diversity and cohesion" category.

**Colombia: environmental conservation and retraining go hand in hand in Veolia's "observer" scheme**

Following a long-term and often debilitating illness, it is not always easy for employees to return to work. Companies must therefore adapt or even innovate if they do not want to lose this talent.

At Veolia in Colombia, the position of "environmental observer" was thus created for cases of this kind. After a medical checkup by doctors, staff members highly attached to the Group and keen to invest in the environment are trained for their new position. Their responsibilities include improving waste collection points and eliminating illegal waste dumping, along with cleaning up green spaces, particularly by raising awareness among visitors and local residents. They learn how to sort waste at source and teach others about it, and receive advice in how to maintain plots of land and sow plants there. Each working within a given scope, the "observers" put their training into practice to establish a new

environmental culture among those living directly beside these green spaces. Thanks to discussions with residents and their concrete actions, areas such as Manzanillo Park, where waste had been accumulating for years, have now been given a new lease of life. "Veolia has had a very positive impact in this park: the green spaces have been rehabilitated thanks to the plants sown and the local residents made aware of the importance of disposing of their waste, not on the ground but in the bins provided to this end," explains María Del Carmen Barco, a Cartagena resident. And this has also given a new lease of life to the "observers," offering them the opportunity to start over in a sympathetic framework that gives them the daily satisfaction of seeing how their actions positively impact their environment.

The "environmental observers" in figures

- > 7 observers are active in 20 localities
- > 15 training workshops have been organized for their benefit
- > 80 environmental awareness-raising workshops have been offered for the local communities
- > 600 plants have been sown since the launch of the initiative
- > 93% of residents appreciate the observers' role and 87% are satisfied with the collection point upkeep and the positive impact on their neighborhood.



**EXPLAINER**

# VIA by Veolia: Open Innovation a solutions accelerator

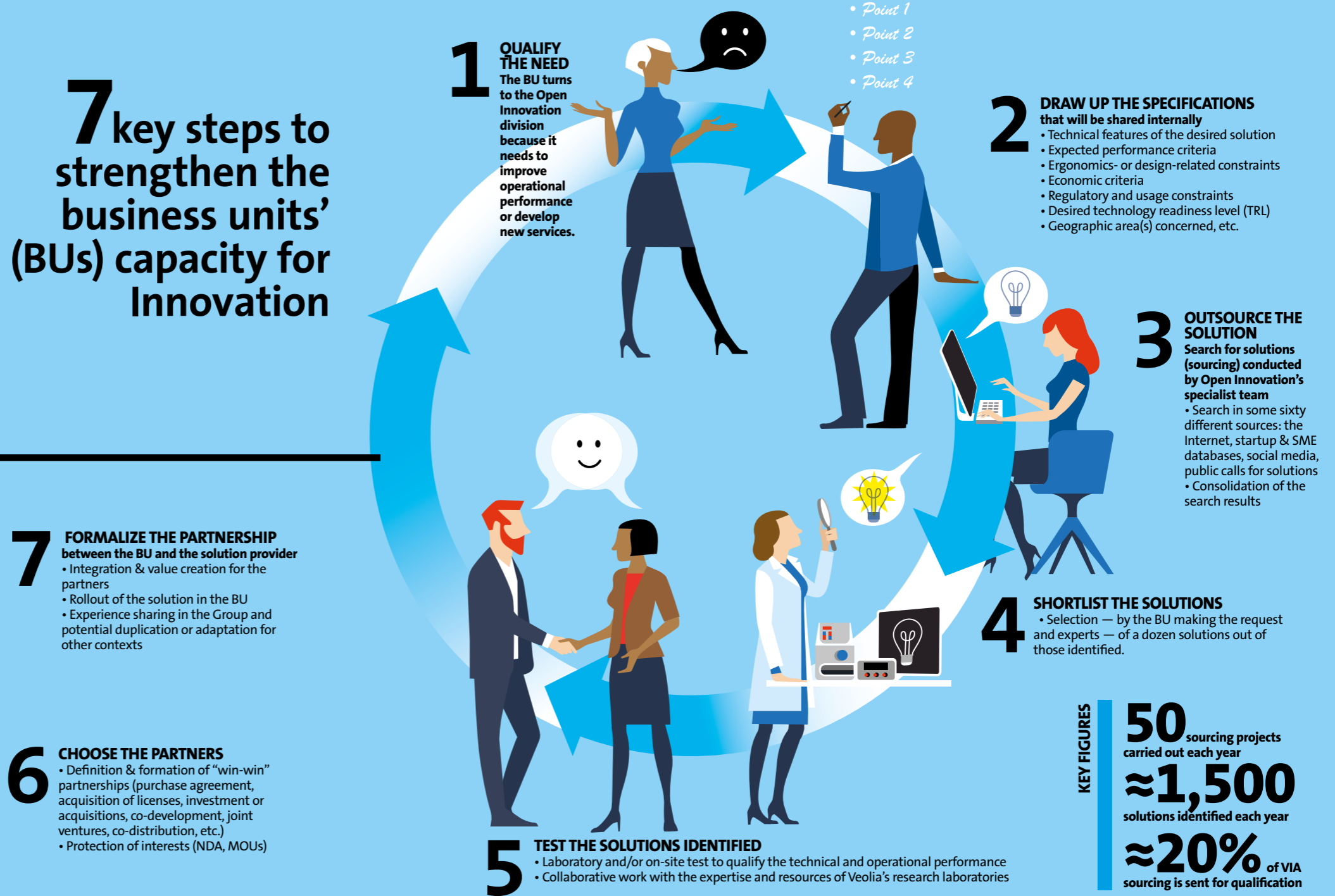
Given the nature of the environmental concerns we are facing, companies find themselves obliged to take a technological leap in every field. The scale of the challenge means that we must leave no stone unturned when it comes to innovation. At Veolia, this is the role of the Open Innovation program — VIA by Veolia. Taking the form of a department dedicated to operational units and support functions, it helps them gain rapid access to emerging and disruptive solutions developed outside the company.

48/49

Today, within Veolia's Research and Innovation division, Open Innovation serves as a complement or support to research programs. Open Innovation will create value in domains in which needs have been identified but internal expertise is less developed. VIA by Veolia gives the Group the capacity to rapidly detect, validate and collaborate with budding companies in the startup and SME ecosystem. The Open Innovation team provides its expertise and contacts with the cleantech and energy tech ecosystem to carry out sourcing, allowing the most promising innovative external solutions to be identified. It oversees the analysis, selection and qualification of the sourced solutions, while

guiding the business units in forming partnerships. Within the Group, the team also supports Open Innovation initiatives by the zones and Business Units, such as Germany and its U-Start program. Externally, the team collaborates with several key clean-tech players, including the Cleantech Group and Greentown Labs in Boston, the largest clean-tech incubator in the United States. In Europe, via U-Start, the Group partners InnoEnergy and EIT Raw Materials. Veolia's R&I is also a partner of the IncubAlliance incubator attached to the Paris-Saclay Campus. In 2018, the Group joined forces with the European Commission's European Innovation Council for a Pitch & Networking day focused on Innovation in support functions. ■

## 7 key steps to strengthen the business units' (BUs) capacity for Innovation



**KEY FIGURES**

- 50 sourcing projects carried out each year
- ≈ 1,500 solutions identified each year
- ≈ 20% of VIA sourcing is sent for qualification

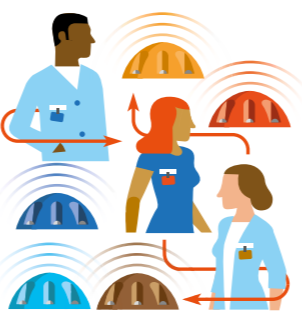
### OPEN INNOVATION IN ACTION/A SENSOR FOR RECYCLING POINTS



VEOLIA WASTE SOLUTIONS (WS) TURNED TO VIA BY VEOLIA to identify and test (qualify) economically viable solutions to reliably measure the fill rate of recycling points, whatever the season, and then send the data to Veolia to optimize waste collection. These solutions would function independently at least for the duration of the longest contracts (7 years and more).



BASED ON THESE SPECIFICATIONS, international sourcing identified 45 new products able to meet WS's requirements.



THANKS TO A COLLABORATIVE APPROACH between the Research and Innovation division, WS, IT and Birdz (a Nova Veolia subsidiary), five sensors were chosen for qualification tests in the laboratory and on the ground in France.



BASED ON THE PRELIMINARY CONCLUSIONS from the tests, Veolia has already ordered 500 examples of the sensor chosen for installation as part of two contracts.



THE SENSOR MODEL CHOSEN will be rolled out on the French market. BUs from other zones (United Kingdom, Germany, Australia, Singapore) are keeping a close eye on the results of this project.



15/1

## Air'Volution: the compressed-air multiservice vehicle

With Air'Volution, Veolia is designing the future of waste collection and management services. The aim of this highly innovative project is to develop a 100% clean and scalable vehicle.

Thanks to its compressed air-powered engine, this extraordinary vehicle emits neither fine particles nor nitrogen oxide. Rechargeable in a few minutes at a pre-compressor station or in five hours at a "standard" charging

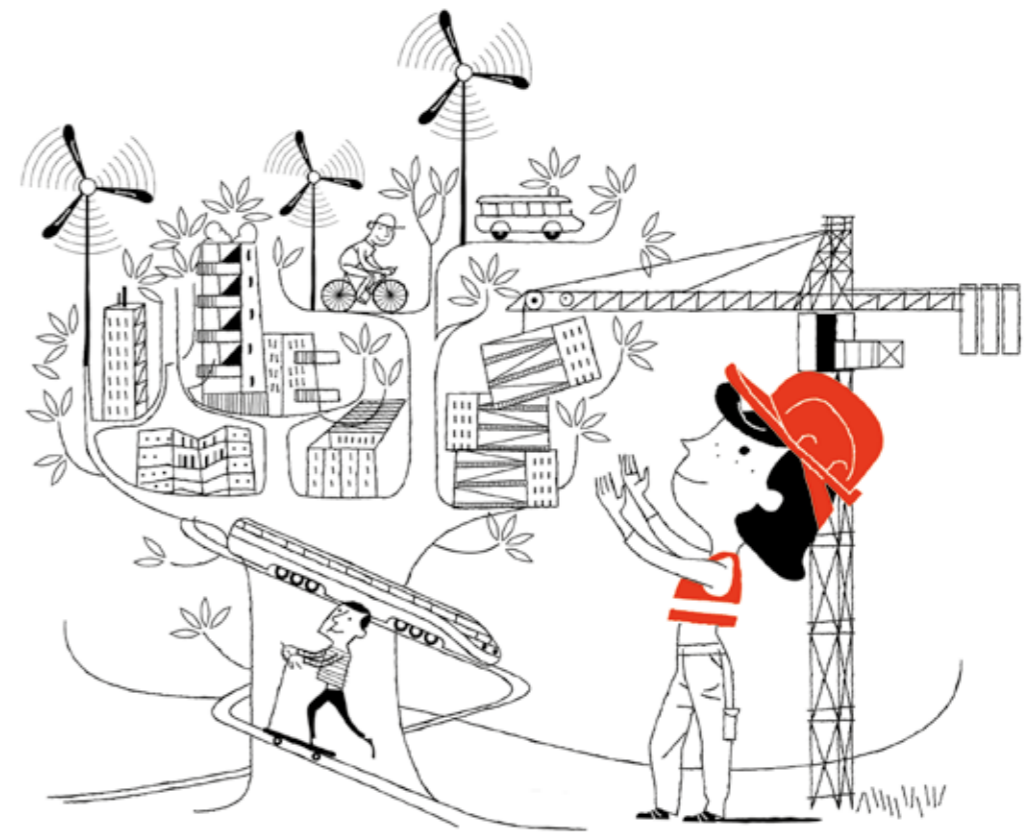
station, it will have a range of 50 km and be able to move around just as easily in an urban environment as on private — particularly industrial — sites. This versatile vehicle will be able to integrate different interchangeable

modules to carry out various tasks: a bin to collect waste, a flat bed to transport up to a ton of bulky items, or a mobile water tank for high-pressure cleaning. Air'Volution could even one day be used in other fields, such as passenger transport.

**A deliberately disruptive design**  
"With its innovative design, this vehicle is part of the new 'green dynamic' driven by the expectations of a society increasingly concerned by environmental issues. It will catch the attention of passers-by in the street and give even more meaning to our waste collection and management activities," explains Romain Defrance, Project Manager at Veolia Propreté Industries Services, in charge of Air'Volution since March 2018.

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# INDOOR AIR QUALITY OFFER

1

## AIR CONTROL : Continuous air quality measurement and monitoring



- Step 1 Assess the level of air quality
- Step 2 Identify the potential sources of pollution
- Step 3 Propose appropriate solutions

**THE BENEFIT**  
Be aware of air quality to actively improve the environment

3

## AIR HUMAN : Involve all stakeholders in improving buildings air quality



- Step 1 Make information about air quality accessible and understandable
- Step 2 Involve users in remediation actions
- Step 3 Take into account the perceptions of the people concerned

### THE BENEFITS

Make occupants, employees and users the "actors" in improving air quality; anticipate and prevent risks around the perception of air quality

2

## AIR PERFORMANCE : Manage and optimize facilities and guarantee air quality levels



- Step 1 Assess the air quality level
- Step 2 Optimize practices and facility operation
- Step 3 Provide a results guarantee and performance tracking

**THE BENEFIT**  
Provide quality air in buildings

### OPTION AIR PERFORMANCE +

- Improve existing air treatment facilities
- Install new equipment