



# Twentyfour7.

*Wärtsilä Stakeholder Magazine*

→ 01.2019





# \*contents

Wärtsilä Stakeholder Magazine\*

## REPORTAGE

**16 AN IDEAL ENERGY SOLUTION?**  
Hybrid plants help ensure the stability of power supply.

## FEATURE

**26 TIME TO ACT!**  
The coral reefs are in danger. Luckily, we can still save them.

## SOLUTION

**54 THE GREENER THE BETTER**  
Retrofitting an energy storage solution to North Sea Giant.



## FEATURE

**22 FUTURE IS CALLING**  
Blockchain can have a big role in digitising global shipping.



## PASSION

**46 EVERYTHING COUNTS**  
Saara Kujala thinks that even the smallest things can bring big changes.



[ CONTENTS ]



# \*contents



# 32

PASSION FOR BIG DATA

## Around the globe

### 10 SNAPSHOT

A sneak peek at Wärtsilä's Experience Centre

### 12 NEWS IN BRIEF

Aruba says yes to clean energy

### GLOCAL WATCH

Underwater services grow stronger

### WORDS & NUMBERS

### 13 SUSTAINABILITY

The clock is ticking. It's time for us to act.

### TRENDS & SCENARIOS

Meat from stem cells

### 14 CORPORATE CITIZENSHIP

PACE organization helps girls build successful careers

### 15 COLUMN

Committed to green technologies

## Sign off

### 69 MORE TO COME

Wärtsilä turns 185 this year

### 70 AT YOUR SERVICE

Platform for innovation

### 71 CLASSIC

Horse power

### CULTURE

3D images out of light

### 72 AMBITION

Energy is everyone's business

### 74 LITTLE ENGINEER

Become a superhero

### THE GEAR

### 75 TRANSFORMATION

Towards a 100% renewable energy future

For more articles and online-only features, visit [wartsila.com/twentyfour7](http://wartsila.com/twentyfour7)

## in detail

### 60 FLEXIBILITY IS THE KEY

Greener future for UK's electricity market

### 62 BITCOIN MINING

How much energy does it use?

### 64 SAFER AND EASIER DOCKING

SmartQuay solution offers it all

### 66 MEET WÄRTSILÄ 14

The new engine is compact, fuel-efficient and sustainable

**Publisher:** Wärtsilä Corporation | Hiililaiturinkuja 2 | 00180 Helsinki | Finland | Telephone: +358 10 709 0000 | **Email and feedback:** [twentyfour7@wartsila.com](mailto:twentyfour7@wartsila.com) | **Editor-in-Chief:** Atte Palomäki | **Managing Editor:** Virva Äimälä | **Editorial team:** Marit Holmlund-Sund, Mari Kankaanranta, Pia Posio, Laura Quinton, Mirja-Maija Santala, Sanni Suominen, Mikaela Terhi | **Editorial office and layout:** Spoon Helsinki | **English editing:** Michael Miller | **Printed by** Punamusta | Joensuu | Finland | **ISSN** 1796-2161 | WÄRTSILÄ® is a registered trademark | Copyright© 2019 Wärtsilä Corporation | **Paper:** cover Galerie Art Gloss 250 g/m<sup>2</sup> inside pages NovaPress Silk 90 g/m<sup>2</sup> | **Front cover photo:** iStock | **Other cover and sleeve photos:** Wärtsilä and iStock

Written permission from Wärtsilä Corporation is required for the reproduction of articles in whole or in part.

Follow us on:



[www.wartsila.com](http://www.wartsila.com)

The following information contains, or may be deemed to contain "forward-looking statements". These statements might relate to future events or our future financial performance, including, but not limited to, strategic plans, potential growth, planned operational changes, expected capital expenditures, future cash sources and requirements, liquidity and cost savings that involve known and unknown risks, uncertainties and other factors that may cause Wärtsilä Corporation's or its businesses' actual results, levels of activity, performance or achievements to be materially different from those expressed or implied by any forward-looking statements. In some cases, such forward-looking statements can be identified by terminology such as "may," "will," "could," "would," "should," "expect," "plan," "anticipate," "intend," "believe," "estimate," "predict," "potential," or "continue," or the negative of those terms or other comparable terminology. By their nature, forward-looking statements involve risks and uncertainties because they relate to events and depend on circumstances that may or may not occur in the future. Future results may vary from the results expressed in, or implied by, the following forward-looking statements, possibly to a material degree. All forward-looking statements made in this publication are based only on information presently available in relation to the articles contained in this magazine and may not be current any longer and Wärtsilä Corporation assumes no obligation to update any forward-looking statements. Nothing in this publication constitutes investment advice and this publication shall not constitute an offer to sell or the solicitation of an offer to buy any securities or otherwise to engage in any investment activity.

DISCLAIMER

# editorial



## A connected world, a better world

**20.4 BILLION. THAT'S THE NUMBER** of connected devices Gartner expects to be in existence by 2020. This vast network of connected devices will allow us to collect real-time data on nearly every facet of our lives. Sophisticated Artificial Intelligence (AI) systems will then analyse this colossal amount of data and use it to optimise the efficiencies of different systems and processes that impact life on earth.

This is especially true of the maritime and shipping sector. While ships and ports get smarter with technologies such as auto-docking, and while autonomous vessels make operations safer and more efficient, technologies like blockchain and 5G networks are helping standardise systems and processes at high velocities across the entire shipping industry.

Meanwhile, in the energy space, flexible power generation systems adjust automatically to weather conditions, storing excess power and optimising the grid, ensuring that it is fed with clean and affordable energy at every moment. This coupled with hybrid power plants are showing countries the way to transition to renewable energy safely.

Thanks to connectivity, all of this is happening seamlessly at a rate unheard of. And in order to safeguard these systems, it is also essential to pay heed to cyber security. By ensuring that security is at the core of our people, processes and technologies, we are able to minimise risks and increase our vigilance.

What is the end result of all of this? Improved efficiency is certainly a given. But more importantly, it means reduced waste, fewer emissions and less pollution, all of which adds up to an increasingly sustainable business.

At Wärtsilä, as we celebrate our 185th anniversary this year, we have seen our planet undergo tremendous change. Climate change and pollution are the cardinal challenges of our times, and we are committed to overcoming them. The company has redesigned itself many times over the decades in order to create long-term value in this changing world. Now we are doing it all over again, turning into a data-driven, digitally connected, as-a-service enterprise.

I hope you find the content in this magazine inspiring, and that it helps you understand how smart technology can enable sustainable societies.

### Atte Palomäki

Executive Vice President  
Communications & Branding  
[atte.palomaki@wartsila.com](mailto:atte.palomaki@wartsila.com)  
twitter: attep



# Speed should never sail solo



We are all familiar with the advantages of high-speed engines. Wärtsilä 14 adds the most complete marine offering on Earth to the equation, as well as the industry's largest lifecycle support and service network. Watch the benefits multiply.

Read more at [www.wartsila.com/wartsila14](http://www.wartsila.com/wartsila14)





# \*around the globe

NEWS & ONLINE | GLOCAL WATCH | WORDS & NUMBERS | TRENDS & SCENARIOS | CORPORATE CITIZENSHIP

## Gear up for a high-tech ride

**THE WÄRTSILÄ EXPERIENCE CENTRE**, part of the recently opened Wärtsilä Helsinki Campus, uses the latest in audio-visual technology.

Inside the 250-square-metre exhibition room, visitors can don a virtual reality system that enables them to visit a power station or a cruise

ship and get a first-hand look at Wärtsilä's smart and innovative solutions in action.

A 10-metre, 180-degree curved screen also helps them observe vessels moving around the world, helping them understand how Wärtsilä's smart solutions are used globally.

PHOTO: MARJA VÄÄNÄNEN



# News

## ARUBA TRANSITIONS TO CLEANER ENERGY

Last year in December, Wärtsilä signed a contract to deliver a dual-fuel power plant to the Caribbean island of Aruba.

The 102 MW plant ordered by the local utility, Water – En Energiebedrijf Aruba N.V. (WEB), will enable the company to transition to a cleaner and HFO (heavy fuel oil)-free future.

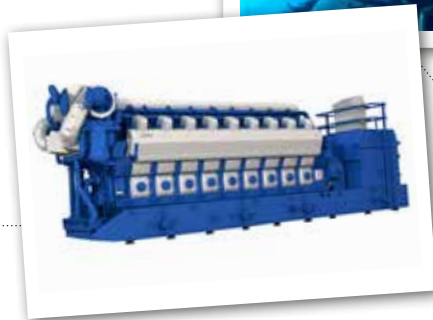
While the plant will initially operate on HFO, it will eventually switch to liquefied natural gas (LNG) when LNG becomes available on the island. The plant will also have the flexibility to switch to alternative back-up fuels (HFO or LFO) should it be necessary.

“WEB has been aggressively taking steps to increase the efficiency and diversity of its generating assets,” says **Luis Oduber**, CEO, WEB Aruba. “Central to this is the adoption of greater levels of renewable energy, and for this, our existing plant needs to be replaced. The new Wärtsilä plant has the efficiency and flexibility needed to meet our needs.”

The six Wärtsilä 50DF dual-fuel engines that will power this plant will facilitate the integration of higher levels of wind and solar into the system. Thus, the overall emissions will be largely reduced and will have a positive impact on the environment.

The plant is expected to be fully operational by February 2020.

ENERGY  
MAKE THINGS HAPPEN



### MEXICO:

Wärtsilä delivered a 130 MW power plant to Pemcorp, a Mexico-based independent power producer, on a fast-track basis. The natural gas-fuelled plant that was ordered in October 2017 commenced full operations in September 2018, just 11 months after the signing of the original order. The facility, located close to the city of Monterrey, will supply electricity to a nearby major Asian automobile factory under a long-term power purchase agreement. Wärtsilä also operates and maintains the facility under a three-year operation and maintenance (O&M) agreement, which includes a 15-year Guaranteed Asset Performance Agreement.

## Wärtsilä GLOBAL WATCH



### ARCTIC:

Wärtsilä's 31DF dual-fuel engine will power a new, highly advanced polar luxury cruise vessel. The 150-metre ship is being built for the France-based operator Ponant in Norway. Since the vessel will operate in the environmentally sensitive Arctic and Antarctic waters, Wärtsilä's engine is the perfect choice for the vessel. It runs on LNG and is known for its fuel efficiency and minimal emissions. In addition, Wärtsilä will use high levels of connectivity and digitalisation to enable the highest levels of safety and have the least possible impact on the environment.

EXCITEMENT  
RESPECT AND TRUST



### SPAIN:

Wärtsilä strengthened its position in the underwater services market by acquiring Burriel Navarro, S.L., a Spanish company. Burriel Navarro specialises in a range of underwater work, including inspection, repair and hull cleaning. From its head office in Valencia, the company operates an extensive service network in the main ports of Spain. The acquisition will help Wärtsilä grow its underwater services and expand its presence in the European market.

DO THINGS BETTER  
EXCELLENCE

# EVERY MONTH COUNTS

TEXT: LENA BARNER-RASMUSSEN PHOTO: 123RF

Enough of talking. If we are to set the course straight at a time that might be one of the most crucial in humankind's history, we need to act now. Here is how the shipping and energy industries can make a difference.

**THE UNITED NATIONS CLIMATE** Change Conference, COP 21, in Katowice, Poland 2018 was all about concrete actions. Because that is what is needed in a world that has experienced its 10 warmest years on record since 1998.

Wärtsilä, being active in two industries, shipping and energy, is in a pivotal position to take actions that make a real difference. Sustainability has been high on the company's agenda for several decades.

“The technology for a more sustainable shipping industry and energy market has been in place for years. What has been lacking though are affordable solutions and a true will to change,” says **Marko Vainikka**, Director, Corporate Relations and Sustainability at Wärtsilä.

Luckily, we are seeing more affordable solutions now, and nations are increasingly setting aside their own agendas to grapple with one of humankind's biggest challenges so far: global warming.

“The IMO (International Maritime Organization) recently included climate change among its strategic directions and the European Commission announced a decision to adopt a strategic long-term vision for climate neutral economy by 2050 called ‘A clean planet for all,’” says Vainikka.

**BUT HOW DOES ALL THIS TRANSLATE** into something concrete? First, the marine industry.

The marine industry has traditionally been powered by less environment-friendly options like heavy fuel oil. A switch away from these will make a huge difference. This is where Wärtsilä steps in. It powers vessels with LNG. The ice-breaker *Polaris* and the passenger-ferry *Viking*

Grace are good examples of this.

Investments in fuel efficiency play an important role too.

“Shipping is by far the most efficient way to transport large volumes of goods from A to B. Over 90% of all goods are transported by sea. Since carbon emissions stand in direct proportion to fuel consumption, we can make a massive impact by looking at fuel efficiency from an end-to-end perspective,” says **Andrea Morgante**, Vice President, Strategy & Business Development at Wärtsilä Marine Business.

Affordable energy is the ticket to a better life and high on the agenda for most countries in the world. Coal is available and comes with a less hefty price tag. This is the main reason for the sluggish adoption of renewable energy sources like solar and wind. The good news is that the prices have come down a lot.

“In Finland alone, the price of wind energy has dipped by more than 50% in the two last years. This is the launching pad to wider adoption of renewable energy. Sustainability needs to meet affordability for change to happen,” says **Matti Rautkivi** at Energy Business, Wärtsilä.

**BUT THE SUN DOESN'T ALWAYS** shine and the wind gods are fickle. To make up for the days without sun and wind you need backup power. Wärtsilä's



solutions come with quick ramp-up times, which mean that you don't need your power plants to run on energy-consuming baseload power all the time. Different battery solutions for storing energy from solar and wind are also on the rise.

These solutions combined can help societies adhere to the calculations by the Intergovernmental Panel on Climate Change (IPCC), which state that 80% of the world's energy needs to come from renewable resources by 2050.

So the technology is in place for the world to change the trajectory of global warming. Now we need the will, and quite urgently so. According to IPCC, the coming years are probably the most crucial in the whole history of humankind. In this time frame, every month counts.

## [ WORDS & NUMBERS ]

USEFUL DEFINITIONS AND NUMBERS OF INTEREST.

### LANDLUBBER

If “flotsam” or “jetsam” strike you as strange, then you're likely a ‘landlubber’ – a term that refers to someone unfamiliar with the sea or even an unseasoned sailor.

### FATHOM

You may think that the word means “to understand or comprehend”, but a sailor knows that a fathom is also a unit of length – used primarily in nautical measurements and equal to six feet, which is approximately the length of outstretched arms.

# 57 TWh

As per the current estimates, the energy consumed by the cryptocurrency Bitcoin and its networks is 57 TWh in a year. By comparison, Switzerland's consumes 58 TWh of electricity in a year. A single Bitcoin transaction needs over 500,000 times more energy than a Visa transaction, resulting in huge carbon emissions.

## [ TRENDS & SCENARIOS ]

FUTURE PERSPECTIVES.



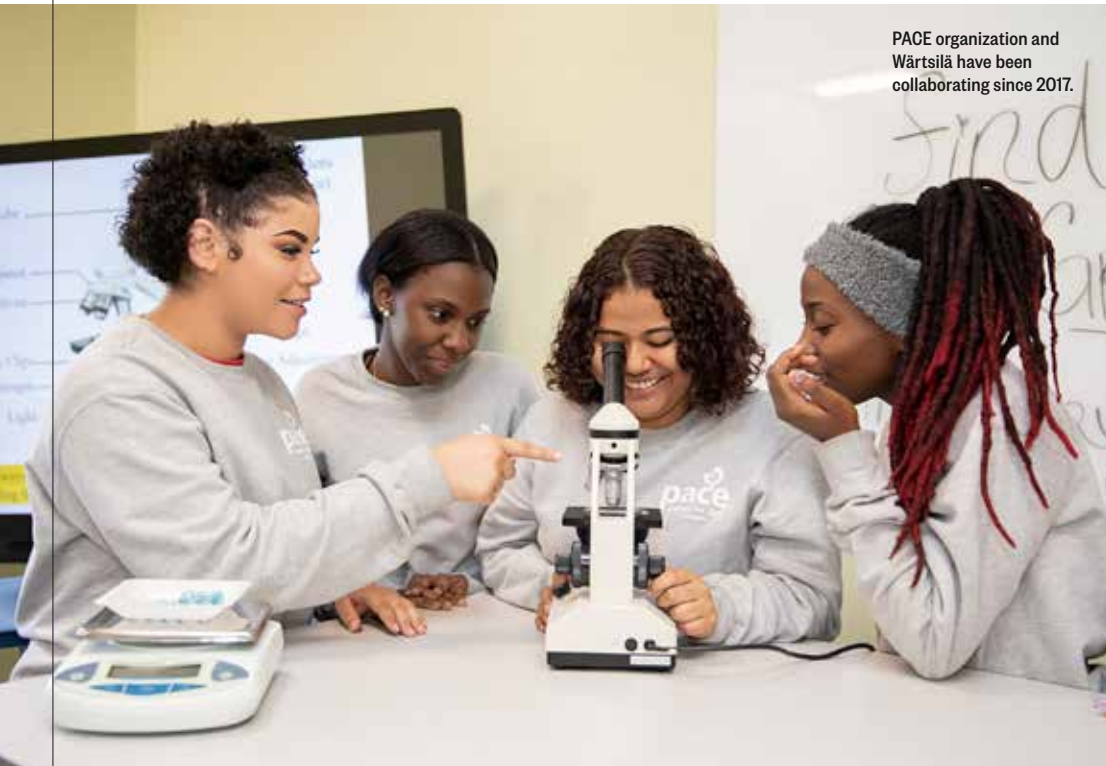
## ‘Frankenstein’ meat for healthy gourmet

As the environmental impact of meat consumption becomes clearer, “clean or cultured meat” may be the right solution for those unwilling to turn vegetarian. JUST Inc., a leader in growing meat from stem cells in a lab, is trying to recreate the

delicate, marbled Wagyu beef – a meat that sells for around USD 50 per 100 grams – in its bioreactor lab in San Francisco. The company already sells vegetarian versions of mayo and a bean-based product that turns into something resembling

a scrambled egg. Other firms too are working on creating similar products. While it sounds promising, at this stage the technology is simply too expensive to produce cultured meat on a scale that could be a viable alternative to the real thing.





PACE organization and Wärtsilä have been collaborating since 2017.

[ CORPORATE CITIZENSHIP ]

# Who runs the world? Girls!

In the United States, more girls are getting caught up in the juvenile justice system than ever before. What happens once they get back to their normal lives? See how an organisation called PACE is, with Wärtsilä’s aid, helping steer them towards successful careers.

TEXT: KAMALA GOVINDAN PHOTO: PACE CENTER FOR GIRLS BROWARD

**IN THE LAST 20 YEARS**, the number of girls entering the juvenile justice system in the us has been on the rise. However, most of their crimes are “status offences”. This includes truancy or running away from their home – all cases that are considered criminal activities for those under 18 years of age.

However, even once they’re out of the system, it’s not easy for them to rebuild their lives. Many have to fight against ‘recidivism’ which is the tendency to repeat offences.

“When girls are limited in their access to education and treatment, or when their numbers, relative to boys, increase in the juvenile justice system, particularly for assaultive behaviour, status offences, and technical violations of probation, we are often not supporting them or providing them with the tools they need to become successful adults. We’re not offering them opportunities to learn how to become healthy, safe, and productive,” states a report by Rights4Girls, a human-rights organisation that works to end gender-based violence in the us.

This is where organisations like Florida-based PACE step in. They provide gender-responsive services that help girls in the juvenile justice system. The not-for-profit organisation aids at-risk girls by

helping them with after-school activities, education, life-skills and career guidance from real-world role models.

**SINCE 2017, WÄRTSILÄ AND PACE** have been collaborating on this mission at PACE’s Broward County office.

“I was serving on the committee for PACE’s annual fundraiser called ‘Girls Just Wanna Have Fun Brunch!’ The proceeds from the fundraiser would help support the girls,” explains **Alicia Lockhart**, Agreement Sales Manager at Wärtsilä in Americas region. “So, I brought the sponsorship opportunity to our communications manager and she said, ‘This is amazing, let’s do it.’”

The partnership gave ten women in the office tickets to attend the fundraiser and a further ten were funded by Wärtsilä. Subsequently, several of them have also volunteered with Partners4Pace, PACE’s volunteer program that supports counselling and training for at-risk girls.

This support, says Lockhart, is key to guiding the girls towards a more secure future.

“Some of these girls take four different city buses to get to school every day. Some of them are within

the juvenile justice system and so, it is a vulnerable group here,” says Lockhart.

“I definitely think this support is important for them. Through my time working with these girls, I’ve heard some of them say – ‘Miss, I didn’t know I could be a lawyer or a doctor or an engineer. How do I get a job like yours?’ These girls don’t even know what they can do, what they are capable of. It’s important that we open their eyes and show them all the amazing opportunities they have,” she adds.

The kind of guidance that these role models and volunteers give ranges from helping girls write their resumes, to conducting team-building activities and helping them develop their presentation skills.

“Working with the Career & College Readiness Coach at PACE, we developed a skill-building workshop, where the girls came to our office and we treated them to a day of resume writing, learning how to face your fear of speaking in public and building leadership skills,” explains Lockhart. “After this day of learning, the girls were ready to take on a mock job interview. The girls are at a prime age for their first jobs, and none of them had ever practised an interview, so this was perfect timing.”

**MORE SPECIFICALLY, WÄRTSILÄ IS NOW** planning on helping PACE Broward County focus on providing training for science, technology, engineering and math (STEM) careers.

Girls interested in the fields of engineering, for example, could get a chance to receive a “mini-training from a coordinator,” says Lockhart.

The Wärtsilä Land & Sea Academy is one place where these students could potentially do that. The academy provides training for Wärtsilä’s customers and internal staff on the proper handling of ship and power plant equipment. It also caters to younger visitors.

“Previously, we’ve had schools come in here and even have had the ‘bring your kids to work’ day. We try to give a basic understanding of what our equipment is doing in the industry. We relate it to what they study in their science classes and what they see in their day-to-day lives,” says **Robert Miller**, Regional Training Manager, Wärtsilä. “It improves their understanding. When they come here, they can actually see what a specific company is doing with what they’re learning about.”

All this, says Miller, will be especially useful to the girls at PACE as the Wärtsilä Land & Sea Academy will be lending their support to the organisation and their programs for at-risk girls. ●

[ COLUMN ]

## Leading the charge against climate change

**THERE ARE TIMES IN YOUR LIFE** when something happens that will change your world view. The Climate Reality Project Leadership Corps Training in Berlin, Germany, was one such moment for me.

Climate Reality is a global network of activists committed to spreading awareness about the climate crisis and working on solutions for what is considered the greatest challenge of our times. More than 500 ‘Climate Reality Leaders’, like me, were part of an intensive three-day training programme conducted by a broad panel of international experts.

Presentations and panel discussions were the order of the day, with the most extraordinary being the presentation by former American Vice President and Nobel Prize laureate **Al Gore**. He talked about the science behind climate change, how it will shape the future, and what existing solutions we could deploy to cope with it.

**‘HOPE’ WAS A DEFINING THEME** of the training, revealing to us the infinite possibilities associated with tackling the climate crisis, and highlighting why the current period in history could emerge as ‘the great opportunity of change’ for the world.

Renewable energy is one such opportunity that can significantly change the path we are on. In fact, several countries are already scaling up their solar and wind capacities. But a change of any magnitude cannot be achieved alone. This is where communities come in. During our training, we were sensitised to work with communities and fellow Climate Reality Leaders from around the world.

Today, I am proud to count myself as part of what Climate Reality calls ‘a dynamic group of world-changers shaping the conversation on climate, everywhere from family dinners to international summits, and building a twenty-first-century movement for solutions.’ I am empowered, confident and re-energised to take the road less travelled, to actively participate in building and contributing to the regional and local chapters while mentoring more people in order to help tackle climate change.

**EVEN OUR OWN COMPANY**, Wärtsilä, is committed to renewables and green technologies in a big way. We launched our vision of 100% renewable energy in 2018. Our global initiative ‘An Oceanic Awakening’, which focuses on the radical transformation of the world’s marine and energy industry into one supremely efficient, ecologically sound and digitally connected ecosystem, is a case in point. We are working on making the Earth a better place. Are you with us?

**JANE JÜNGER**  
Communication & Marketing Manager, Wärtsilä in Norway

I AM EMPOWERED,  
CONFIDENT AND  
RE-ENERGISED TO  
TAKE THE ROAD LESS  
TRAVELLED.

PHOTO: PETER TUBAAS





# AN ENERGY SOLUTION FOR ALL SEASONS

While wind and solar power are considered game changers for the energy market, their intermittent nature has always been a problem. Hybrid plants that use conventional power-generation methods are one sure-fire way to ensure the stability of power supply. But even here, there is potential for improvement.

The Essakane solar plant is Africa's largest hybrid power plant.



**T**he use of solar and wind power has matured over the years with costs associated with such renewable sources of energy becoming much cheaper.

According to the U.S. Energy Information Administration (EIA), in 2015, around 12% of world marketed (bought and sold) energy consumption came from renewable sources such as biomass, geothermal, hydropower, solar, and wind which will increase to 17% by 2040.

Renewable energy has clearly galvanised the energy market with the numbers speaking for themselves. That is, however, until nature decides to be fickle.

“We have started seeing a growing amount of intense tropical storms, flooding, heatwaves, drought, forest fires and

coastal inundation. The economic losses have tripled in the past 30 years. There is an urgent need to mitigate climate change, as well as to adapt to it,” says **Petteri Taalas**, Secretary-General of the World Meteorological Organisation.

The effects of climate change were already visible in the summer of 2018 in Europe, with a period of extreme heat and sun, and no wind. This was something wind energy producers in the region were ill prepared for.

“Most renewable systems today are not smart,” says **Luke Witmer**, Lead Research Engineer at Greensmith Energy, a Wärtsilä company, tasked with adding intelligence to the company’s utility control systems. “In fact, they are

quite basic. They either generate power when the wind blows or when the sun shines, or they don’t.”

#### COME RAIN OR SHINE

How do energy producers ensure that power supply is stable in the face of such conditions? The ability to adapt and innovate is a start. “I don’t suppose wind farms in Europe were very happy last summer. But as a systems operator, we had to make sure there was enough energy at all times and at a right price. In my opinion, the key thing here was flexibility and agility,” says **Pekka Tolonen**, Director, Growth&Development, Wärtsilä.

For a turnkey energy infrastructure supplier like Wärtsilä,

the solution is to understand the market and play assets off each other in the most profitable way. According to the experts, the ideal energy utility set-up is a system that is based on solar and wind, as they are the cheapest, and supplemented with flexible thermal power generation and energy storage.

This system can then operate as an independent asset in the power grid, balancing out the intermittency of renewable generation, or alternatively, be integrated with renewables as hybrid plants. But, even for this ideal system, predicting the future can be a challenge.

“We’ve only reached the tip of the iceberg where we are just beginning to optimise all these parameters. We are at the edge

ACCORDING TO THE  
EXPERTS, THE IDEAL  
ENERGY UTILITY SET-UP IS  
A SYSTEM THAT IS BASED  
ON SOLAR AND WIND.





of the data space that our society's climate models operate in. There are often no precedents that our systems can go by to predict windless summers or sunnier winters," says Witmer.

That's not all. Market prices can also be as volatile as the weather, and no one can predict the best way to run a hybrid plant consisting of solar, wind, generator and battery assets as each of them has completely different operational parameters.

#### **BUILDING A NEAR-PERFECT SYSTEM**

However, there is hope. Companies like Greensmith Energy are actively working on solutions that use statistical models, artificial intelligence (AI) and forecasting to solve this problem.

"We are seeing more intelligent and predictive systems that can react when exposed to market forces like high or low demands for energy," explains Witmer. "Our software is solving an optimisation problem where the objective is to maximise revenue, given the constraints of the weather being advantageous to power generation or not."

Not just generation, but storage and getting the energy mix right are also part of solving the problem. "For a utility system planner, the way to solve this is to know when exactly to delve into stored battery power, if it exists, or when to ramp up or ramp down fossil fuel or natural gas-powered generators," adds Witmer. "Consider also that these generators sometimes take

hours to start up and stop, yet electricity prices spike up or down depending on supply and demand in a window of minutes."

Part of the solution is to develop combustion engines, as Wärtsilä has done, that can go from cold to full power in minutes or use stored battery power that can be tapped instantaneously when the sun doesn't shine.

Greensmith Energy's predictive systems can also help in extending the life of these batteries, preventing huge so-called 'non-linear' lifecycle costs (wear and tear). "A utility can maximise its revenue by charging and discharging its batteries. But doing this can kill a battery in as little time as three years," says Witmer. "Battery degradation has to be calculated into our financial and operational models to achieve the 20-year lifecycle that some projects require."

"To be fully prepared for the unknown requires building multiple levels of flexibility into our systems," he says. "So, for now, for these variables that are beyond control, we are dependent on optimisation hacks that run these hybrid plants in the most agile way possible to keep everything under control at all circumstances."

AI technology is advancing by leaps and bounds, and with companies like Greensmith Energy continuing to develop intelligent and predictive systems, the perfect energy solution is not far off the horizon. ●

"WE ARE SEEING MORE  
INTELLIGENT AND  
PREDICTIVE SYSTEMS  
THAT CAN REACT WHEN  
EXPOSED TO MARKET  
FORCES LIKE HIGH OR LOW  
DEMANDS FOR ENERGY."



# BLOCKCHAIN

## THE CASE FOR DIGITALISING SHIPPING

Blockchain technology is set to take the shipping industry by storm. The last time something of this magnitude happened, it was called container shipping. While the industry is hoping that the technology will lead to greater transparency and standardisation, it is the potential for cost savings that has everyone intrigued.





“BLOCKCHAIN CAN  
PLAY AN  
IMPORTANT ROLE IN  
DIGITISING GLOBAL  
SHIPPING.”

As blockchain technology (of cryptocurrency fame) develops, it has gained its fair share of supporters and detractors, but despite this, it is quickly being adopted by the marine industry because of its proven ability to optimise costs.

“Shipping is a slow and age-old industry still conducted in large part by phone and email. Possibly the last true disruption to the industry was containerisation,” says **Daniel Wilson**, Director of Business Development at TradeLens. And he should definitely know. After all, TradeLens was launched in January 2018 by A.P. Moller – Maersk and IBM to apply blockchain to the global supply chain.

The TradeLens ‘ecosystem’ currently includes more than 40 port and terminal operators across the globe, as well as customs authorities, brokers, cargo owners, freight forwarders, transportation and logistics companies, and others. The TradeLens platform empowers multiple trading partners to collaborate on a single shared view of a transaction without compromising details, privacy or confidentiality. Think of it as cloud-based shipping where every transaction is sealed and stamped electronically.

THE NEXT BIG REVOLUTION IN SHIPPING?

During a 12-month trial, Maersk and IBM applied blockchain to the shipping industry and found that the transit time of a shipment of packaging materials to a production line in the United States could be reduced by 40%, avoiding thousands of dollars in cost.

“We believe blockchain can play an important role in digitising global shipping, an area of the global economy that moves many trillion dollars of goods every year. However, success with the technology rests on bringing the entire ecosystem together around a common approach that benefits all participants equally with an open and neutral system,” continues Wilson.

The ramifications are huge and some see it as a revolution akin to when container shipping replaced stevedores and sacks of rice.

So how does it work? Instead of keeping sensitive and often proprietary ledger records or asset registries in one place, on a computer in one warehouse, for example, or in an office somewhere else only to be emailed back and forth, blockchain systems offer a tamper-proof way of exchanging data (or time-stamped blocks, as they are called) because of the simple fact that they are never just located in one place. The information that can be held on a blockchain – money, information, a contract, a bill of lading – exists as a shared and secured decentralised and encrypted public ledger. It is inherently resistant to modification and is thus easily verifiable.



Port of Oakland, California.

“The application of blockchain technology in the shipping industry has the potential to cut administrative and operational risks for shipowners, charterers and brokers,” says **Michael Saava**, a partner on the shipping team at law firm Watson Farley & Williams in Dubai, and co-author of an important paper on the subject.

THE CASE FOR BLOCKCHAIN

By digitising the paper trail of international shipping – signed and stamped cargo and freight documents involving hundreds of pages that need to be physically delivered to dozens of different agencies, banks, customs bureaus and other entities – the blockchain could save and make billions by increasing time to market for products, cut trade barriers and thereby create jobs.

“The expectation is that blockchain technology will create a platform not anchored down by endless paperwork and complex transactions but instead be fully digital thus enabling more fluid freight movement and reduced costs and resource waste,” continues Saava in Dubai.

But unless the whole world can agree on one open blockchain standard, not unlike today’s email, GPS or GSM mobile communications standards, detractors see a situation where a few global players will retain their own ‘siloed’ and proprietary way of working. This benefits no one.

“How all this will be achieved remains to be seen,” admits TradeLens’ Wilson. “But we are growing at a rapid clip.”

The hope of course, as with other important world standards, is that companies, governments, authorities and other

interested parties will be able to agree on a common and basic standard that works with existing systems, and then apply monetisable applications on top of it all.

Wärtsilä, for its part, is closely monitoring all these developments and is actively participating in accelerator programs with start-up companies on all fronts of the maritime sector. The new maritime business accelerator programme formed in Turku, Finland, in August 2018 is a case in point. It brought together innovative start-ups and maritime industry companies like Wärtsilä, Royal Caribbean and others to find new growth companies for partnerships.

With more stakeholders coming together in this manner, a future where growth is enabled by blockchain isn’t that far off the horizon. ●



# SOLVING THE GLOBAL CORAL REEF CRISIS

Coral reefs around the globe are one of the many victims of climate change. Rising temperatures and sea levels are killing these colourful underwater ecosystems. However, experts emphasise that there's still hope if we act quickly.



“WE CAN’T GET AWAY FROM THE FACT THAT RISING SEA TEMPERATURES THREATEN THE REEFS.”

In the late 1990s, **Jessica Haapkylä**, a young hydrobiology graduate from Finland, went to Hawaii on an internship. Some 1500 kilometres south of Honolulu, she found herself in an underwater wonderland. She couldn’t believe what she saw there – a coral reef, filled with and surrounded by astonishing colours and gigantic creatures such as manta rays and sharks. Two decades later, that effect has not worn off. “There’s no way of describing it with words,” she recalls. “I got hooked right away. The scenery was just spellbinding.” It was nothing like the water world she’d seen back home, in the murky lakes of central Finland and the shores of the Baltic Sea. Inspired, she decided to make a career out of studying corals and coral reefs. In 2005, Haapkylä started studying coral diseases in Indonesia. However, to her dismay, she discovered that the fragile ecosystems had begun to deteriorate. According to a 2008 study by the International Coral Reef Initiative (ICRI), by the 2030s, 90% of world’s reefs are expected to be at risk from both human activities and climate change. The threat to the health of reefs is particularly strong in Southeast Asia, where 80% of the reefs are endangered.

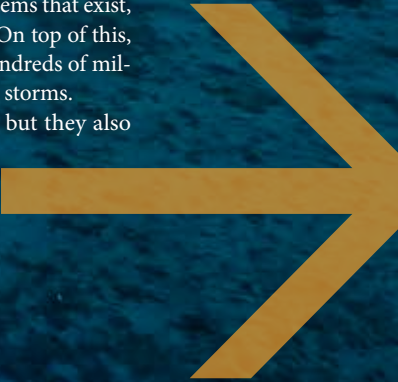
**DIRE STRAITS**  
The catastrophic situation is not exclusive to Southeast Asia, though. In 2016, a mass coral bleaching destroyed an estimated 29% of shallow-water coral cover across the Great Barrier Reef Marine Park in Australia. The park authority called the recent loss of coral cover unprecedented. Haapkylä notes that the biggest threat of all is climate change. “We can’t get away from the fact that rising sea temperatures threaten the reefs, and the rise is caused by climate change,”



she says. Seeing the destruction of the Great Barrier Reef, Haapkylä admits, brought tears to her eyes even under her diving mask. “The situation is dire,” admits professor **David Smith**, the director of the Coral Reef Research Unit at the University of Essex in the UK. Smith points out that heat-induced bleaching is leading to disastrous coral mortality around the world. He points out that corals are particularly vulnerable to rising temperatures as they, by default, operate at the top of their thermal maximum. If the change takes place at a slow rate, the coral might be able to adapt to some extent. However, with the so-called marine heat waves caused by El Niño, their chances are slim. El Niño is an irregularly occurring series of climatic changes affecting the equatorial Pacific region that results in unusually warm, nutrient-poor water. “One-degree rise for four to eight weeks breaks down the symbiotic relationship between the coral and the algae, causing biochemical problems and mortality,” explains Smith. Sea temperatures aren’t rising with the same intensity across

the world, and the threat of marine heatwaves also vary. Also, warming oceans aren’t the only threat to the reefs. For instance, in many parts of Southeast Asia, historic and present destructive fishing techniques, such as blast fishing, which blows up the reef at a 10-metre radius, are the main cause of damage. Other common damaging activities include coral mining, pollution (organic and non-organic), overfishing and the digging of canals and access into islands and bays. “But even in the direst straits, we have two options: putting our head in the sand or finding solutions,” adds Smith.

**TIME TO ACT**  
Haapkylä and Smith believe that the events in Australia in 2016 have acted as a global wake-up call. After all, coral reefs are the most diverse ecosystems that exist, and are home to countless species of marine life. On top of this, coral reefs are a source of income and food for hundreds of millions of people and act as natural defences against storms. “They are the engines of marine biodiversity, but they also





“IT’S DOWN TO ALL  
OF US TO LIVE MORE  
SUSTAINABLY. IF WE  
DON’T, OUR  
CHILDREN WON’T SEE  
CORAL REEFS.”

provide really important services for society that goes beyond biodiversity,” says Smith.

According to Smith, a lot can be solved by studying the areas where corals are more resilient. For instance, less vulnerable subspecies that are likely to survive in the changing environment may be used to repopulate damaged reefs. There’s ongoing research in extreme environments, where scientists are trying to figure out what factors affect the coral animal’s adaptability.

Smith believes that the best opportunity comes with combining different efforts. “There’s not just one measure, but there’ll be a toolbox,” he says.

Despite extensive research, and as with climate change in general, there’s a consensus that not enough is being done to save the reefs at the moment. The good news, according to

Smith, is that due to the economic importance of coral reefs, there’s a certain amount of political pressure on governments to act. He has also noticed that businesses and corporations are increasingly taking note of the situation.

“It’s not just conservation efforts, but also businesses that are dependent on coral reefs, such as the dive tourism industry. We want to ensure that best practices are shared and that organisations commit to taking coordinated action,” says Smith.

**WHEN EVERY INCH COUNTS**

This applies to each and every one of us. Haapkylä highlights that although governments and corporations have much more power and resources to battle climate change, there’s no such thing as a small act.

“We should consider the long-term well-being of our planet in all of our life choices, ranging from green investments to people picking travel destinations. Every effort counts, be it eating less meat or recycling waste,” she says.

Smith agrees. He urges people in positions of influence to bring changes within organisations and make them adopt more eco-conscious ways, not only by avoiding negative impact but also by highlighting any positive efforts taken to improve sustainability.

Smith also encourages everyone to spread the word to ensure that people understand the gravity of the situation.

“It’s down to all of us to live more sustainably,” he says. “If we don’t, our children won’t see coral reefs. That’s the absolute fact.” ●



# DIVING DEEP INTO THE SEA OF DATA

If mixing medicine with astrophysics to create new smart solutions for the marine and energy industry sounds like a totally bizarre idea to you, think again. This is precisely what two prominent data scientists – Ilona Söchting and Sirkku Karinen – at Wärtsilä are up to.



“USING DATA FROM DIFFERENT SOURCES ADDS AN ENORMOUS VALUE TO THE ANALYTICS WORK.”

When in the hands of the right people, massive amounts of data can uncover new facts and insights that can take a company’s business to the next level. Wärtsilä’s **Ilona Söchting** and **Sirkku Karinen** are a living proof of that.

They come from two very different worlds, though. Söchting, a senior developer and specialist in advanced analytics, hails from Grosswallstadt near Frankfurt am Main, Germany, while Karinen, a solution manager in the analytics wing, is from the Finnish capital, Helsinki.

And geography is not the only thing that sets them apart. Söchting has a PhD in astrophysics, specialising in utilisation, machine learning and pattern recognition. Karinen, on the other hand, has a PhD in medicine and she developed algorithms and software to analyse molecular medicine, mainly in cancer genetics.

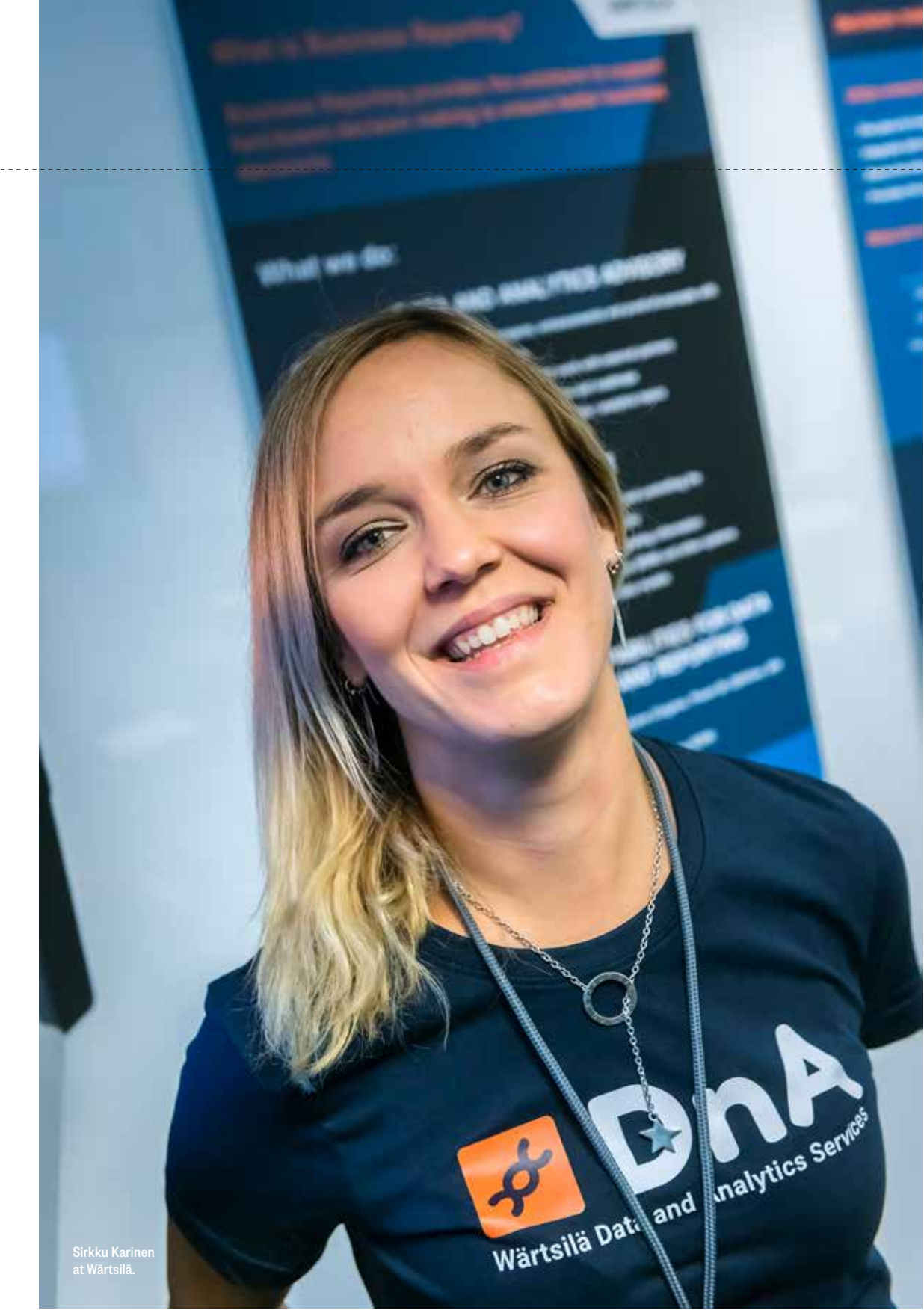
However, they share a common passion – analysing big data. “We are proof that data analytics is basically the same, regardless of your background. The same principles can be applied to any data analysis,” says Karinen.

**BUILDING A CULTURE**

Traditionally, Wärtsilä has always collected business-related data about installations and various components. This data has mainly been utilised to improve engines and components. Advanced data analytics, however, can take these numbers to the next level. Combining data repositories in Wärtsilä with external data sources can reveal new facts. “Using data from different sources adds an enormous value to the analytics work. I am actually amazed by how much data Wärtsilä has,” says Söchting.

The challenge is in unlocking this data for use, as many companies lack a “data culture”. The duo, therefore, spend much time educating the organisation on the benefits of data analytics.

In their latest project, which aims to predict traffic, the two are using data to provide input for new opportunities. “Data from the Automatic Identification System (AIS), which provides unique identification, real-time position, course and speed of vessels, is being combined with internal data sources from engines and components. This gives us a unique opportunity to tailor new products and services,” explains Karinen.



Sirkku Karinen at Wärtsilä.

**DIGGING FOR GOOD DATA**

For Karinen and Söchting, one of the biggest challenges is dealing with dirty and unwieldy data. It is rarely nice, clean and pretty, and sometimes it takes all their energy to clean and sort the data even before they can begin to analyse it. However, once that barrier is crossed, the data can then be used for creating new businesses using the AIS data-based initiative for the marine solutions.

Karinen explains, “Standard data analysis follows given

“FOR WÄRTSILÄ, FAILURE IS NOT AN OPTION.”

procedures for clean-up, error monitoring and analysis. It is vital that these procedures and rules are followed to obtain good results.”

“The general misconception is that you can feed in any type of data and get magnificent results,” adds Söchting. To give an example, Söchting compares this process to a Google search. “People do not realise that Google has spent billions and done a tremendous job classifying and analysing millions of different sources so that we can get a good search result,” she says.

There is, however, a significant difference between search results and what this data means for businesses like Wärtsilä.

“Our products are often mission-critical for the customer, such as in emergency power plants at hospitals or on cruise vessels carrying thousands of passengers. For Wärtsilä, failure is not an option,” the two agree.

The insights produced by data analytics are raw material for Wärtsilä’s business experts, who can further develop the data. The result is often innovative data-driven business processes, such as spare parts predictability. “We see ourselves as a function that supports others in achieving better results,” says Karinen.

**STRATEGIC CHOICE**

There is a lot of hype around digitalisation to which data analytics is closely related. Companies need to decide whether to outsource their analytics or do it in-house. And as such, data analytics is a necessity today for almost every company.

Benefits can be reaped in the form of business opportunities as well as in improving internal processes, such as automating processes for accountants doing reconsolidation, for instance, using robotic process automation. Business opportunities currently being explored are voyage management products with optimised traffic predictions with the ultimate aim of being able to have fully autonomous vessels. ●

*Since the time this article was written, Sirkku has left Wärtsilä.*



Ilona Söchting is a senior developer and specialist in advanced analytics at Wärtsilä.



# HEDGING EXPERTISE BRINGS BANG FOR THE BUCK

Working in and between various currencies poses unpredictable risks to global businesses. Wärtsilä has proven to be award-winning in preparing for them; now, we hear what Wärtsilä’s Group Treasury Dealer Paul Malmström has to say about sustainable foreign exchange practices.

Everyone who’s travelled across currency borders knows that a lot is up to luck. What you get for your money depends on the exchange rate – and at any point in time, it might be wildly different to what it was a week or a month ago.

For a regular Joe, a few dozen euros or dollars might not ruin a holiday budget, but for multinational corporations, the changes in currency rates might mean millions of euros in losses. Thus, the risk must be managed to ensure that the business isn’t exposed to financial risks because of fluctuations in exchange rates.

Foreign exchange (fx) risks arise from various sources, such as cash flows that are affected by changes in exchange rates, loans and deposits that are either payable or receivable in foreign currencies, or in bidding for or investing in foreign projects. Wärtsilä is familiar with this. After all, not only is it located in more than 80 countries, but it also has about 115 currencies in its global enterprise resource planning system.

“Fx risks are significant, not just for companies as big and complex as Wärtsilä, but also for smaller ones,” says Paul Malmström, Dealer at Wärtsilä’s Group Treasury. “Fortunately, there are various ways to manage the risk, depending on the nature of the company’s cash flow.”

Malmström, if anyone, should know what he’s talking about. Last March, Wärtsilä with Malmström as its representative was announced the Finnish champion in currency hedging in a competition organised by the Nordic financial services group Nordea.

### NO ROOM FOR SPECULATION

In practice, all money coming in and out of Wärtsilä goes through the Group Treasury. Speculation with currency rates is forbidden for Wärtsilä companies, and all foreign exchange exposures are, if allowed by local regulations, hedged by the Treasury.

In fx, hedging is an effort to mitigate the risk of unfavourable currency rate movements. This can be done by, for example, protecting assets with an fx forward contract, in which the counterparties agree on a predetermined currency rate for a future date.

“The realisation of fx losses has a negative impact on the cash flows, margins and profits of the company,” Malmström says. “The hedging of exposures improves the forecasting of a company’s cash flows and protects the margins.”

All Wärtsilä companies deal directly with the Wärtsilä Group Treasury, which then nets the transactions and makes external deals with Wärtsilä Relationship Banks to mitigate the Group’s fx exposure.

“This increases Wärtsilä’s attractiveness in the eyes of the bank, too, because volumes are much larger and the counterparty risk is reduced,” says Malmström. “As a result, the Group receives much more competitive pricing than individual Wärtsilä companies would if they were dealing directly with a local bank.”

### A WINNING STRATEGY FOR WÄRTSILÄ

Malmström’s expertise in currency hedging is a result of years of experience. He developed an interest in exchange rates as a university student, and although his first job at Wärtsilä wasn’t at the Group Treasury, he jumped at the opportunity as soon as one occurred.

“It is extremely interesting to keep a keen eye on the financial market and Wärtsilä’s business segments and see the impact they have on each other,” he explains.

The competition by Nordea, organised for the first time, provided Malmström with a chance to test his skills against peers from other firms by making them mitigate the foreign exchange risks of an imaginary company. His top spot was followed by industrial machinery company Metso, and third place went to pulp and paper manufacturer Stora Enso.



Wärtsilä with Paul Malmström (middle) as its representative was announced the Finnish Champion in currency hedging in a competition organised by the Nordic financial services group Nordea in 2018.



“FX RISKS ARE SIGNIFICANT, NOT JUST FOR COMPANIES AS BIG AND COMPLEX AS WÄRTSILÄ, BUT ALSO FOR SMALLER ONES.”

The most common foreign exchange deals are spot, swaps, and forward contracts.

- **Spot deals** are used to convert one currency to another with immediate effect.
- **Swap deals** are used to sell and buy a currency on different value dates.
- **Forward deals** are used to buy or sell a currency at a specified time in the future at a predetermined price, regardless of the actual market rate on the day of the payment.

Malmström’s winning strategy was based on analysing the imaginary company’s cash flow and the currencies it used, and choosing the right kinds of protection methods. On top of personal pride, he sees the win as an acknowledgement of Wärtsilä’s efforts in safeguarding its business – and he’s willing to defend his title at this year’s competition, if given the chance.

Some might get cold feet for being responsible for such immense piles of money. However, Malmström is used to dealing with big numbers.

“Obviously it can be a tiny bit baffling to have a billion Japanese yen in hand, but as long as you understand what’s going on and how to keep the money safe, it’s just another figure amongst others.”



# GRACIOSA ON THE PATH TO 100% RENEWABLE ENERGY

While the rest of the world is figuring out how to transition to renewable energy, a tiny island with a population of less than 5,000 is leading the way with its new hybrid power plant. Read about how they are weaning themselves off their dependence on fossil fuels.

Port in Praia,  
Graciosa island,  
Azores, Portugal.



Off the coast of Portugal, on the volcanic ‘White Islands’ of the Azores with a population of less than 5,000, life proceeds at an easy pace. Most people living here are occupied with traditional tasks such as agriculture, grape cultivation and dairy farming. And while island life sounds idyllic, it is also a fact that this life would be impossible without sufficient and reliable power.

The ‘White Islands’, much like other island nations and cities, have traditionally had no option but to depend on external sources for their energy. The consequences include routinely importing fossil fuels to power their energy grid while dealing with the high costs and relative unreliability of supplies.

But all this is set to change. The new Graciosa Hybrid Renewable Power Plant with its integrated 6 MW/3.2 MWh energy storage management system will soon be able to supply 1 MW of solar and 4.5 MW of wind power to the

local electricity grid, reducing the island’s reliance on imported fossil fuels and significantly cutting down on greenhouse gas emissions.

This new hybrid renewable power plant is being managed by GEMS, an energy management software system developed and installed by Greensmith Energy, a Wärtsilä company. The result: an integrated power system combining renewables, engines and energy storage that will deliver both economic and environmental benefits.

The GEMS software is among the most advanced in the world, using artificial intelligence (AI) and big data to control and balance multiple energy assets including wind, solar, and diesel generation. Simply put, the GEMS software automatically optimises energy generation based on load patterns and weather forecasts, increasing the use of renewable energy and decreasing the cost of diesel power generation, while improving the reliability of the island’s energy grid.

This will not only make the UNESCO classified ‘World Biosphere Reserve’ island greener by boosting renewable energy consumption from 15% to 65%, but also eliminate the need for 17,000 litres of diesel per month. This reduces the island’s carbon footprint and greatly impacts the cost of energy going forward.

The plant was commissioned by late October 2018. The execution of this project has been complex and depended on a number of things which had to be executed in phases.

**NEARING THE FINISHING LINE**

According to **Luke Witmer**, lead research engineer at Greensmith Energy, “all the phases are near completion.”

“We are wrapping up the development of a new operation logic and safety procedure that is based on the site’s asset and equipment combinations and

also getting all the pre-testing of software logic done with the various equipment providers.”

For Wärtsilä, the project is quite special as it is their first big island grid with as many as four different types of assets: diesel generation sets, wind, solar and storage. “Each asset by itself is not new to Greensmith Energy, but the challenge was having all of these complex pieces come together into one project,” says Witmer.

His team oversees the functional specifications, as well as designing and implementing both the renewable and load forecasts with support from third-party forecasting service providers.

**DIFFICULT TO DISPATCH**

The real challenge, Witmer says, was in integrating and executing the project in a way that maximised the renewable energy utilisation within a long list of on-ground constraints.

IN THE FUTURE,  
GREENSMITH ENERGY  
EXPECTS THE GRACIOSA  
HYBRID RENEWABLE  
POWER PLANT TO COVER  
OVER 60% OF THE  
ISLAND’S YEARLY  
ENERGY NEEDS.

View of Graciosa  
island, Azores.





A lake situated in the crater of a dormant volcano on the Portuguese archipelago of the Azores.

“THE TRANSITION OF THE ENERGY INDUSTRY IS REALLY ABOUT THE START OF A GOLDEN AGE OF COMPUTER TECHNOLOGY.”

“On Graciosa, our breakthrough is that GEMS does both individual asset control as well as system balancing to maximise renewable energy penetration, something traditionally done by system operators, either large ISOS or RTOS,” he says.

Greensmith Energy is also working on the optimisation component, which means getting the system to perform at its best, by following the strict diesel generator constraints (such as minimum run times and minimum loading levels) while observing N-1 reliability metrics and more, to minimise the cost of serving the load.

“The tricky part is that most places that have reached high renewable energy penetrations have a more dispatchable type of renewable generation such as biomass or geothermal. Wind and solar, on the other hand, are among the least dispatchable as they are the most intermittent, which is an added challenge at this level of renewable energy penetration,” says Witmer.

HARMONISING ALL LEVERS AND GEARS

Integration is indispensable for such island projects, and Witmer believes that leveraging integration expertise is “the only way” to achieve a robust and reliable system architecture, to operate both safely and optimally.

In the future, Greensmith Energy expects the Graciosa Hybrid Renewable Power Plant to cover over 60% of the island’s yearly energy needs. The aim is to reach a stage when all of the diesel generators can be turned off and the island runs on 100% renewable energy.

This could be done for a significant portion of time, up to several successive days in some cases, depending on the solar and wind conditions. As per Witmer’s calculations, if that happens, the savings (depending on fuel costs) could be as high as USD 3.15 million every year.

That is promising if the formula can be applied to other islands and geographies. **John Jung**, the former CEO of Greensmith Energy, believes it can.

“The transition of the energy industry is really about the start of a golden age of computer technology, which maximises the efficiency of our assets. Graciosa is a great example, but it is also scalable. Imagine a similar system in continental Australia, and you can see the potential of these solutions,” he says, leaving us with some food for thought. ●



# CARBON RECYCLING INTERNATIONAL WANTS TO MAKE AN IMPACT WITH POWER-TO-X

Icelandic company Carbon Recycling International won the Wärtsilä SparkUp challenge. See how their innovative idea to produce renewable synthetic methanol helped them beat the odds.

The winner of the 2019 SparkUp Challenge is Carbon Recycling International (CRI). Their inventive solution for renewable methanol helped them stand out from nearly 70 other competitors and win a capital grant of EUR 50,000.

“It feels really good to win,” says **Benedikt Stefánsson**, Director of Business Development at CRI. “We are ready to get to work with Wärtsilä, to collaborate on finding new opportunities together and make an impact.”

“We have much in common with Wärtsilä and I see a lot of synergies between us,” says **Margrét O. Ásgeirsdóttir**, CFO of CRI. “It is important for small and large companies to work together. With a combination of agility and strength, we can broaden the renewable ecosystem.”

While CRI is the official champion of the challenge, **Matti Rautkivi**, Director of Business Development at Wärtsilä Energy Business, says that in reality, there was more than one winner.

“Wärtsilä is the real winner of this challenge,” he explains. “We get the opportunity to collaborate with these great companies.”

**AN INVITATION FOR COLLABORATION**

The SparkUp Challenge is a way for Wärtsilä to accelerate collaboration with start-ups and scale-ups. Young growth companies are invited to pitch their ideas to Wärtsilä, and winners receive a cash prize as well as opportunities for collaboration. While the first SparkUp Challenge in 2017 was based around Smart Marine technology, this year, the focus is on Power-to-X, which is key to achieving Wärtsilä’s vision of a 100% renewable energy future.

Power-to-X is a process to convert excess electricity into something which can be used later. This is particularly important with renewable energy because we still need power when the sun isn’t shining or if the wind isn’t blowing. Power-to-X stores this energy in a form which can be accessed as and when it is needed.

Out of about 70 applicants to the SparkUp Challenge, a shortlist of 14 were chosen to be screened and evaluated. The four finalists were Carbon Recycling International, Green Hydrogen, Sunfire and Clime-works. They came to the SparkUp Challenge Day at the Wärtsilä Campus in Helsinki, where they pitched their ideas to a jury composed of Wärtsilä and independent energy experts. They were judged on their knowledge, solution and their readiness to collaborate with Wärtsilä.

**READY TO MAKE AN IMPACT**

Jury member **Petteri Laaksonen**, Research Director for the Department of Electrical Engineering at Lappeenranta University of Technology, studies carbon capture and the production of hydrogen and synthetic methanol. He says all of the contenders were interesting and that it was difficult to pick a winner.

“Some of this technology is still in the development phase and there are questions on how to scale it up,” Laaksonen explains. “Pilot projects have small volumes, but we hope CRI is ready for big volumes. That’s one reason why we picked CRI.”

Rautkivi was also on the jury and says all the finalists created value from different angles. CRI stood out from the crowd because they already have experience in developing and commercialising their solution.

“CRI has done the entire process from the beginning, and we need to understand that process,” he



And the award goes to...

### ABOUT CARBON RECYCLING INTERNATIONAL

- Uses renewable energy to produce synthetic methanol from carbon dioxide and hydrogen.
- Based in Kopavogur, Iceland.
- Founded in 2006.
- About 40 employees.

[www.carbonrecycling.is](http://www.carbonrecycling.is)

says. “CRI has great people and a great solution, and they have already been involved with major co-creation projects.”

**PRODUCING NEXT-GEN ENERGY SOLUTIONS**

CRI has already commercialised Power-to-X technology. At the George Olah Renewable Methanol Plant in Grindavik, Iceland, they obtain CO<sub>2</sub> by processing gas emissions from a geothermal power plant and obtain hydrogen by electrolysis of water using renewable energy.

Their renewable methanol product Vulcanol is used by companies in Europe and China. Currently, the plant has an annual production capacity of 4,000 metric tonnes of synthetic methanol.

“The world needs liquid energy storage, and our solution to convert CO<sub>2</sub> to methanol is already being used in several projects,” explains Stefánsson.

CRI’s other ventures include the Fresme project in a Swedish steel plant and Mefco<sub>2</sub> in Germany, both of which receives support from the EU Horizon 2020 research program.

**TOWARDS 100% RENEWABLE FUTURE**

The winner of the SparkUp Challenge has been announced, but this is only the beginning. What’s the next step?

“We’re going to Iceland!” Rautkivi says and laughs. “We want to go there and see what CRI is working on, to understand Wärtsilä’s role and how we can help with this technology. We will collaborate on real projects. Our Smart Energy vision is to have a 100% renewable future, and we believe Power-to-X technology is an important key to achieve that goal.”

Moving towards a 100% renewable future is necessary from an environmental standpoint, but Stefánsson also stresses that it makes financial sense. Renewable methanol solutions can be cheaper than LNG, which makes it relevant for both the marine and energy sectors.

“To get costs down we need to scale up,” explains Ásgeirsdóttir. “We are working in an ecosystem, and this now includes big new opportunities with Wärtsilä. We already have some great ideas on how we can collaborate.” ●

research and development

“THE WORLD NEEDS LIQUID ENERGY STORAGE, AND OUR SOLUTION TO CONVERT CO<sub>2</sub> TO METHANOL IS ALREADY BEING USED IN SEVERAL PROJECTS.”





# Energised by people

To Saara Kujala, working with people from different countries, cultures and backgrounds is an inspiring experience. During her 10 years as a Wärtsiläian, she has seen small things lead to big changes – often for the better.



“LIGHT AND ELECTRICITY ARE SUCH BASIC THINGS BUT THEY PLAY A HUGE ROLE IN, FOR EXAMPLE, OVERCOMING POVERTY.”

On a motorway traversing through rural Myanmar, Saara Kujala used to look at the landscapes rushing past the car window. Sometimes she saw buffaloes in a field with no fences, with just a herder looking after them; every now and then, the animals could be spotted hard at work ploughing, and people were carrying piles of brushwood for making fires.

When it was dark, it was pitch black: not a single ray of light anywhere.

“That’s when I realised how much difference a single light bulb hanging from the roof of a house can make,” Saara says now, years later in the comfort of Wärtsilä’s headquarters in Helsinki. “Light and electricity are such basic things but they play a huge role in, for example, overcoming poverty.”

At the time, Saara was working for Wärtsilä in Singapore as a manager, project development, regularly visiting nearby markets in all of Southeast Asia. She emphasises that the everyday reality she witnessed was mainly that of the rich and wealthy, but seeing and meeting people from all walks of life brought about new perspectives and the ability to see the overall value of her job.

“Although my background is commercial, the ideological side of what we’re doing is important to me,” she explains. “Even the smallest of things can bring about big changes, such as giving people access to electricity or enabling an increase in the share of renewable energy sources.”

SUSTAINABILITY IS SENSIBLE

During her four years in Singapore, Saara had the opportunity to witness the rapidly changing energy market as a financial analyst and later as a manager in the independent power producer (IPP) project development function. Now, her title in Helsinki is general manager, business development.

The six-strong team led by Saara is packed with people who have in-depth knowledge of power generation technologies, power systems and modelling in various corners of the world. Together, they use calculation tools and software to evaluate the future needs of different markets in terms of capacity and solutions to provide fact-based analysis for market development projects.

“Sometimes we look at cases where Wärtsilä doesn’t have obvious business potential, but through our thorough analysis, we can build up business cases,” she explains.

Now, more than ever, enabling the production and use of renewable energy is imperative for the well-being of the planet and everybody on it. This is where Wärtsilä’s vision of the transition to 100% renewable energy future is valuable.

“We can create concrete suggestions for customers regarding the optimal path to boosting renewables and flexibility in their electricity network. With our tools and analyses, we can show that it really is a profitable and sensible investment.”

Saara also believes that such analyses coming from a stock company sound more credible than those from elsewhere. Government-level regulations and emission targets are one thing, but what’s left below the line rarely fails to convince business owners.

“What is also important is that Wärtsilä doesn’t just deliver services. Sometimes we develop IPP projects ourselves and become a committed co-owner in them. We put our money where our mouth is.”

CHALLENGING THE STATUS QUO

Wärtsilä’s commitment to its projects was one of the things that caught Saara’s attention as a 20-something industrial management student. For her thesis, she interviewed Wärtsiläns, and one of them in particular happened to be an inspiring speaker.

“For the first time, I heard about Wärtsilä’s ability to develop power plant projects; the hands-on work from project site identification, in exotic locations, to negotiating complex agreement packages, and finally investing equity into the projects,” she recalls. “The deep involvement in projects as a co-owner was very impressive. Also, to me being able to work in an international setting was the main reason I chose my field of studies to begin with.”

Fast-forward to life after graduation, and the encounter led Saara to work in the same project development team. Her first position was a financial analyst in development and financial services. The year was 2009, and the global financial crisis was blowing all around the world. For a recent graduate, landing such a job felt like winning the lottery.

The next big opportunity came in the form of an offer to relocate to Asia. In Singapore, Saara was faced with new challenges: one of her first cases was to analyse the energy system in Indonesia as part of a team looking for new business opportunities in Indonesia.

“At first, it felt like I have no clue whatsoever about what I



“Although my background is commercial, the ideological side of what we’re doing is important to me,” Saara Kujala says.



“IT’S EASY TO FIND  
MOTIVATION WHEN MANY  
OF OUR PROJECTS ARE  
LIKE START-UPS,  
STARTING FROM ZERO.”

was supposed to get out of the exercise, and I’m just putting numbers on paper,” she says as she laughs. “Fortunately, when digging deeper into the data, it did all start to make sense. My colleagues in Indonesia took the analysis forward with our customers and have successfully used it to grow the business massively.”

To Saara, that was a revelation: what she was part of was bigger than the Excel sheets on her computer.

“It’s almost scary, but also wonderful, how such a tiny thing can make such a big difference. Decades of status quo can be challenged just because something is being looked at from a new angle and with fact-based analysis.”

STRIPPING THE TITLES

Ten years after being hired fresh out of school, Saara is happy to have spent all of her professional career at Wärtsilä. Her dream of an international job is well delivered: with Wärtsilä having customers in about 180 countries and colleagues from over 130 nationalities, there’s always something new to learn, hear and see.

On top of this, Saara feels like she has been able to be creative and run things her way.

“It’s easy to find motivation when many of our projects are like start-ups, starting from zero,” she says. “We build huge things from scratch, with importance for the futures of nations.”

In the projects, Saara is used to navigating with cultural differences and approaching matters with professionalism. Particularly as a young female working with people in senior positions in the energy industry, she has sometimes noticed an initial reaction of surprise on the faces of international partners – but she hasn’t let that startle her.

“Often it’s enough to just be calm, friendly, and always professional. Expertise speaks for itself,” she notes. “People soon start ignoring who’s senior and who’s junior and reach out to the one who knows best.”

That’s what Saara and her team want to be: the ones who have the best knowledge in understanding future power systems, on a global scale. Their aim is to become the go-to people when it comes to understanding and analysing power systems.

“That way, the message would start spreading itself to places we haven’t had the chance to go to yet.” ●



Saara Kujala has spent most of her professional career at Wärtsilä.



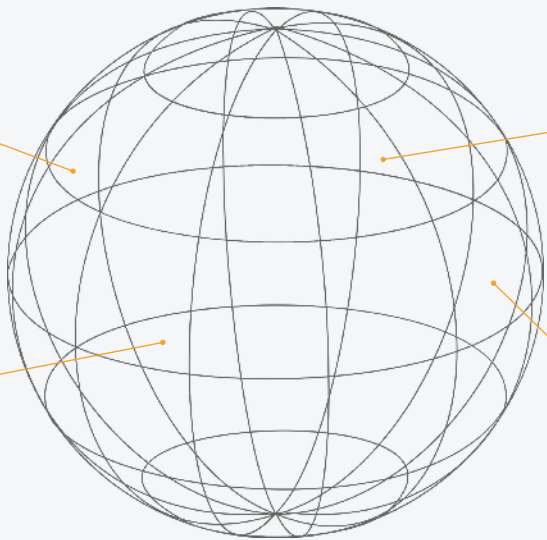
# THE SEAS ARE UNDER CYBER-ATTACK

THE MARINE INDUSTRY IS INCREASINGLY GOING DIGITAL AND THUS CONSTANTLY UNDER THE RISK OF CYBER-ATTACKS. HERE IS WHAT THE ATTACKERS ARE HARMING AND HOW IT CAN BE PREVENTED.

## INCREASE IN THREATS, WORLDWIDE

31% of the companies have experienced cyber-attacks on operational tech infrastructure.

84% of the attacks are not covered by insurance.



600% increase in attacks against Internet of Things (IoT) and connected devices.

53% of the attacks result in damages of USD 500,000 or more.

## WHAT'S UNDER ATTACK?

33% Cargo systems

86% Navigation systems (ECDIS, BNWAS, GPS, IBS)

16% Ballast

39% Power (Engine control and monitoring)

46% Safety (VDR, GMDSS etc.)

## HOW CAN CYBER-ATTACKS BE AVOIDED?



**Network incident:** hacker infiltration compromises a vessel's internal network and gains access to its critical control systems.



**Unknown threat:** if the crew is unaware of a threat and fails to take appropriate countermeasures, an attacker can harm the vessel's infrastructure.



**Fleetwide malware:** a malware-infected USB, used for system updates, infects multiple vessels and provides critical data to the attackers.



**Cyber assessment:** evaluate the system and recognise its cyber risks and technical vulnerabilities.



**Cyber foundation:** establish guidelines for a comprehensive security policy.



**Cyber protection:** apply appropriate security controls with defence-in-depth approach.



# AN OCEAN GIANT TURNS GREEN

What happens when you retrofit an energy storage solution to a large offshore supply vessel? Harald Torbjørn Klepsvik, the owner of North Sea Shipping (NSS), is best positioned to answer that question since NSS is already reaping its benefits. Here's what we found out when we met him at Wärtsilä's Future Innovation Day at Stord, Norway.

Tug Achilles and tug Belos have started towing the North Sea Giant through Ringdalsfjord in Halden, Norway.





Offshore vessel owner and operator North Sea Shipping (NSS) was keen to explore options to make its North Sea Giant subsea construction vessel on the west coast of Norway more competitive while reducing its environmental footprint. In August 2017, Wärtsilä agreed to retrofit the world's first energy storage solution with an Electronic Bus Link (EBL) module onboard the advanced DP3 vessel.

The North Sea Giant is not only one of the world's largest subsea construction vessels. It also is one of the most advanced ones. New transformers, filters, switchboard, shore connection equipment, upgrades of existing components and commissioning as part of the project are also contributing to this.

The estimated reduction in emissions was 5.5 million kg CO<sub>2</sub>, 30 tonnes of NO<sub>x</sub> and 1,200 kg SO<sub>x</sub> per year. While the final numbers aren't out yet, the owner **Harald Torbjørn Klepsvik** is impressed with the reductions so far.

"There are still some modules to be installed so we can't give the full result yet. From what we've seen so far, I am confident to say the savings are going to be better than we expected." Not only will more efficient engines lead to fuel cost savings, time will also be saved as the vessel will require refuelling less often.

#### FAMILY BUSINESS WITH A GLOBAL PARTNER

NSS is a family company, started in 1984 and still owned by the Klepsvik and Økland families. Specialising in vessels for demanding marine operations, the Norway-based company today focuses on offshore construction vessels, inspection, maintenance and repair (IMR) vessels, seismic survey ships and cable-laying vessels.

"At times it has been a struggle, but the technological advancements over the last 20 years have been really interesting," says Klepsvik. Throughout that time, the company has enjoyed a strong relationship with Wärtsilä.

"We have worked with Wärtsilä since we did our first new build around 20 years ago. We saw then that Wärtsilä has very competent technologists, so it's no surprise to me that the partnership has continued for so long."

"WE HAVE LONG ENJOYED A POSITIVE COLLABORATION WITH WÄRTSILÄ, WITH EVERYONE INVOLVED FOCUSED ON SOLVING PROBLEMS."



solution



North Sea Giant is a large offshore supply vessel. The picture is shot from the port of Halden, Norway, and out towards Iddefjord where the ship is at anchor.

“WE BRING THE OPERATIONAL PERSPECTIVE AND WÄRTSILÄ BRINGS THE ENGINEERING EXPERTISE. TOGETHER, WE CAN MAKE GREAT SOLUTIONS.”

**A POSITIVE COLLABORATION TO SOLVE PROBLEMS**

nss always benchmarks Wärtsilä against other suppliers, but Klepsvik says they almost always come back to Wärtsilä. “We have long enjoyed a positive collaboration with Wärtsilä, with everyone involved focused on solving problems. We come back to Wärtsilä time and again because it is important for us to be active in the process, and that is how these projects go. We bring the operational perspective and Wärtsilä brings the engineering expertise. Together, we can make great solutions.”

An example of the collaboration was the need for a redefinition of applicable classification rules to allow the retrofit project to proceed. As a DP3 class vessel, the North Sea Giant is listed in the most advanced category of vessels that apply dynamic positioning.

An installation of an energy storage solution into such a vessel was a world-first and required a redefinition of applicable classification rules. Wärtsilä and nss worked together in close collaboration with the DNV-GL classification society to solve the issue.

**WÄRTSILÄ, ALL THE WAY!**

Klepsvik also values the consistency of Wärtsilä systems across their fleet. “It makes life much easier for our operators and chief engineers. They know the system, and they can go from vessel to vessel without much trouble. That efficiency of operations is important for our business.”

Following the success of this retrofit, North Sea Shipping is keen to repeat the project on other vessels. “I’ve already discussed the next projects with the Wärtsilä team in Norway. They have come up with ideas to make the results even better,” he says.

“Everything goes so fast in this business. We install something today and already there is something new to consider. It’s a challenge, but it’s one that we enjoy.”

Also, from the Norwegian project delivery team the cooperation with the North Sea Shipping is highly appreciated. “Working with North Sea Shipping has from the start been very inspiring and fruitful for us. Challenging Wärtsilä to deliver tomorrow’s innovative solutions requires a front-end customer seeking the most advanced technology available in the market”, says **Sindre Utne**, General Manager, Project Centre Norway. ●



**BUILDING SUSTAINABLE BITCOIN MINING NETWORKS**  
page 62

**WÄRTSILÄ 14: LIGHTER, SMARTER AND GREENER**  
page 66

■ **Twentyfour7.**  
**in detail**

59



# FLEXIBLE ENERGY SOLUTIONS CLEAR THE WAY FOR RENEWABLES IN THE UK

► TEXT: ANNE SALOMÄKI PHOTO: ISTOCK

**FLEXIBILITY IS KEY** in making the move to renewable energy sources. In the UK, which has traditionally been heavily dependent on fossil fuels, Wärtsilä's solutions help boost the transition to a greener future.

**H**alf-time of a football match between the two top teams in the Premier League, or a commercial break during the season finale of Coronation Street. Those who've stayed put in front of their telies return to their earthly needs: getting a snack, switching on the kettle to enjoy their afternoon cuppa, or flushing the loo.

This is known as 'tv pickup' in the UK: a large number of people glued to the same tv show taking advantage of the breaks to operate all kinds of electrical gadgets and use toilets. However, it's not the only event that puts extra pressure on electricity networks. Sudden surges and mass switch-offs happen for other reasons as well, all of which the electricity and gas transmission system needs to be prepared for.

"It's impossible to precisely forecast the demand for electricity at all times, and that's why flexibility is of utmost importance," says **Jan Andersson**, Market Development Analyst at Wärtsilä.

"The networks need sources that can be ramped up quickly, which is not possible with nuclear or coal."

This is particularly the case with fluctuating renewable energy, such as wind and solar power. There might not be enough wind or sunshine to meet the need during peak hours, or renewable energy production has to be limited due to lack of flexibility if the energy is not stored effectively. There can also be weather forecast errors or delays in expected weather conditions.

## CENTRICA BACKS UP WIND AND SOLAR

One way to balance the grid during peak times is to have power sources that can be switched on rapidly to ensure that the country doesn't shut down. Wärtsilä has been involved in a project by energy and services company Centrica, which has two 50 MW power plants based on five Wärtsilä 34SG engines, running on natural gas. Wärtsilä has the overall role in the project, covering engine supply as well as plant engineering, procurement and construction.

The plants, located in Brigg in North East Lincolnshire and Peterborough in Cambridgeshire, can provide electricity for about 100,000 households in less than two minutes after they've been switched on. Upon completion, the plants will be the biggest medium-speed, engine-based gas power plants in the UK, bringing Wärtsilä's installed capacity in the country to over 250 MW.

"This way, we can support surges in electricity demand or fill the gap when solar or wind power is unavailable, stabilising the grid whenever needed," says **Bent Iversen**, Senior Business Development Manager at Wärtsilä.

**Mark Futyan**, Distributed Power Systems Director at Centrica Business Solutions, deems flexibility critical to keeping the grid stable and balanced. Thus, Centrica's strategy focuses on meeting the new challenges of providing and ensuring stability.

"As we're going to have more and more renewable

"IT'S IMPOSSIBLE TO PRECISELY FORECAST THE DEMAND FOR ELECTRICITY AT ALL TIMES, AND THAT'S WHY FLEXIBILITY IS OF UTMOST IMPORTANCE."

and distributed energy, we must have sources of flexibility on the system to be able to control the frequency," he notes. "The under-two-minute start-up time is a rare feature and very important to the UK grid."

The 50 MW Wärtsilä-built plant in Brigg will balance the stability of the grid. Together with the 50MW Peterborough plant the two will generate enough electricity to supply 100,000 homes.

## BYE, COAL. HELLO, RENEWABLES!

Britain's heavy reliance on coal stems from its industrial past. The country's coal production increased remarkably throughout the Industrial Revolution to feed, for example, steam engines.

"Just a few years ago, the dominant fuels in the UK were coal, gas and nuclear," Iversen says. "However, as many of the coal plants are pretty old, they can't comply with new emission regulations anymore. In addition to the emission issue, the coal plants also have financial difficulties with low capacity fees."

By capacity fees, he refers to the government's Electricity Market reform package. In 2014, the UK government introduced the Capacity Market, which

aims to ensure a secure electricity supply by paying energy companies for reliable sources of capacity on top of electricity revenues.

For the government, the annual auction is a way to encourage the investments needed to replace old power stations as well as modernise the existing ones to ensure sufficient and reliable capacity that can back up intermittent renewables. In short, the government wants to provide the nation with reliable energy at an affordable price. Whether this governmental scheme incentivises the need for flexibility in the grid remains to be seen.

## FLEXIBILITY BRINGS DOWN THE BILL

However, the competition can get fierce. Power companies look at day-ahead markets, intraday markets, and ancillary service markets in calculating their bids – and the ones that are not cleared in the auction will be automatically dropped out.

According to Andersson, the high interconnector capacity in the latest auction was one of the main reasons for the low clearing price, and what happens in the next auction depends on the number of interconnectors that enter the auction. Whatever the end

result is, the need for flexibility isn't going away; the government has committed to increasing the share of renewables in the grid, not least because of the Paris Climate Agreement

The steps towards more sustainable alternatives have been significant: in 2017, the UK saw the greenest year in its history in terms of energy generation. The government also aims to shut down all of its remaining coal power stations by 2025. Andersson points out, though, that if the auction prices remain low, the Capacity Market might force the plants to be decommissioned even sooner.

Andersson says that the country will simultaneously increase its gas capacity to supplement the remaining nuclear and coal plants when renewable generation is low.

"The focus is on renewables, but gas will be used to bring needed flexibility to the system," he explains.

Flexibility also helps avoid peaks in electricity prices, which is good news for end users. As there should always be sufficient energy at hand, the price won't jump as high as it would without flexible resources being fed to the grid when the demand goes up.

## DEMAND RESPONSE LENDS A HAND

Despite big developments in the renewables sector, both Iversen and Andersson believe that the UK will remain dependent on fossil fuels for quite some time. The best way to speed up the transition is boosting flexibility in power systems and energy storage opportunities. The UK has also increasingly begun to utilise demand response, meaning that consumers are encouraged to reduce or shift their energy usage during peak hours with financial incentives.

"Demand response is definitely a growing trend," says Andersson. "As more and more people get involved, the effect it has on energy consumption patterns will be much more noticeable, too."

Another point Andersson makes is that as the energy efficiency of the UK's housing improves, heating buildings and homes will no longer eat up as much energy reserves.

"Attempting to reduce the carbon footprint of housing with efficient solutions has been trending in other markets as well, so it's likely that the UK will follow suit."

Iversen sees that the developments in energy storage technology will provide new means to respond to sudden surges in electricity demand or failures in ongoing production.

"Energy storage technologies and advanced energy management software will become an inevitable part of the power system in shifting and optimising energy within the day. For years to come, there will also be a need for gas-powered plants and other flexible generation to ensure power system reliability when renewable energy is not available." ●



# BUILDING SUSTAINABLE BITCOIN MINING NETWORKS

► TEXT: PAYAL BHATTAR PHOTO: ISTOCK

**BITCOIN MINING IS NOW** using more electricity than 159 individual countries, more than Ireland or Nigeria, according to UK-based energy website Power Compare. That's a huge quantum of energy that has caused the network to have a massive carbon footprint. Is renewable energy the solution? Find out.

**P**icture yourself as a player in a bitcoin mining game. Your target is to find a valid hash algorithm for a new block of transactions. Every time you find a valid hash, you win the block and are rewarded 12.5 bitcoins (current rate for reward) valued at USD 9000 and an additional USD 2000–2500 as transaction fees. It's a fast-paced, exciting, addictive and very rewarding game. It is estimated that globally miners are rewarded more than USD 100,000 every 10 minutes!

That's a crucial time period because only one miner wins every 10 minutes and the hunt for the next valid hash starts right after. As the value of a bitcoin rises, the hunt for a valid hash becomes more complex and hence more valuable and rewarding. To stay on top of the game, miners have to ensure that their hardware is state-of-the-art, extremely powerful and energy-efficient.

"The catch, however, is that the bitcoin mining algorithm is adjusted every 14 days to cope with this increased computing power that miners apply," says Dr. **Harald Vranken**, Associate Professor, Open University of the Netherlands & Radboud University.

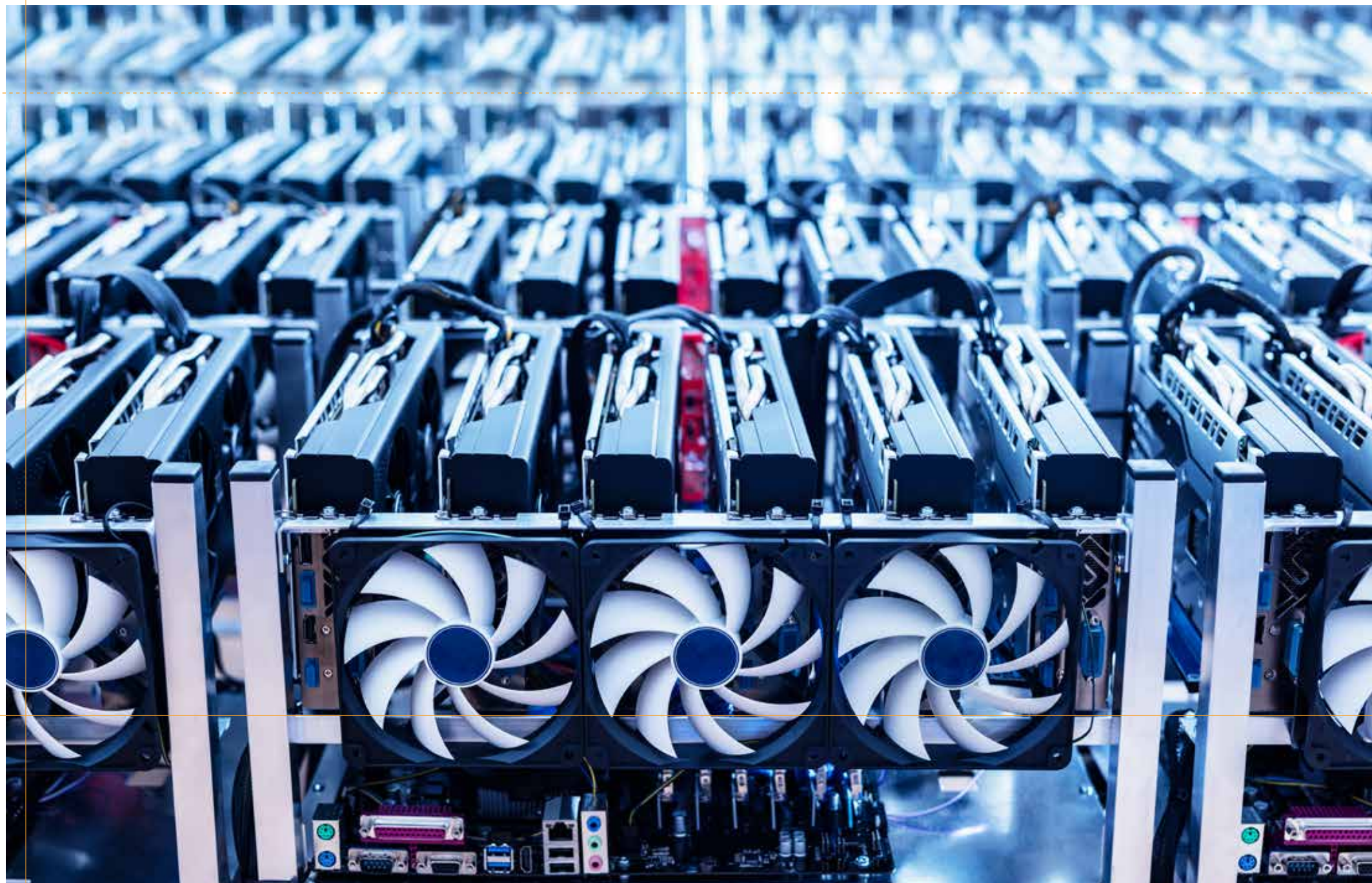
"If the computing power increases, then the difficulty of finding a valid hash increases accordingly. Hence, in the end no one really benefits (except the

companies selling mining equipment), but we face the situation in which more and more hashes are being computed, and hence more and more energy is being consumed," he explains.

## HIGH VOLTAGE

Reliable energy is critical because it means higher speed and better ability to mine bitcoins. But it takes a heavy toll on costs. According to reports, energy is the largest cost centre for miners accounting for 40–80% of estimated total mining costs of more than USD 1.5 billion. So, reducing energy costs via better hardware has been a huge priority for the sector over the past decade. What began as an activity on Central Processing Units (CPUs) went on to be replaced by GPUs (Graphics Processing Units) in the graphics cards of CPUs in 2010, Field Programmable Gate Arrays (FPGAs) in 2011, and Application-Specific Integrated Circuits (ASICs) from 2013 onwards.

But despite the rapid transformation in hardware over the past few years, the energy bill of the sector is growing at an exponential rate. According to Power Compare, in November 2017, bitcoin's estimated annual electricity consumption stood at 29.05 TWh. 'If bitcoin miners were a country they'd rank 61st in the world in terms of electricity consumption,' notes



“RELIABLE ENERGY IS  
CRITICAL BECAUSE  
IT MEANS HIGHER  
SPEED AND BETTER  
ABILITY TO MINE  
BITCOINS.”

Power Compare. It estimates that in October 2017 alone electricity consumption by Bitcoin mining grew at about 29.98%. At this rate, bitcoin mining would consume all the world's electricity by February 2020. It's an alarming estimate that makes everyone wonder whether this growth is sustainable at all.

According to Digiconomist, 'Bitcoin's biggest problem is not even its massive energy consumption, but that the network is mostly fuelled by coal-fired power plants in China. Coal-based electricity is available at very low rates in this country. Even with a conservative emission factor, this results in an extreme carbon footprint for each unique bitcoin transaction.'

## THE SWITCH

But that trend may not last long as the landscape of the energy sector worldwide is changing in favour

of renewables. According to reports, China, which accounts for almost 70% of the world's bitcoin-mining pools, has asked industry to reduce its carbon emissions and may also impose taxes to control the domestic power market and digital currency operators.

"Because miners are extremely sensitive to electricity prices, they tend to locate in areas where electricity is cheap, which most often is where renewables are used: hydro, solar, wind. This gives electric utilities an incentive to further develop renewables, which reduces their cost, makes them more competitive, and hopefully accelerates the transition away from fossil fuel power plants," says **Marc Bevand**, Independent Researcher & Angel investor.

For instance, cryptocurrency miners are reportedly setting up in the free-trade zone in Ciudad del Este in Paraguay, to tap cut-rate power generated

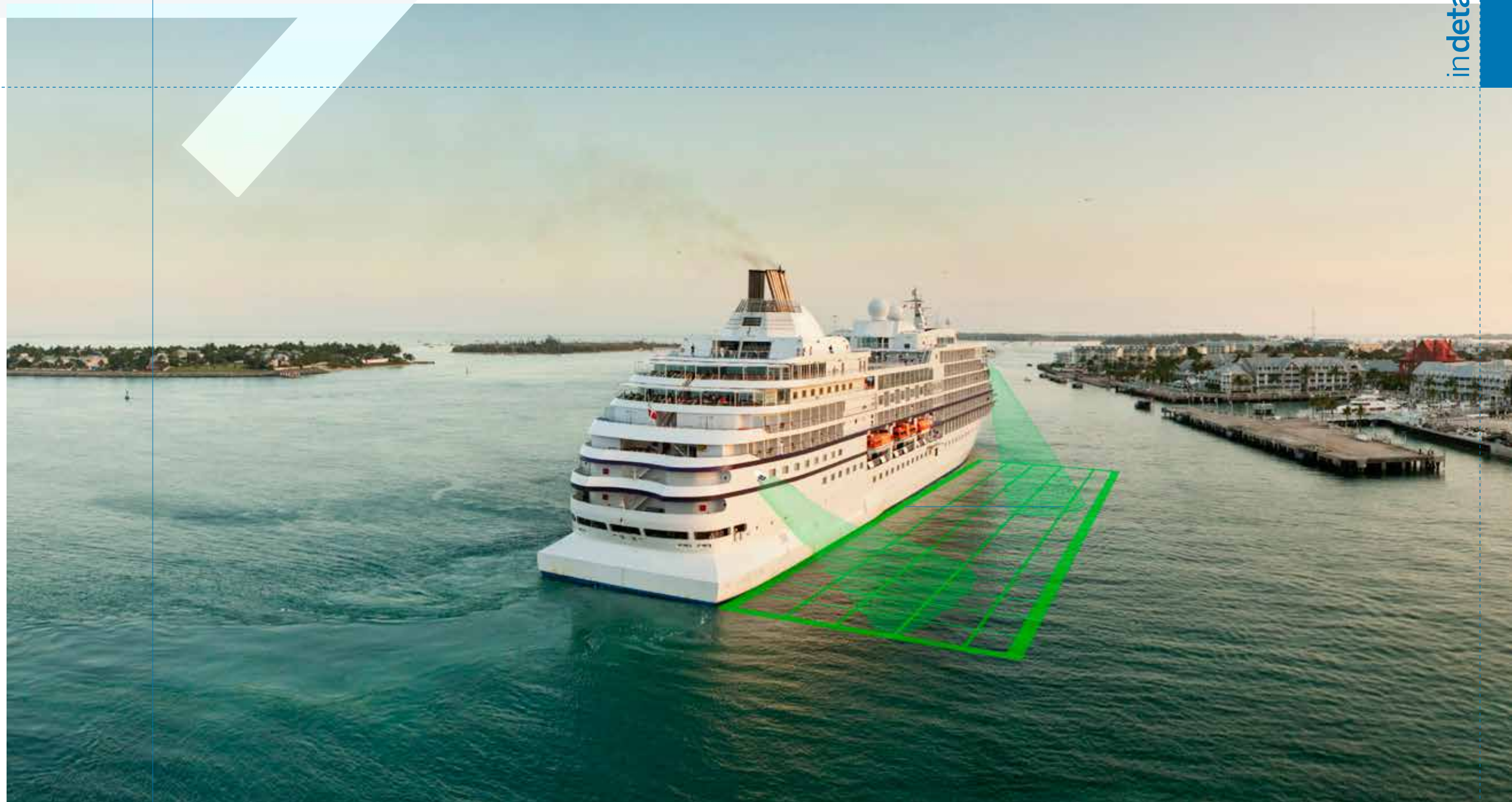
from the nearby hydropower plant as electricity prices are about one-fourth those in neighbouring Brazil. Canadian utilities are wooing miners with cheap electricity and cooler climatic conditions to keep energy costs under control. Experts say that with renewables and power storage prices falling drastically and with most economies around the world set to control their carbon footprint, bitcoin miners will find it worth their while to become more environment-friendly. ●



# SMARTQUAY SOLUTION = FASTER, SAFER DOCKING

► TEXT: ZIKO RAY ILLUSTRATION: ADOBESTOCK

**THE DISRUPTIVE SMARTQUAY** solution by Guidance Marine, a Wärtsilä company, measures distance and speed to the actual quayside, day or night, without anybody being able to jam or interfere with critical signals.



**T**he shipping industry is witnessing rapid transformation. Vessel manufacturers are crafting gigantic cargo and cruise vessels with huge payload capacities and leveraging state-of-the-art technologies.

And while the trend of building mammoth cargo and cruise vessels is ballooning, the challenges associated with faster and safer docking, particularly during rough weather conditions, are mounting proportionally.

#### NEED OF THE HOUR

“Vessels are getting larger and the designs more advanced, often to maximise space for passengers (for example extending panorama decks beyond the vessel hull), thereby obstructing the view from

the bridge. The skipper has to be very experienced, estimating the approach distances, speed and relative heading by sight. This is especially challenging when under time pressure or in poor conditions,” says **Milijan Mudrinic**, Software Technologies Group Manager, Guidance Marine.

To solve this pivotal challenge, Guidance Marine’s proficient workforce developed the SmartQuay solution, which furnishes reliable and accurate measurements to quay fenders for a wide range of conditions.

The solution also assists the skipper with augmented reality video feeds, ensuring pinpoint accuracy.

“SmartQuay has been trialled over an eight-week period and we have achieved excellent initial results. We are now working with our current customers as

## THE SOLUTION ASSISTS THE SKIPPER WITH AUGMENTED REALITY VIDEO FEEDS, ENSURING PINPOINT ACCURACY.

well as other potential early adopters for various retro-fit opportunities as well as fleet-wide adoptions and integration into NACOS Platinum,” says Mudrinic.

#### DEPLOYMENT COSTS AND COMPATIBILITY

According to Mudrinic, the most complex deployment of the solutions includes four separate sensor pods installed on the bridge and at the stern (two ports and two starboards).

Each pod incorporates a vision and a thermal sensor powered and connected via Ethernet cable only. The installation is straightforward for new builds as part of the normal network cabling or even for retrofit opportunities where spare cable capacity can usually be used.

“In any case, we work closely with our expert colleagues from Wärtsilä APSS team to manage all aspects of such installations including the bridge mounting of displays and the video analytics server which contains all the smart software. The installation and commissioning do not require dry docking and the sensor bracket deployment can usually be completed in a single port call,” adds Mudrinic.

#### THE FUTURE OF SMARTQUAY

On the compatibility front, Guidance Marine is confident that the SmartQuay system should, in principle, be compatible with all cruise vessels as long as the physical installation is possible.

“For other vessels, including merchant container vessels, which have different layouts to large cruise

vessels, we are also considering a simplified, lower-cost system which uses fewer high-definition measurement pods but then augments the system with more cameras and additional augmented reality overlays to provide more of a ‘surround’ or ‘bird’s-eye’ view,” adds Mudrinic.

With more ships sailing across the length and breadth of oceans, more sophisticated marine traffic management has emerged and Guidance Marine’s SmartQuay solution is the first step towards modernising this process. ●



# WÄRTSILÄ 14: LIGHTER, SMARTER AND GREENER

► TEXT: DAVID J. CORD ILLUSTRATION: WÄRTSILÄ

**THE NEW ENGINE** in Wärtsilä’s smart marine solutions range is compact, cost-efficient and more sustainable. It also comes with an improved load-taking capacity and safety features.

Compact, fuel-efficient and sustainable are the top three adjectives to describe Wärtsilä 14 engine, the latest addition to the company’s fleet of advanced, high-speed range. Unveiled at the International Workboat Show in New Orleans, USA, that took place between 28 and 30 November 2018, this new product is designed to excel in its power-to-weight ratio aspects. That means it is designed to fit requirements for limited space and weight in order to maximise space for cargo.

“Having the Wärtsilä 14 engine in our portfolio enables us to offer an even wider solution range, which greatly improves the total efficiency,” says **Janne Klemola**, Product Director, Wärtsilä Marine Business. “The market is rapidly changing, and customers demand that we maximise the overall performance of the whole solution, improve safety and advance environmental sustainability.” And this new engine checks all the above boxes.

The Wärtsilä 14 engine has been developed in collaboration with the Liebherr Group, a Switzerland-based company that specialises in land-based applications for its large engine products.

“Collaboration with Liebherr began to deepen when we started to develop this engine,” says **Tomi Kaarniemi**, Product Manager at Wärtsilä. “We are very excited at what we’ve accomplished together.”

**PETITE POWERHOUSE**

Technologically speaking, the Wärtsilä 14 comes in 12- and 16-cylinder configurations, with a power output between 755 and 1340 kWm in mechanical propulsion and 675–1155 kW in an auxiliary generation and diesel-electric propulsion.

The engine is lighter and more compact compared with others in the market. So, it saves space and weight in the ship. Its load taking capability is much better compared with medium-speed engines, so it has a fast start and performs better in harsh environments. It is also equipped with the Wärtsilä UNIC automation system modules for monitoring and improved safety.

“There is a huge business potential for such an engine in this power range,” says Klemola. “If you visit a harbour you might see many ships working around the piers that would be perfect for the Wärtsilä 14, such as tugs, fishing boats or smaller sea-going vessels. The engine also fits auxiliary power generation requirements for merchant ships like container carriers or tankers.”

The Wärtsilä 14 fits those applications that require small high-speed engines: smaller vessels using cleaner fuels on the lower end of the power range, such as the new Wärtsilä HY Tug 40. The shallow-draft tug includes two Wärtsilä 14 engines and a hybrid propulsion system that delivers flexible



WÄRTSILÄ 14 IS  
LIGHTER AND  
MORE COMPACT  
COMPARED WITH  
OTHERS IN THE  
MARKET.

**Wärtsilä 14 specs**

Cylinder configuration	12V	16V
Nominal power (kWm)	755–1005	1005–1340
Nominal power (kW <sub>e</sub> )	675–865	900–1155
Nominal speed (rpm)	1500–1900	1500–1900
Bore (mm)	135	135
Stroke (mm)	157	157
Engine displacement (L)	27	36





Wärtsilä HY Tug 40.



operating modes, such as one for zero emissions. “The Wärtsilä HY Tug 40 is really a fantastic showcase for us,” explains Kaarniemi. “We designed the entire ship and propulsion system.”

**A PRUDENT CHOICE**

Apart from being technologically advanced, the Wärtsilä 14 engine comes with improved cost efficiency. “The industry is moving towards cleaner and lighter fuels. So, the time is right for the high-speed Wärtsilä 14,” Klemola continues. “One major innovation is the Digital Fuel Injection system which is optimised to operate on marine distillate fuel oils. We want to ensure that our product portfolio delivers the best possible value to our customers.” “Another major customer advantage is the investment cost,” says Kaarniemi. “The Wärtsilä 14 is designed to be cost-competitive, and thanks to its fuel-efficiency it helps us to be very competitive

through the whole lifetime of the machinery compared with other high-speed engine makers. We’re convinced that customers will be very pleased with the benefits they receive and the low total cost of ownership.”

**FOR FUTURE NEEDS**

The engine is more than just a high-speed, technologically advanced machine. It is designed for the future, designed to be environmentally sustainable. The engine follows Wärtsilä’s vision of the green ships of the future and complies with global environmental regulations. The Wärtsilä 14 engines are supplied with Wärtsilä’s innovative system to reduce nitrogen oxide emissions. The Wärtsilä NO<sub>x</sub> reduction (NOR) system is optimised for the Wärtsilä 14 and maximises the overall performance of the engine and exhaust gas cleaning system. The new engine is an important addition to the company’s smart marine portfolio, broadening

THE ENGINE IS  
MORE THAN JUST  
A HIGH-SPEED,  
TECHNOLOGICALLY  
ADVANCED MACHINE. IT  
IS DESIGNED FOR THE  
FUTURE, DESIGNED TO  
BE ENVIRONMENTALLY  
SUSTAINABLE.

Wärtsilä’s offering and providing its customers with a wider range of options. Also, the services aren’t limited to just providing engines. The company offers many more solutions and hybrid installations, including complete packages from in-house design, manufacturing, project management services and life-cycle support. “We are able to deliver and support engines, propulsion systems, generators, exhaust gas treatment systems – automation and hybrid systems, in other words, the whole machinery,” explains Klemola. ●

TEXT: KAMALA GOVINDAN PHOTO: WÄRTSILÄ

**185 years and counting**

Wärtsilä’s story is one that has quite literally withstood the test of time. It started off as a sawmill and ironworks way back in 1834 and is today a global leader in smart technologies for the marine and energy markets. If there is one consistent fact about its journey over the years, it is that Wärtsilä has never been shy about adapting and innovating while providing trailblazing products and solutions. Take, for instance, its foray into magnetically galvanised wires in 1930, a feat that helped the company stave off the worst impacts of the Great Depression. Then, in 1942, Wärtsilä,

in partnership with Friedrich Krupp Germania Werft AG, built Finland’s first diesel engines proving that it was no laggard when it came to producing advanced technology. Cut forward to the modern age, and Wärtsilä is still at the forefront of technological innovation. At a time when sustainability is the need of the hour, Wärtsilä has committed itself to use smart technology to build sustainable societies. This has resulted in the invention of the Wärtsilä 31, the world’s most efficient 4-stroke engine, and also the application of big data and machine learning to develop smart ports, power

plants, marine systems and other services. To mark the occasion of its 185th anniversary, Wärtsilä has released a book reflecting upon its own history. Titled ‘Of Machines and People’, the book contains interviews with 59 individuals who have worked with the company over the past five decades in various capacities ranging from industrialists to chauffeurs and engineers to salesmen. In their recollections, readers will be able to gain a deeper insight into the transformative path that has made Wärtsilä what it is today, and also understand that the secret behind the company’s success has always been its people and its attitude.

\*Sign off

AT YOUR SERVICE | CLASSIC | AMBITION | LITTLE ENGINEER | COLUMN

Wilhelm Wahlforss and  
Elsa Högberg at the ship  
naming ceremony.



[ AT YOUR SERVICE ]

# A honey pot of innovation

**WÄRTSILÄ'S SMART TECHNOLOGY HUB** in Vaasa will be a state-of-the-art centre of research, product development and production for Wärtsilä and its customers and suppliers, start-ups, universities and other institutions. We asked **Hannu Mäntymaa**, Director, R&D and Engineering at Wärtsilä, a few questions about the significance of the new industry hotspot.

## 1 WHAT DOES SMART TECHNOLOGY HUB MEAN TO WÄRTSILÄ AND ITS CUSTOMERS?

The Hub will enable Wärtsilä, together with its partners, to lead the transformation towards a 100% renewable energy future and a smart marine ecosystem. It will be the place to be, a so-called 'honey pot', to innovate solutions that can solve the challenges, such as climate change and business opportunities, our customers and industries are in the middle of. The Hub is a platform for innovation, and it will be connected to other Wärtsilä centres of excellence globally

"THE SMART TECHNOLOGY HUB IS A PLATFORM FOR INNOVATION."

so that they can share best practices, innovative solutions and technical support.

## 2 WHY IS COLLABORATION SO IMPORTANT TO INNOVATION AND R&D?

Collaboration, or co-creation as we like to call it, is the only way to stay in a market-shaping leadership position in a rapidly changing world. Collaboration improves the speed of innovation by bringing together diverse views and

competences. By collaborating, we are able to combine different ideas that can lead to new disruptive innovations and technological solutions. Collaboration also adds inspiration and energy to R&D with faster idea generation, learning, employee engagement and the ability to test and bring ideas forward.

## 3 WHAT ARE THE BIGGEST CHALLENGES (NOW AND IN THE FUTURE) THE GREAT MINDS AT THE HUB WILL BE TACKLING?

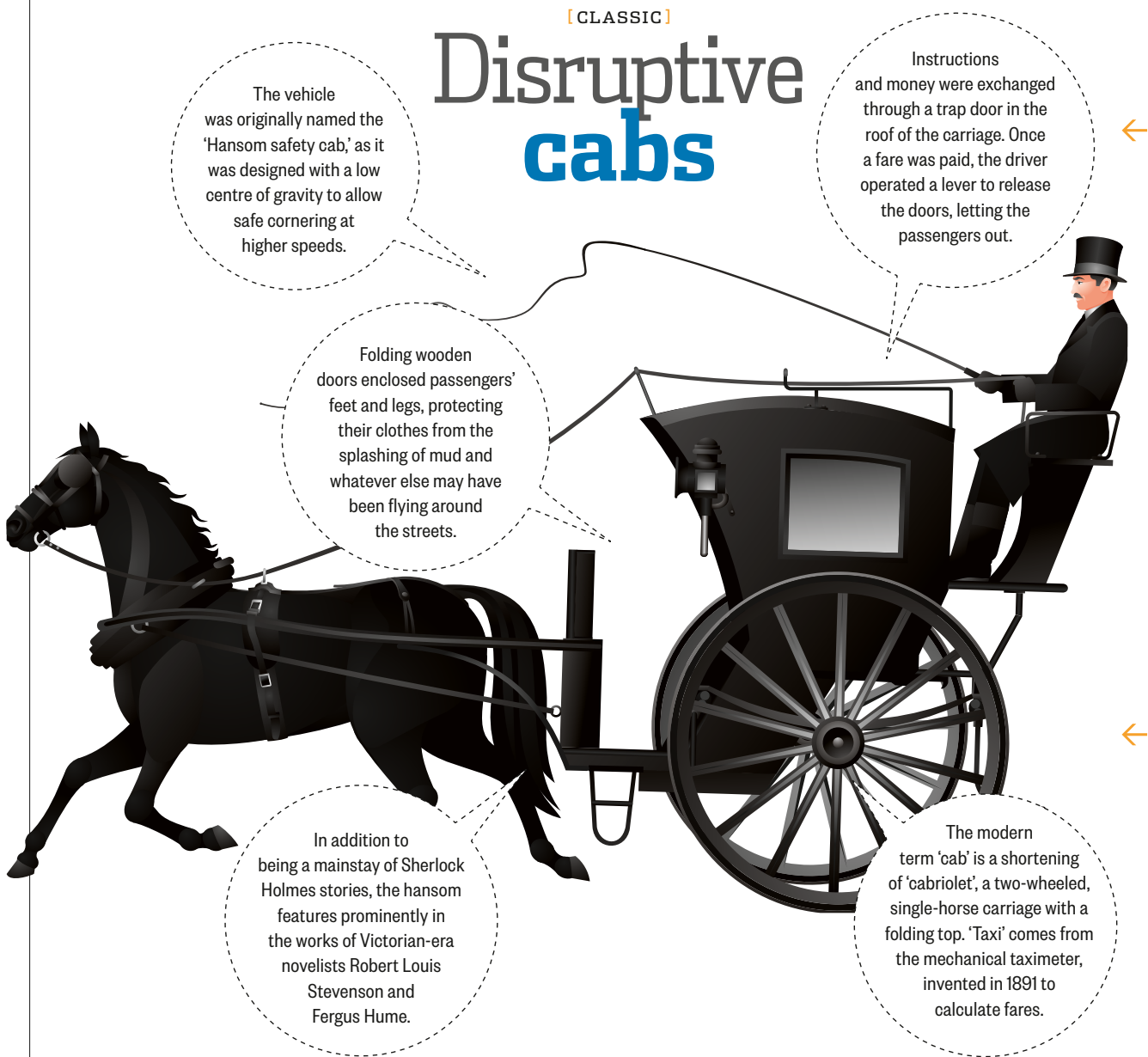
Our co-creation and R&D are inspired by Wärtsilä's purpose: enabling sustainable societies with smart technology. And since climate change, energy efficiency and flexibility as well as safe and reliable operations are challenges and opportunities our industries are facing, we believe our broad portfolio of products, open innovation culture with our partners, new digital technologies, competences and solutions will be our winning formula to enable sustainable societies and create extraordinary value to customers.

ILLUSTRATION: SHUTTERSTOCK

sign off

[ CLASSIC ]

# Disruptive cabs



## ORIGIN

1834, over and above being the birth year of Wärtsilä, marked a shakeup in London's for-hire transport with the invention of the hansom cab. Designed and patented by York architect **Joseph Hansom**, the cabs gained instant popularity for their cheap prices and agility and remained the Victorian era's go-to ride in the cities of the British Empire, Europe and North America.

## TECHS & SPECS

**Designer**  
Joseph Hansom, improved by John Chapman, et al.

**Typical dimensions**  
3.8 m x 2 m x 2.7 m

**Era of use**  
1834 – early 1900s

[ SCIENCE ]

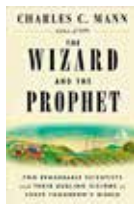


Cat poo could help you become a better entrepreneur, according to a study published by University of Colorado researchers.

Their work uncovered a positive correlation between exposure to *Toxoplasma gondii*, a parasite found in feline faeces, and risk-taking and entrepreneurial behaviour. The study adds to a growing body of evidence suggesting that parasitic infections may be affecting the way our brains operate, influencing human culture to a degree we never imagined.

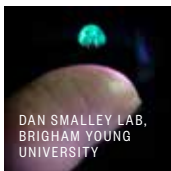
[ CULTURE WATCH ]

[ LITERATURE ]



Respect nature or bend it to our will? The philosophical puzzle that defines our age is sketched out in entertaining detail in journalist **Charles C. Mann's** book *The Wizard and the Prophet: Two Remarkable Scientists and Their Dueling Visions to Shape Tomorrow's World*. The book tells the quirky tales of two forgotten 20th-century figures, agronomist **Norman Borlaug** and ecologist **William Vogt**, whose opposing views shape how we think about the environment and mankind's role in it.

[ TECHNOLOGY ]



In the life-imitates-Princess-Leia category, scientists at Brigham Young University have developed a way to generate free-floating, 3D images entirely out of light. The technique, called photophoretic optical trapping, involves capturing and suspending tiny particles in mid-air and using them as a 'screen' for laser projectors. Technically not a hologram, the tiny image produced doesn't require a surface and can be seen from all angles.



# Going boldly

[ AMBITION ]

## where no woman has gone before



Nina Skorupska, Chief Executive of the UK's Renewable Energy Association (REA), is one of the most influential women in the UK energy market.

Nina Skorupska is the Chief Executive of the Renewable Energy Association and has been at the forefront of the march towards renewable energy grids. Now, her goal is to get households in the UK to produce their own electricity for the benefit of all. This is her story.

As the Chief Executive of the UK's Renewable Energy Association (REA), **Nina Skorupska** is one of the most influential women in the UK energy market. Surprisingly, however, the energy industry was not her first passion.

"I was a *Star Trek* fan and I wanted to boldly go where no woman has gone before," recalls Skorupska as she reminisces about the choices that made her the person she is today.

As any Trekkie would do, Skorupska went to university to study astronomy and astrophysics. "But I realised my mathematics wasn't as hot as it needed to be," she laughs. Soon enough, based on her professor's guidance she ended up joining the energy sector. Where space may have lost a would-be pioneer, the energy industry ended up gaining a formidable leader.

While energy may not have been her first choice, she pursued her career with enthusiasm and boldness. The daughter of a Polish immigrant, she became the first woman to run one of RWE's UK power stations. She was only 39 then and it was just the beginning. Eventually, she went on to lead the REA in 2013 and was even named one of Women's Engineering Society's Top 50 Influential Women in Engineering in 2016.

### THE RISE OF THE PROSUMERS

Having been part of the industry for the past 30 years, Skorupska has seen the energy industry's metamorphosis from the ground up. And, as far as she is concerned, this is the most exciting time for the sector thanks to the advent of renewable energy.

According to a KPMG report prepared at the request of the REA, since 2012 the costs of domestic-scale solar photovoltaic cells have fallen 40% and global wind costs have fallen 60% since 2009. At the same time, the storage capacities of batteries have been rising while the costs of the batteries themselves have been falling. The case for renewable energy has never been stronger than it is now.

"It is absolutely about having the sensibility of understanding the good and the bad things of all the different technologies and how fast things are changing, and the need to change to address climate change," says Skorupska.

One of her responsibilities in leading the REA is to promote the use of renewable energy in the UK, and the most interesting and possibly the hardest part of doing this is the concept of sharing power generation – already a popular concept in many parts of Europe. And for this to happen, Skorupska wants individual consumers to use renewable energy to generate power for themselves, and even feed excess power back into the grid. The industry calls this group of consumers 'Prosumers' and Skorupska is proud to be one of them.

"I have solar panels on my home and not only do I consume it, but I produce it as well and I sell it into the market," she explains.

### TAMING THE FINAL FRONTIER

Skorupska's efforts to turn more people into prosumers is aided by the REA's network of over 560 renewable energy stakeholders who possess the technologies and expertise to help prosumers generate decentralised energy for homes, entire neighbourhoods, towns or even businesses.

"There's no one single template," she says of what works in the prosumer economy. "The key thing that makes all of this work is technology"

However, this doesn't mean that Skorupska is unaware of the risks. She says there are two major worries, both of which are about protecting the consumer.

The first major worry is about the cyber security risks of a connected and shared grid. "When you connect everything up, other things and other people want to connect to you as well," warns Skorupska. "So, we have to work hard with technology specialists and we have to stay ahead of very clever people who try to take advantage of new things."

The second worry relates to scams related to renewable technology. "We must not have cowboys come in and abuse and take advantage of consumers, because this will set back decentralised energy big time," explains Skorupska.

In order to combat this, the REA already has a subsidiary, the 'Renewable Energy Consumer Code', to verify and check that people are installing renewable and clean tech. The REA is also currently advising a forum by the Department for Business, Energy and Industrial Strategy (BEIS) and Office of Gas and Electricity Markets on smart systems to upgrade UK's energy system.

"What we need to ensure is that the system is fair and transparent. We continue to educate and innovate, and hopefully, more and more people will become excited and not just someone like me," says Skorupska, optimistically. ●

"WE MUST NOT HAVE  
COWBOYS COME IN  
AND ABUSE AND TAKE  
ADVANTAGE OF CONSUMERS  
AS THIS WILL SET BACK  
DECENTRALISED  
ENERGY."



TEXT: STEVE ROMAN

PHOTO: WÄRTSILÄ

#### [ THE GEAR ]



Minimalist packers can rest easy with the **Scrubba Air Sleeve**, a fully weatherproof laptop sleeve that doubles up as an inflatable pillow. The award-winning accessory weighs a mere 170 to 310 grams and is tough enough to protect devices from drops, knocks and even hammer blows.



**Spectacles 2**, Snap Inc.'s second generation of video recording glasses are the travel must-have for social media zealots. The stylish specs record high-definition video clips and photos, and then sync them with your Snapchat Memories. They also protect your eyes from the sun.

Achy, swollen legs are an all-too-common companion on long-haul flights, after long meetings, during exhibitions when you have to stand for long periods or after working out. The Swiss-tested Compression Socks from **Danish Endurance** offer a high-tech cure, delivering an optimal 18-21 mmHg of support to boost blood circulation. Available in black, white, yellow and pink.



#### [ LITTLE ENGINEER ]

## The gloves are on

**THE WORLD NEEDS MORE SUPERHEROES**, probably almost as much as it needs more engineers. Luckily, today's kids won't have to face the struggle of choosing between these equally noble careers thanks to the Avengers Hero Inventor Kit.

Created by littleBits, the New York-based outfit that made its name with electronic building blocks, this multiple award-winning set is an interactive super-hero gauntlet that apprentice Avengers can build, customise and program themselves – a novel way to learn circuitry and coding while developing creative skills at the same time.

The kit's physical components include various electronic 'bits' like an LED Matrix, accelerometer, sound effects module, Bluetooth interface, power

unit and light sensor along with plastic pieces, stickers and a battery.

The real action, though, happens in the mobile app, where popular Marvel characters of both genders preside over step-by-step lessons in assembling various circuits and coding with a drag-and-drop block language. There are 18 challenges in all, complete with helpful video demonstrations and a troubleshooting guide, that make the gauntlet react in different ways to different stimuli. Kids can also leave the app out of the picture and just experiment with the hardware.

The gauntlet comes with a tough case and is meant to be villain-proof, but littleBits also has a 30-day, no-questions-asked return policy. Recommended for ages eight and up.

# sign off

## Towards a future built on 100% renewable energy

**IF I WAS TO MAKE ONE PREDICTION** for the next couple of decades, it would be that the future as we know it will be centred around renewable energy.

According to the International Renewable Energy Agency (IRENA), power from solar, wind and other renewables currently make up a fifth of global energy production, and it is growing faster than any other source.

While the fact that renewables are a clean and emission-free source of energy is undeniable, the rapid adoption of renewable energy, globally, is also based on sheer economics. Thanks to advances in technology, the costs of renewable energy production have come down dramatically, making it a preferred alternative to more conventional energy sources. According to IRENA, there has been a 75% drop in the cost of electricity produced by solar energy since 2009, while the cost of wind turbines has come down by half in the same period.

This has caused utilities around the world to aggressively adopt renewables in their energy production mix, or risk losing out on the next big revolution in the energy market. They are also seeking ways and means to back up renewable energy power generation with flexible generation and energy storage. This is crucial to ensuring that the transition to clean energy takes place smoothly. Energy systems integrators like Wärtsilä can help by providing smart solutions that can help energy producers make the switch safely, securely and profitably. This is also the goal behind Wärtsilä's Smart Energy Vision to help our customers transition to a 100% renewable energy future by designing, building and providing them with complete solutions and services across the entire energy generation lifecycle.

To do this, Wärtsilä has employed a host of cutting-edge technologies including smart, flexible engine power plants, future-proof energy storage solutions and advanced software based on machine learning that can help continuously optimise energy generation from start to finish. Our flexible power generation systems can automatically adjust to weather conditions, store excess power and offer the ability to go offline and restart quickly, multiple times a day. Thanks to digitalisation, remote sensors and artificial intelligence (AI), this is possible at a rate of efficiency that is unheard of in more traditional systems. With these, we are able to support our customers over the lifecycle of their installations with services and solutions that enable increased efficiency and guarantee performance.

Over the next few years, I see market forces continuing to push unprofitable and inflexible baseload generation out while embracing more cost-effective solutions like renewables which will then become the new baseload. Wärtsilä is set to partner with its customers every step of the way as we build a 100% renewable energy future together.

**Marco Wirén**

President

Energy Business & Executive Vice President  
Wärtsilä Corporation



# Enabling sustainable societies with smart technology

OPERATIONALLY  
EXCELLENT, AGILE  
AND DIVERSE

USING DATA TO SHAPE  
OUR MARKETS

HERITAGE OF  
TECHNOLOGY  
INNOVATION

PARTNERING FOR  
LIFECYCLE VALUE

CARING FOR OUR  
ENVIRONMENT AND  
COMMUNITIES

We reshape the world through innovative technology and new business models, and lead the transformation towards smarter ecosystems and energy intelligence. We are all about efficient use of resources, zero emissions and uncompromised safety. Join us as we step into the future!





[WWW.WARTSILA.COM](http://WWW.WARTSILA.COM)