Twentyfour7.

Wärtsilä Stakeholder Magazine

→01.**2017**

THEME:
SPEED

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*Wärtsilä Stakeholder Magazine**

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R&D: FREDRIK GRÖNLUND'S MISSION (ALMOST) IMPOSSIBLE

Around the globe

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in detail

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The need for speed

EVERYTHING IN OUR ENVIRONMENT seems to get faster by the year, if not the day. For some perspective, the first production automobile had a top speed of 10 mph (16 km/h). Currently, the fastest, road-legal production car, the Hennessey Venom GT, clocks in at 270.5 mph (435.3 km/h) – a 27-fold increase.

The digital progress is even more amazing. Take for instance, computer microprocessor speeds. From the first Intel 4004 at 740 kHz to the latest Intel Core i32350M at 2.3 GHz, the speed has multiplied by more than 3000 times.

So how do we keep up with all these speedy developments? As **Jaakko Eskola** points out in his column, it's getting more and more difficult to predict how things might change. Rather than attempting to guess the speed of progress, we should focus on finding ways to adapt and fit in advancements as best we can.

Back when "Speedy Ville" took over Wärtsilä in 1926, our innovations came more quickly, but they were not as fast and furious as they've become in the last 10 years. Even our homeland of Finland, which turns 100 this year, was barely getting started then but has since developed into one of the most socially progressive countries in the world.

Speaking of social progress, Kenyan long-distance runner **Tegla Loroupe** has set several speed records. Now she's applying the drive that helped her run faster to accelerating development efforts in her native country. She's also teamed up with others to create the Olympic Refugee Team, providing a home for refugee athletes who have been displaced from their own countries, due to rapid changes in geopolitics.

Fuelled by our own drive to improve the lives of our customers and the people they serve, we aim for ever-greater efficiency in all we do. For example, we search for ways to help maximise the use of sustainable resources, such as solar energy. In this issue you can read how our Smart Power Generation power plants enable integration of renewables and are paving the way for rapid growth in solar and wind energy in locations all over the world – from America to Africa.

On the digital front, the newest member of our Wärtsilä family, Eniram, is taking intelligent performance management into high gear. SkyLight, launched last fall, provides the means to optimise ship performance quickly and cost-effectively to help our marine customers keep up with the speed of their businesses.

So, dear customers, no matter which way you look, we'll be doing our best to keep pace with the speed of change to keep you on top of the wave.

Atte Palomäki
Executive Vice President
Communications & Branding
atte.palomaki@wartsila.com
twitter: attep

We take fun seriously

THANKS TO WÄRTSILÄ FUNA, FRED DANCES FOR THE FIRST TIME SINCE 1984

WE ARE THE RELIABLE INTEGRATOR WITH COMPELLING AUDIO AND STUNNING VIDEO SYSTEMS

WÄRTSILÄ HAS ALL THE ELECTRICAL AND AUTOMATION SOLUTIONS YOU NEED

WÄRTSILÄ CONNECTS THE DOTS

Wärtsilä is the world leader in shipping, with the only complete marine offering. It includes all the electrical and automation solutions you may possibly need. Because we know how all the parts are made, we are the best at integration as well. We are very serious about fun – and know how to ensure the optimal experience at sea or on land.

WÄRTSILÄ

Arctic appeal

AFTER THE FIRST LARGE SEA FREIGHTER managed to travel through the Northwest Passage in 2013, the Polar Research Institute of China predicted that up to 15% of the country's annual trade would travel along Russia's Northern Sea Route by 2020. Seeing itself as a "near-Arctic nation," China is looking to strengthen its role in the region. For example, in July 2016, Chinese shipping giant Cosco announced plans to send more cargo vessels via the Arctic, the polar research vessel *Xue Long* completed its seventh Arctic expedition, and China approved tenders for its first domestically produced icebreaker.

With all the increased interest in the Arctic route and Arctic shipping, Wärtsilä joined the non-profit consortium Team Arctic Finland. What's more, Wärtsilä will leverage its extensive experience in the Chinese market with Chinese customers, like Cosco, to explore and maximise the opportunities presented by the Arctic route, focusing on providing sustainable solutions with maximum reliability, safety, quality and operational efficiency in the extreme Arctic conditions.

*around the globe

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

PHOTO: iSTOCK

[AROUND THE GLOBE]

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News

STAR-QUALITY SHIP

On 29 January 2017 Baltic ferry and cruise operator Tallink Group launched its new fast ferry, Megastar.

In addition to the state-of-the-art amenities for its 2800 passengers – such as a two-level shopping area, open-layout dining areas and a versatile choice of lounges – Megastar is the most advanced and environmentally efficient ferry on the Baltic Sea. Designed exclusively for the Tallinn-Helsinki route, Megastar complies with the current and future emission regulations for Emission Control Areas like the Baltic.

Megastar features Wärtsilä dual-fuel engines running primarily on liquefied natural gas (LNG), though it also can run on diesel. When operating in gas mode, the sulphur oxide (SO_x) and particle emissions from the Wärtsilä engines are nearly zero. Furthermore, the nitrogen oxide (NO_x) emissions are at least 85% below those specified in the current regulations, and CO_2 emissions are some 25% less than those of a conventional marine engine running on diesel fuel.

With the three 12-cylinder Wärtsilä 50DF and two 6-cylinder Wärtsilä 50DF main engines, the 212-metre-long ferry boasts two fixed pitch propellers, propeller shaft lines and the Nacos Platinum navigation system from Wärtsilä. A maintenance agreement with Wärtsilä optimises the Megastar's performance, enhances its availability and reliability. Wärtsilä continuously monitors the condition of the engines, and carefully analyses the received data to determine service and maintenance needs. This ensures the optimal performance of the engines and reduces operating expenses. Wärtsilä's online operational and technical support is available 24/7.

EXCITEMENT
RESPECT AND TRUST

ENERGY
MAKE THINGS HAPPEN

DO THINGS BETTER
EXCELLENCE

Wärtsilä GLOCAL WATCH

INDONESIA:
A deal to supply two 57 MW power plants to Indonesian state utility PT PLN has been won by a consortium between Wärtsilä and Indonesian construction company PT PP (Persero) Tbk. The plants will be built in the cities of Jayapura and Kendari and are scheduled to be operational in the first half of 2017. This will be possible thanks to the use of Wärtsilä's Gas Cube Technology, which allows for the installation of a pre-engineered and modular power plant package, involving minimal site work. Once finished, Wärtsilä's installed capacity in Indonesia will have exceeded 3.2 GW during 2017.

GERMANY:
Wärtsilä has won two interesting orders in Germany which will go a long way in helping the country meet its climate action plan. The first order is to supply a 100 MW combined heat and power plant to Kraftwerke Mainz-Wiesbaden AG in Germany, which will help the region shift completely to a modern, low-carbon-emitting system. The second is a radical bio-hybrid production plant for German energy company Erdgas Südwest GmbH. Packing a unique liquefaction system, the plant is designed to clean and liquefy both biogas and pipeline gas streams, a new solution that offers flexibility in energy storage. This makes it possible for even smaller gas streams to be made profitable.

UNITED STATES:
Carnival Corporation, the world's largest cruise company has, signed a 12-year strategic partnership with Wärtsilä worth EUR 900 million. The agreement will see Wärtsilä take care of all engine maintenance and monitoring work for 79 vessels in Carnival's fleet. Both companies will also collaborate on ongoing planning activities, with the risks and rewards shared equally between the two. For Wärtsilä, the partnership encourages increased focus on research and development and improving energy efficiencies.

WASTE HANDLING TAKES A LEAP FORWARD

TEXT: ANNA GUSTAFSSON **PHOTO:** JOHANNES TERVO

Wärtsilä can now provide a full portfolio of waste handling for ships. In addition to wet waste management, the company now offers solutions to handle dry waste onboard as well.

THERE IS HARDLY ANY INDUSTRY today that does not need to be environmentally conscious, and the shipping industry is no exception. For Wärtsilä, sustainability issues come naturally, says Vice President of Environmental Solutions **Juha Kytölä**. Environmental protection acts as an inspiration to push forward even more ground-breaking technologies.

Vessels produce waste, and different amounts of it, depending on the vessel type. Wärtsilä has for some time already been able to offer an efficient wastewater cleaning system for ships. But a completely new area of expertise has now been introduced, with Wärtsilä providing the technology to take care of solid waste on ships.

EARLIER, SHIPBUILDERS HAD TO INTEGRATE different equipment from different providers. But the trend nowadays is of shipyards expecting the whole system from a single provider, Kytölä explains.

"Here Wärtsilä has definitely responded to the market's need. The full-treatment solution is what the ship builders have been looking for; they expect the systems to work together. They purchase a complete working solution for the ship."

On cruise ships, a surprisingly large amount of waste can build up in a short time. Before, the storing of the waste took a lot of space. But now, as the waste is largely managed onboard, there is less need to store it, therefore requiring less space on the ship.

"When less space is used for storing waste, more space can be used for the passengers," Kytölä points out. "This is a clear advantage in meeting the passenger's needs."

IN PRACTICE, THE NEW SYSTEM of waste handling means better possibilities to reuse and recycle. Materials like metal and glass can now be collected separately inside the ship. Taken onshore when the ship comes to harbour, these materials can be transferred for recycling. Nothing goes to waste.

Bio-waste coming from food and food processing is an issue, especially on cruise ships where thousands of passengers and a significant number of crew members are fed several times a day. Cruise ships have to come up with solutions while managing with limited facilities and limited space.

Wärtsilä's new waste management system enables the bio-waste to be managed largely onboard. Food scraps and leftover material are processed by extracting the water from the waste onboard. The water is then processed through a 'grey and black water' treatment system. The dried waste is handled together with bio-material and other burnable waste. It can be burned onboard in incinerators, which are also part of Wärtsilä's waste management system.

FROM AN ENVIRONMENTAL POINT of view, the less energy the waste management systems use, the less energy that needs to be produced.

With waste management, the efficiency comes from a well-working system, explains Kytölä. "The efficient process of collection, recycling and disposal in modern low-emission incinerators provides high efficiency, with the lowest impact on the environment."

Kytölä is convinced that the integrated, full-solution waste management system that Wärtsilä can now provide will become the industry standard. The work doesn't stop there, though, as research and development is an ongoing priority for the company.

Juha Kytölä is convinced that the waste management system will become the industry standard.

[WORDS & NUMBERS]

USEFUL DEFINITIONS AND NUMBERS OF INTEREST.

DARK DATA
Information that is collected by a business but is never used to derive insights or to make decisions. It is estimated that most companies are only analysing 1% of their data.

LANGLEY
Unit of solar irradiance that measures energy distribution over an area (one gram calorie per square centimetre).

30 knots

Top speed of RMS *Queen Mary 2*, the fastest cruise ship in the world. During the time of its maiden voyage in 2004, the Wärtsilä-powered vessel was also the longest, widest and tallest passenger ship ever built.

[TRENDS & SCENARIOS]

FUTURE PERSPECTIVES.

The tiny food truck

Many companies are racing to build driverless vans and trucks for deliveries, but some visionaries are looking for smaller solutions.

Starship is the first commercially available autonomous delivery robot. Travelling at the top speed of 16 km per hour and with a maximum load of 10 kilos, it will use the sidewalks for its deliveries. The robot is created by Starship Technologies, an Estonia- and London-based company established by Skype co-founders **Ahti Heinla** and **Janus Friis** in 2014.

The little Starship isn't the only one delivering food and beverages solo. In November 2016, the full-sized Otto truck developed by Uber completed the first driverless commercial delivery: over 45,000 cans of beer.

Tegla Loroupe and Yiech Pur Biel, representing the Olympic Refugee Team, receive their award from CMI's Project Director, Hussein al-Taee, and Executive Vice President Communications & Branding, Atte Palomäki.

GOING THE DISTANCE FOR REFUGEES

[CORPORATE CITIZENSHIP]

The swelling number of refugees worldwide creates humanitarian crises but also ones of identity. But the Olympic Refugee Team gives displaced athletes a way to compete and to set a positive example for those who share the "title" of refugee.

IN JANUARY 2014, TEGLA LOROUPE, a world half-marathon champion and world marathon record holder, received the Finnish Athletics Federation's Philanthropy in Sports Award for her work in brokering peace through sports. Her Tegla Loroupe Peace Academy Centre in Eastern Kenya encourages its more than 400 current students to learn but also to run and play sports. The academy hosts an annual 'peace race' that brings together the eight tribes in the area for some friendly competition.

The Finnish Sports Gala (Suomen Urheilugaala) is also a yearly competition, which rewards achievements in Finnish sport during the past year. Starting in 2014, the year Loroupe won, the Finnish Athletics Federation started including the Philanthropy in Sports Award at the Gala to recognise national or international charitable deeds performed within or through sports. The award, in the form of a trophy and a USD 10,000 grant for the recipient's chosen charity, is donated by Wärtsilä and given together with the non-governmental organisation Crisis Management Initiative (CMI).

BUILDING ON HER LOCAL success in Kenya, Loroupe saw an opportunity to support refugees, from anywhere in the world, who had a talent for running but no options to further their careers or to join an Olympic team from their home countries. With the support of **Thomas Bach**, President of the International Olympic Committee, Loroupe formed and led a team of 10 refugee athletes, from Syria, Congo, Ethiopia and South Sudan, in the 2016 Olympics in Rio de Janeiro. For this contribution, she was honoured as the 2016 UN Person of the Year in Kenya in October 2016.

On 17 January 2017, Loroupe returned to Helsinki with one of the refugee athletes from her team, 800-metre runner **Yiech Pur Biel** from South Sudan, to accept another Philanthropy in Sports Award, on behalf of the Rio Olympics refugee team. The team inspired the promotion of sports opportunities for refugees because it demonstrated that the opportunity to play sports, compete and develop as an athlete does not have to end if one becomes a refugee.

Since participating in the Olympics, Biel adopted the role of a sports ambassador. He spoke to the United Nations as well as to refugee groups in Minnesota, USA, about how education and sports can change your life. His own experiences of success have given him hope and motivation to continue, and he sees his legacy as setting a good example for others who share the "title" of refugee. Biel was happy to receive the award because, in addition to the recognition of the team's efforts, the funding means "being able to give more help to fellow refugees."

LOROUPE CHARACTERISED HERSELF as the "Mom" of the refugee Olympic team and, like any parent, would like to see the youths she has supported succeed. "I want them go back to their home countries and show their world records and the evidence of their education as motivation for others and for themselves to continue onwards."

Seeing the flag of the Olympic refugee team flying gave hope to many of the more than 60 million refugees throughout the world, so Loroupe will continue the project at least through the 2020 Olympics. Meanwhile, Biel will be pursuing a degree in international relations, which he plans to use to support refugees in some capacity, such as through a non-governmental organisation or in developing businesses. Ultimately, his hope is that "there will not be more refugees in the future." But as long as there are, he will continue to promote sports as a way to for them to connect with others in the world refugee "family" and achieve their personal goals.

THE FUNDING MEANS "BEING ABLE TO GIVE MORE HELP TO FELLOW REFUGEES."

TEXT: ANNA AISTRICH **PHOTO:** PASI SALMINEN

[COLUMN]

Adapting over predicting

IF THE YEAR 2016 could be described with one word, I guess "fickle" would be it. Nothing seemed to come out the way we anticipated. The polls got it wrong with both Brexit and the US election. Looking ahead in our business proved to be just as difficult. In the beginning of the year, the sentiment, backed up by several market research studies, was that world trade was picking up and that more vessels would be needed to carry goods and raw materials. Now we know that the market took a sudden turn – there was hardly any activity in the merchant segment.

Perhaps 2016 goes to show that predicting the future has permanently become a whole lot more difficult. So, rather than speculating about "why" or making predictions that may not hold, I want to focus on the big picture and to pinpoint Wärtsilä's position in it. Our most important role is to be there for our customers at any time, to help them tackle the rapid changes in the world.

In a world taken by surprise by sudden jolts, we need to emphasise three things in our organisation. The first two are agility and speed, which is why we have honed our internal processes to make decision-making more swift. The third element is openness. Both towards the external world – finding partners who can help us solve our customers' challenges – but also internally. Working cross-divisionally is very important in finding solutions to new types of problems.

A couple of months ago, I had the pleasure of hosting a special event, as a group of retired Wärtsilä employees visited our headquarters in Helsinki. They were baffled already in the reception area, where we demonstrate some of our most advanced solutions. In a very short time, we have made giant leaps when it comes to updating our offering – the lion's share of them digital. The only engine we display at the reception area is in the form of a hologram. We have transformed ourselves from engine-makers into complex problem-solvers. If you look at the energy equation today, our role is no longer limited to energy production. It's our energy management services, managing the complete energy mix on a system level – with solar and other renewable resources – that make the difference.

To excel in this complex field, we need the best minds. We have always taken an active part in supporting education and universities across the globe. This year, as Finland turns 100 years old, we have taken a special interest in lending helping hands to Finnish universities. The quality of education is the foundation for innovation in the future.

Wärtsilä is celebrating its 184th year as a company, and we have been there during every crucial moment in Finland's history. Adapting to the world around us has always been at the core of everything we do. So, whatever 2017 has in store for all of us, we are poised to take it on as a positive challenge.

JAAKKO ESKOLA
President and CEO of Wärtsilä Corporation

WE HAVE TRANSFORMED OURSELVES FROM ENGINE-MAKERS INTO COMPLEX PROBLEM-SOLVERS.

PHOTO: WÄRTSILÄ

TEXT KAREN SALO **PHOTO:** BRENDA SUGARMAN

BIG ENERGY IDEAS FROM A SMALL TOWN IN TEXAS

One of the fastest-growing cities in America has a small town heart and a musical soul. With a goal to use 70% renewable resources for electricity by the year 2019, Denton, Texas, turned to Wärtsilä to help make the dream a reality.

The flat plains surrounding Denton are conducive to collecting wind energy.

The Campus Theatre, a grand movie house built in 1949 to cater to local university students, is now the permanent home for all performing arts organisations in Denton.

Live music and music festivals are Denton's soul.

"WE NEEDED A PLANT THAT CAN RESPOND QUICKLY."

The Chairy Orchard is a quaint Denton landmark built by two women who decided to transform the vacant lot between them.

Denton, Texas, has a small-town feel, but its size is influenced by its location. This north-central Texas city, with Dallas about 40 miles to the south-east and Fort Worth about 40 miles to the south-west, is the top of the Golden Triangle. Interstate Highway 35 East travels north through Dallas, and Interstate Highway 35 West travels north through Fort Worth. The two branches converge in Denton, then continue to the north through Oklahoma.

Because of this location, Denton is crucial to Texas commerce – both local and interstate – and has become the site of several large distribution centres for companies such as Target and WinCo Foods, as well as for the manufacturing facilities of Peterbilt Trucks and Jostens.

The home of two universities, Denton is also a college town. The University of North Texas (UNT) and Texas Woman's University have played a major role in Denton's development. In the 1980s, more than 25,000 students were enrolled in the universities and made up about half of Denton's population. This mix of young people influenced Denton's economy and cultures.

Today, Denton is home to the eclectic music festival 35 Denton as well as the Denton Arts & Jazz Festival. During the summer months, there is music on the courthouse lawn every Thursday night.

Together, the UNT School of Music and the Denton club scene have produced close to 50 well-known bands and musicians, including Roy Orbison, Sly Stone, Mingo Fishtrap, Polyphonic Spree, Meat Loaf, Don Henley, Deep Blue Something and Brave Combo.

Of course, all of these elements that make Denton what it is require electricity.

AHEAD OF THE RENEWABLES CURVE

Denton Municipal Electric (DME), established in 1905, is owned by the residents of Denton. As early as 2004, DME was moving away from coal-based power and started using renewables.

For example, customers then could already sign up for a green energy programme that would allow them to receive 100% of their energy from renewable resources. Those who made energy efficiency improvements to their homes or businesses were given rebates, which have totalled more than USD 2.3 million. DME offers the most generous solar rebate programme in the state of Texas with up to USD 30,000 toward the cost of purchasing photovoltaic solar panels.

DME's next step forward was developing a plan to use 70% renewable energy by the year 2019. But integrating such a high percentage of renewables means some intermittency in power generation will be a given. So it is essential to set up a reliable source of on-demand power for those periods of variability.

Buying electricity from the market is an affordable option but comes with a risk, in the form of potential price spikes. "We needed a plant that can respond quickly," says **Mike Grim**, Executive Manager at DME, referring to the fact that Wärtsilä's flexible and quick-start power plant enables DME to capitalise on price spikes in the Electric Reliability Council of Texas (ERCOT) market. This balances the added cost of buying electricity from the market, subsequently lowering the cost of generating electricity for the city of Denton.

reportage

PUSHING PROGRESS

Having grown up in Denton and knowing the people of Denton as well as I do, this author wanted to know what would have convinced this conservative community to accept such a progressive energy plan. I talked to **Matti Rautkivi**, Origination, Americas, in Houston, Texas:

What is the current energy situation in Texas and what are the trends? How does this compare to the US trends?
Currently in Texas, wind is the trend. There is a lot of wind and cheap land in the Texas Panhandle (the area in west Texas surrounding Amarillo). Also, a lot of solar panels are being installed in the area. From Texas to California, the trend is solar and wind. In the next few years, coal power plants will retire and leave the system.

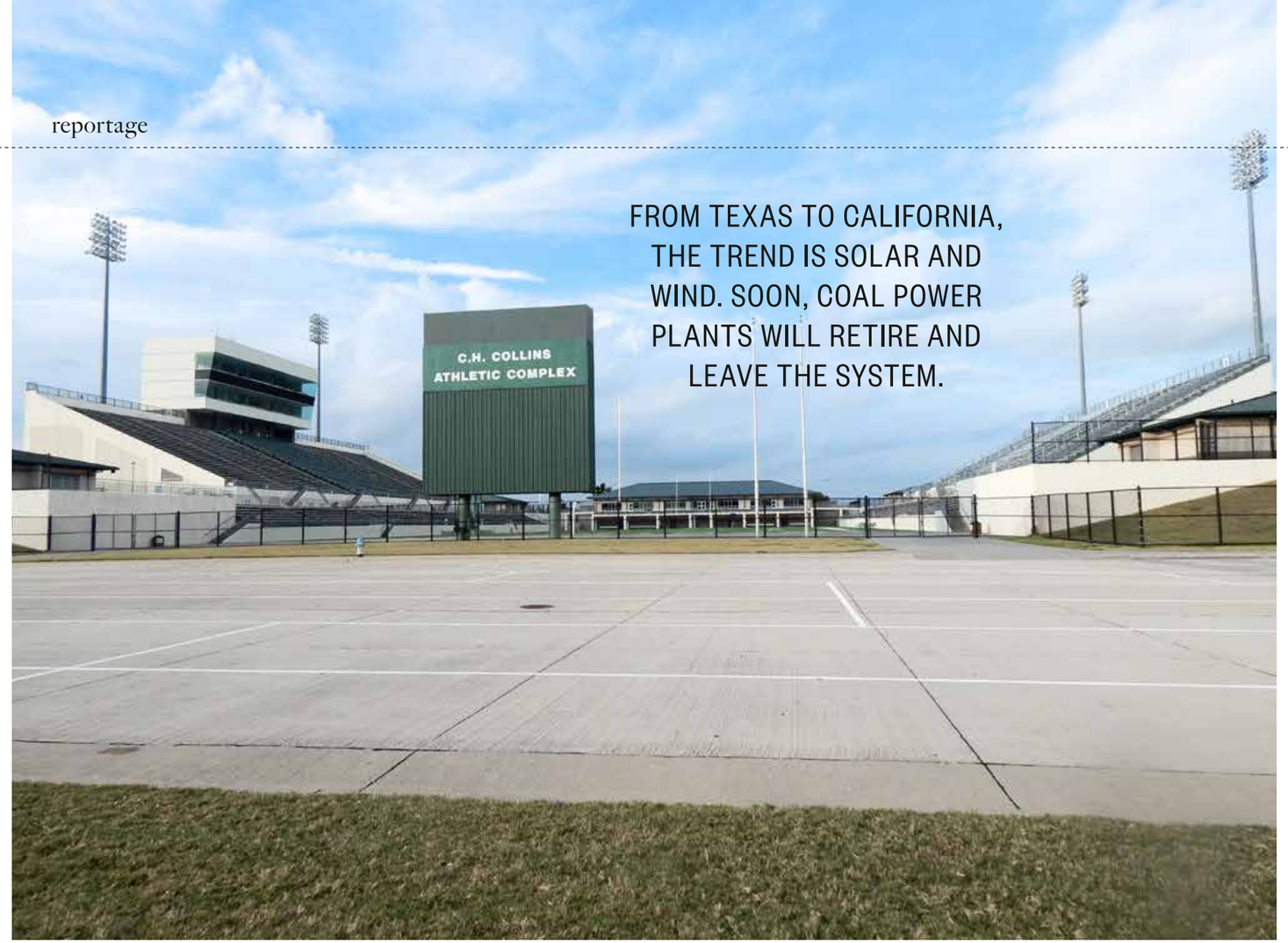
Denton is using the Smart Power Generation plant as a quick startup backup to a higher dependence on renewables. The sun shines a lot over Denton and the wind blows often. During what periods or in what instances will the Smart Power Generation plant be used?
Denton will use renewables as its baseload. The only problem with renewables is that you don't know when you will get them. If the sun isn't shining or the wind isn't blowing, Denton Municipal Electric (DME) has to buy from the market. The market price is variable and when it's high, they will start the Wärtsilä engines as a hedge for the price. DME will get about 17% of the energy from the market and the Wärtsilä engines will provide about 13%.

DME had originally planned to be at the 70% renewables level by the year 2030. What factors contributed to the accelerated timetable and the goal for 2019?
It was purely for financial reasons. Denton is securing long-term wind power purchase agreements and it's really just cheap power. The cost is around USD 20 per MWh, or about half the price of a combined cycle gas turbine power purchase agreement, which is traditionally seen as the option for cheap baseload energy. With the federal incentives available to cities adopting renewables in the next five years, it just makes smart financial sense. And the way that DME did this is really smart. They balance through the market and use Smart Power Generation to enable this overall strategy. I haven't seen this before in the market. It's just really impressive.

Will more cities follow Denton's lead or is Denton special? If so, why?
The states from Texas to North Dakota make up the wind corridor. There are about 120 cities in this area that could easily follow Denton's lead. There are about 200 cities in the US that could also follow in the next few years. I've been contacted by many of these cities, renewable energy think tanks and even environmental agencies with requests for more information about how this was done in Denton. There is a lot of interest.

"THE STATES FROM TEXAS TO NORTH DAKOTA MAKE UP THE WIND CORRIDOR. THERE ARE ABOUT 120 CITIES IN THIS AREA THAT COULD EASILY FOLLOW DENTON'S LEAD."

New construction has sprung up along I-35 through Denton, in what used to be a cattle field.



FROM TEXAS TO CALIFORNIA, THE TREND IS SOLAR AND WIND. SOON, COAL POWER PLANTS WILL RETIRE AND LEAVE THE SYSTEM.

WE HAVE A WINNER

There has been an increase in the use of hydraulic fracturing (fracking) as a source of natural gas. The citizens of Denton voted to ban fracking in the city limits. After lawsuits were filed on behalf of the petroleum industry, the ban was revoked. I asked **Dan Shelledy**, Business Development Manager, Wärtsilä North America, how receptive the Denton citizens were to the power plant plans.

In 2014, the citizens of Denton voted to ban hydraulic fracturing (fracking), and then that ban was revoked. What was the response initially to the use of natural gas in the Wärtsilä engines, considering the atmosphere at the time?
Some citizens were opposed to any gas-powered generators in the city, but there was a misperception of the amount of emissions. The Wärtsilä engines will only run as needed and not at full capacity. They will 1) significantly reduce emissions, and 2) save a good bit of money.

Were there other options for a backup or other bidders? Why did this solution from Wärtsilä win?
There were other bidders. The Wärtsilä technology was the most flexible, the most cost-effective, and had the lowest emissions compared to other quick-start gas technology.

LOOKING LOCALLY
With such a progressive plan in motion, *Twenty-four7.* wanted to find out which features of the initiative most appeal to local residents, both long-standing and more recent.

Brenda Sugarman, as a nearly lifetime inhabitant of Denton, what do you have to say about the Renewable Denton Plan?
It's good to be self-sufficient, and I'm proud to be from a place that is doing something that can be an example for the whole world. Also, it would be nice to have stable prices. I think the stability of the Renewable Denton Plan will make the prices lower and more consistent – with no surprises in the summer months.

And what about the fact that these backup engines will use only about 12 gallons of water per week, compared to 2.3 million gallons used by conventional gas turbines?
Denton is growing, and many new people are moving into this area. It's very common that our lakes have low levels, and we'll be on water restrictions. We won't be able to wash our cars, and we can only water our lawns two days a week. Restaurants no longer serve water automatically when you sit down. You have to ask for water before they will bring it. The price of vegetables goes up because it becomes more expensive to water the crops. Even when we have a very wet rainy season, the lakes may not fill up, and it can be that way for two or three years. So saving water is a huge advantage.


The historic Denton County Courthouse-on-the-Square

Alexandria Washington, a student at the University of North Texas, is proud to live in a town that shows concern for the environment.

Alexandria Washington, you moved from Amarillo to Denton in 2015 to attend the University of North Texas. As a millennial, how do you view the ambitious energy plans for Denton?
They sound very, very environmentally friendly. I think it could really benefit the community to know we live in a place that cares about the environment and especially what we put into our air. Denton has so many young people who care about that, and to know our town does too is a bit relieving and rewarding.

What do you think other Dentonites would say about the plans?
We like to say that 'Denton is always a few degrees cooler than Dallas.' That Denton is a forerunner in planning something so innovative confirms what we've always thought. The smart way that Denton is balancing power with renewables and Wärtsilä's flexible power plant will certainly gain some attention. Perhaps everyone will want to be like Denton.

TEXT: DAVID BERGMAN **PHOTO:** PINU RAHMAN

WOMEN POWER IN BANGLADESH

In the most remote parts of Bangladesh, women entrepreneurs are flourishing and developing the lives of others by introducing solar power.

“I USED THE INCOME FROM THE SOLAR LAMP BUSINESS TO BUY A SEWING MACHINE.”

Kamala Begum was 13 years of age, just married, and barely making ends meet, when in 2001 she was one of the 35 women chosen to be a member of a cooperative that was being set up in Char Montaz, a small island off the southern coast of Bangladesh where she lived.

Now, at 28, Kamala is a successful small-business woman. She says becoming a member of the cooperative changed her life – as well as that of many other members of the organisation.

“I am very much respected now,” says Kamala. “I am no longer poor. I have become middle class, perhaps rich,” she adds with a smile.

The cooperative, which calls itself the Coastal Electrification and Women’s Development Cooperative (the acronym is UBOMUS), was started in 1999 through funding by the World Bank.

“The cooperative started by manufacturing solar lamps,” says **Nasir Uddin**, the executive director of UBOMUS. “The women were trained and an assembly line was created. They then sold the lamps to the local community, with the women sharing in part of the profit,” he explains.

Kamala remembers how she was trained in PSB boards, diodes and transistors and then finally in ‘how to put them together to make the lamps.’ After all, the choice of manufacturing solar lamps made good business sense then.

“At that time, in Char Montaz, people only used kerosene lamps for light. Solar lamps therefore became a popular purchase,” Uddin says.

EMPOWERING WOMEN ENTREPRENEURS

Char Montaz is a very remote island – it takes about 16 hours by car, and then another six hours by boat to get there from the capital city of Dhaka – outside the country’s electricity grid.

The population of this remote island is amongst the 35% of the country’s 150 million population that according to the World Bank has no access to electricity.

While the Bangladeshi government made considerable strides in increasing electricity production (more than doubling its daily production capacity from 4942 MW in 2009 to 12,870 MW recently), – a lack of gas and maintenance problems result in significant power cuts to those who have access to electricity.

And for those off the grid, like in Char Montaz, the wait for electricity could have been much longer. But initiatives like

Kamala feeding fish over the family’s pond. In addition to her sewing company, she also began a poultry business.

According to the ILO, the women of Bangladesh have undertaken a quiet revolution. Kamala and Kajol are posing with their friend Shahida (sitting in the middle).

feature

rendered image
he LNG fuel

Kajol and her husband working on IC boards.

UBOMUS have addressed the problem head-on and devised solutions both to provide power to households and to empower the women in the households. It encouraged women to set up small businesses on the side, turning them into entrepreneurs.

"I used the income from the solar lamp business to buy a sewing machine. I began stitching clothes for men and women – including pants, shirts and blouses," Kamala says.

After practising her sewing for a year, she opened up a small tailor shop which she still runs and manages. "I mostly do all the work myself, but before the festival of Eid, I employ two or three women to help me," she says.

Kamala also began a poultry business. "My husband and I had tried to farm poultry, but the chickens kept on dying from diseases," she recalls. "The cooperative gave me training in how to manage chickens and ducks, what to feed them and things like that. And now we farm 150 chickens and 100 ducks, and sell them and their eggs at the market," she says, beaming with pride.

CHANGING ATTITUDES

Kamala is not alone. Many women on the island have similar stories to tell with varying levels of support from home. Take for example 35-year-old **Kajol Reka**.

"It was only expected that my husband would be sceptical about me working," Kajol says. "This is a rural area. But when he saw the money coming in, my husband slowly understood the advantages of my work."

Uddin says when the cooperative first started it was common for the male members of the families to show some displeasure about the women working outside the home.

"Now, however, the scenario has changed," he notes. "The men are happy as women bring in income. The bad days have gone. There is no prejudice anymore."

Kajol too went on to set up a tailoring business, and her life, she says, is looking up.

"Now that I earn, I can buy anything I need," she says, "I can go to the market and buy for myself, and my husband can't say don't buy this or don't buy that for children," she adds.

She has also been able to give her son a good education, and now he is studying for a commerce degree in Dhaka.

That is interesting in the context of a recent report by the International Labour Organisation, which stated that women in Bangladesh have been undertaking a quiet revolution and made the country a frontrunner among least-developed countries in addressing gender disparity.

Both Kamala and Kajol ran their small businesses alongside their work, which in eight or so years manufactured and sold about 6000 solar lamps.

TIME TO INNOVATE

But then came a point when the cooperative had to stop manufacturing solar lamps. Cheaper products had started trickling into the market. Profit margins began thinning and it was no longer possible to sell solar lamps any cheaper. It was time to broaden the scope and get innovative.

They now focus on selling solar panels and solar-powered devices and systems on the island. The systems can run lights, fans and televisions, and provide significant social and economic benefits to the island.

"People have more hours to work and to study. The lighting is better and safer. And it has reduced indoor pollution from the use of kerosene lights," says Uddin.

Initially it only worked in Char Montaz and three neighbouring islands, but now the organisation covers most of the southern part of Bangladesh. "It has helped install 73,000 solar health systems. Every year our work is expanding," Uddin says.

Initiatives like these spell good news for residents in remote areas of Bangladesh, and help strengthen the country's thrust on renewable energy. Above all, it means more power to women.

"I AM NO LONGER POOR. I HAVE BECOME MIDDLE CLASS, PERHAPS RICH."

TEXT: ASHA GOPALKRISHNAN **PHOTO:** iSTOCK

PORT OF CALL

India's coastal contours resemble a necklace, and its new national program with a symbolic name – Project Sagar Mala (meaning Ocean's Necklace) – aims to accelerate economic development by harnessing the potential of its coastline. Find out why this initiative is making waves in the country and what it means for the maritime industry.

The Indian government is focusing on enabling port-led industrialisation of the country.

feature

"I DON'T THINK ANY COUNTRY HAS AN OCEAN-LED GROWTH INITIATIVE. IT IS VERY UNIQUE TO INDIA."

Come November and the river Mahanadi in Cuttack, the former capital city of eastern Indian state of Odisha will turn into a sea of colour and light, as small boats made of coloured paper, cork and banana tree barks will be set afloat with lamps to celebrate the historic festival *Bali Yatra*, which literally means 'a voyage to Bali'. The week-long fair that draws over a million people every day, each year, commemorates the state's ancient maritime legacy – a time when Odisha's traders used to set sail to the distant lands of Bali, Java, Sumatra, Borneo, Myanmar, Japan, China and Sri Lanka to forge trade and cultural ties.

India's maritime trade has flourished since then. Today, about 95% of India's trade by volume and 70% by value takes place through maritime transport. But with a coastline of over 7500 kilometres, 12 major ports and 200 non-major or minor ports, there's still a lot to be desired.

"Development of ports and coastal regions is a sure-shot way of developing the economy," says **Ramesh Singhal**, Chief Executive of i-maritime, a Mumbai-based consultancy.

"In 300 years of industrialisation, most of the economic development has happened along the coast or on the coast. Look at global cities like Singapore, Dubai, Hong Kong, London, Tokyo, New York, San Francisco – everything is by the coast," he points out.

There is merit in his argument. Even in India, three of the top four metro areas – Mumbai, Kolkata and Chennai – are coastal metros with active trade flows. According to a recent government study, the contribution of maritime states to India's GDP is close to 60%. This explains why there is a renewed impetus on developing India's maritime sector through a national programme – Project Sagar Mala.

PEARLS ON THE NECKLACE

This strategic project by the Indian Shipping Ministry aims to pave the way for port-led industrialisation in the country, which has long been constrained by factors such as high logistics costs and poor linkages between industrial and logistics infrastructure. Since the turn of the century, India's major ports (categorised as those under the central government) have lost about 20% of their total cargo to minor ports (categorised as those under private players or state governments) due to inadequate capacity and longer turnaround time – the time taken to unload and reload freight.

A recent report by McKinsey states that waste caused by poor infrastructure costs India around USD 45 billion per year, or 4.3% of its GDP. According to a government report, due to poor port infrastructure and productivity, India's trans-shipment cargo is handled at South Asian hubs like Colombo or Singapore, which costs Indian ports around USD 230 million in revenue annually.

But all this is expected to change soon. With over 150 initiatives under its belt, the Sagar Mala project promises to script a new story for India's coastal regions.

"I don't think any country has an ocean-led growth initiative," Singhal points out. "It is very unique to India."

The program's framework encompasses the entire value chain. It includes building new mega ports, improving port infrastructure, modernising ports, augmenting the capacity of ports, creating efficient evacuation systems through rail and road linkages, identifying coastal economic zones and developing urban centres next to ports.

"There has to be a balance, though, between modernisation, creating more capacity, and setting up new ports," notes Singhal. He believes setting up new ports is not critically required at the moment since there is already excess capacity compared with trade requirements, but focusing on modernisation could help because payback there is much faster.

THE LEARNING CURVE

Private port players in India would agree. They are not only quick in executing capacity expansions and undertaking infrastructure upgrades, but also in seeking out international partnerships to grow their businesses. Private players like Adani, Essar and Krishnapatnam port, among others, are rewriting the rules of the game.

"Efficiency and margins of India's private-sector ports are the best in the world," says Singhal.

"In the last 10 years, private-sector ports have grown by 13% with operating margins of 60–65%, while government sector ports have grown only by 3–4% with operating margins of 20–25%," he explains. To improve their margins and be able to face stiff competition from minor ports, public or major ports will have to gauge the requirements of the future and modify their offerings accordingly.

Take the changing nature of cargo, for example. "So far, almost 50% of the 1.1 billion tonnes of cargo handled by India has been through commodity-based industries like power plants, steel, refineries, cement plants and fertilizer plants, to name a few, but in the next 10 to 15 years, containerised cargo with high-end electronics, textiles and automobiles, for instance, will drive economic growth," Singhal says.

Public ports are taking notice. For instance, Jawaharlal Nehru Port Trust (JNPT) in Mumbai – the country's busiest and largest container port – is fixing its congestion issues by automating cargo processes and gate systems, introducing an inter-terminal trucking system linking all terminals, creating a

About 95% of India's trade, by volume, occurs through maritime transport.

Employment opportunities for local communities around beaches are expected to rise.

feature

“IF PUBLIC PORTS BECOME MORE EFFICIENT, IT WILL MEAN HUGE ECONOMIC BENEFITS FOR INDIA.”

logistics data bank to track movement of containers, and introducing new tariff incentives for rail cargo to drive up intermodal volumes.

The results are outstanding. Container dwell times have fallen dramatically. From an average of 11 days for imports and 88 hours for exports, the time has now fallen to 1.5 days and 63 hours respectively. Easing of congestion has also improved communication between stakeholders and terminals, thereby introducing a collaborative working mechanism.

This is a good sign. “If public ports become more efficient, it will mean huge economic benefits for India,” Singhal says.

THE DOMINO EFFECT

Additionally, the trickle-down effect of the various initiatives under the Sagar Mala project will benefit different segments and players. While building small, low-cost ports with multimodal connectivity to the hinterland at strategic locations along the coast, is expected to give a fillip to the coastal shipping sector, the initiative to develop inland waterways as a viable means of transport will reduce costs and time for transporting goods. This will benefit industries and boost merchandise export to a much higher level.

The umbrella project will also open doors to dredging opportunities in the country, which will enable berthing of larger vessels at ports.

That’s not all. Employment opportunities for local communities around ports are expected to rise. “This is where a 1000-fold multiplier effect will come into play. So while a port could employ only 1000 people, a nearby industrial centre would employ one million people,” explains Singhal. “In short, ports could become a conduit for industrial, economic and urban development.”

This scenario implies that development of coastal areas would indeed have a domino effect on the overall economy of the country. In the years to come, India may have a new reason to celebrate. But until then *Bali Yatra* will remain symbolic of the country’s maritime history.

Building new ports and modernising existing ones is a key focus for the government.

DID YOU SAY DREDGING?

Early this year, Wärtsilä won a contract for two new 8000-cubic-metre trailing suction hopper dredgers being built for Adani group, India’s largest private multi-port operator. The scope includes two eight-cylinder Wärtsilä 32 main engines for the first vessel, and two seven-cylinder Wärtsilä 32 main engines for the second vessel. Both the vessels will apply the super trident sewage treatment plant, which is optimised for treatment of black and grey water and is a safe way to dispose of sea water at sea and maintain the quality of the world’s oceans.

This is the beginning of a recurring opportunity for the company, because India’s thrust on coastal development, as part of the Sagar Mala initiative, puts an emphasis on dredging. Approximately 20% of the port development cost is being allocated to dredging activities.

“Dredgers will play an important role in the Sagar Mala project, as they ensure safe navigation, creation of new infrastructure, coastal protection and maintenance of coastal and inland waterways,” explains **Parvez Chughtai**, General Manager, Marine Solutions, Wärtsilä India.

So far, 101 new inland waterways have been identified for development, along a stretch of 14,500 kilometres. And that, Chughtai believes, spells opportunities in the marine and energy solutions domain. “The plan is to operate coastal and inland vessels on LNG and this is an area we are very strong in. We can support local yards with our mobile LNG solution design for construction of vessels under the Make in India initiative,” he adds.

If Chughtai’s foresight is anything to go by, India’s coastline holds immense promise, both for the country and for Wärtsilä.

TEXT: NATALIA VALTASAARI **PHOTO:** OLLI LEINO & KARL VILHJALMSSON

Jaakko Eskola, President and CEO of Wärtsilä Corporation, speaking to Wärtsilä employees earlier this year. Wärtsilä was able to meet its revised net sales and profitability targets for 2016.

SATISFACTORY PERFORMANCE SUPPORTED BY GOOD FOURTH QUARTER

Thanks to solid delivery execution, growth in Services' revenues, and an improved project mix in the fourth quarter, Wärtsilä was able to meet its revised net sales and profitability targets for the year 2016. Order intake development was stable, with increased activity in the power generation markets offsetting headwinds in the marine industry. Cash flow developed well, primarily due to a strong focus on working capital management.

IMPROVED ACTIVITY IN THE POWER GENERATION MARKETS

Sentiment in the power generation markets improved during 2016, supported by the emerging markets' growing demand for electricity, as well as by new energy policies and increasing power generation from renewable sources globally. In its main addressable market, i.e. the market for natural gas and liquid fuel power plants of up to 500 MW, Wärtsilä's market share increased to 15% (10) for the first nine months of the year. Energy Solutions' order intake developed well in 2016, growing by 43% to EUR 1,448 million. Highlights included strong ordering activity in Argentina, as well as an order for a 225 MW power plant, which will provide balancing power to the City of Denton in Texas, USA.

WEAK ENVIRONMENT IN MARINE MARKETS

Overcapacity, low oil and gas prices, and weak freight rates burdened the traditional merchant, offshore and gas carrier segments throughout the year, resulting in exceptionally low vessel contracting activity. Although the general marine market sentiment was weak, activity remained resilient in selected niche segments, such as cruise and ferry and ro-ro. Demand drivers in these segments included fleet expansion programs and an ageing fleet, among others. Reflecting the challenging conditions in its end-markets, Marine Solutions' orders declined by 20% to EUR 1,285 million. Activity favoured the cruise and ferry segment, which accounted for nearly 40% of orders received. The upcoming implementation of emission regulations in the marine industry supported the demand for gas-fuelled vessels, particularly in the ferry segment.

SOLID DEMAND FOR SERVICES

Service market activity was solid in 2016, with a healthy demand for power plant maintenance services and positive development in the cruise segment compensating for challenges in certain other marine markets. Services' full-year net sales was stable, amounting to EUR 2,190 million and accounting for 46% of Wärtsilä's total net sales. The strategic, performance-based partnership with Carnival, announced after the year-end, demonstrates our customers' continued interest in value-adding, long-term service agreements.

INVESTING INTO TECHNOLOGICAL LEADERSHIP

During the year, Wärtsilä continued to develop its business by expanding its offering of products and solutions through research and development activities, partnerships and acquisitions.

Wärtsilä's R&D activities remain key in ensuring the competitiveness of Wärtsilä's product portfolio, and in securing a leading position in sustainable innovation. R&D investments amounted to EUR 131 million, or 2.7% of net sales during 2016, and emphasised efficiency improvement, fuel flexibility, and the reduction of environmental impact.

Within the Services business, two acquisitions were finalised during the summer. Weir American Hydro will strengthen Wärtsilä's presence in hydro and industrial services, while Eniram will enable Wärtsilä to enhance its digital offering and in-house capabilities, specifically in data analytics, modelling and performance optimisation. During the year, Wärtsilä also strengthened its digital foundation with the appointment of a Chief Digital Officer to the Board of Management.

PROSPECTS FOR 2017

The overall demand for Wärtsilä's services and solutions in 2017 is expected to be relatively unchanged from the previous year. Demand by business area is anticipated to develop as follows:

- Solid in Services with growth opportunities in selected regions and segments.
- Solid in Energy Solutions, thanks to growth in electricity demand in the emerging markets and the global shift towards renewable energy sources, which will support the need for distributed, flexible, gas-fired power generation.
- Soft in Marine Solutions. Although the outlook for the cruise and ferry segment is positive, the merchant, gas carrier, and offshore segments continue to suffer from overcapacity, slow trade growth and customers' financial constraints.

THE EMERGING MARKETS' GROWING DEMAND FOR ELECTRICITY, NEW ENERGY POLICIES AND INCREASING POWER GENERATION FROM RENEWABLE SOURCES BOOSTED ACTIVITY IN THE ENERGY MARKETS.

R&D activities are key in ensuring the competitiveness of Wärtsilä's product portfolio, says Natalia Valtasaari, Director, Investor & Media Relations.

TEXT: STEVE ROMAN **PHOTO:** WÄRTSILÄ

CRUISING LARGE

Royal Caribbean Cruise Lines' 362-metre *Harmony of the Seas,* launched last May, not only sets the record as the world's largest passenger ship, it also sails past most rivals in terms of dazzling experiences and novel amenities offered on board. What can this floating pleasure palace tell us about changing passenger expectations and other key trends in the rapidly evolving cruise industry?

LUXURY CRUISES AND RIVER CRUISING CONTINUE TO GROW IN POPULARITY. HOWEVER, YOUNGER GENERATIONS ARE LOOKING FOR MORE AUTHENTIC EXPERIENCES.

With a 1400-seat theatre, parks and a water slide, the *Harmony of the Seas* is a floating city.

A pair of tube slides plunging 10 storeys downwards, a zip line nine decks in the air, two surf simulators, two rock-climbing walls and an ice rink. *Harmony of the Seas* is definitely not your grandma's cruise ship.

The list of impressive offerings further extends to, among other things, a 1400-seat theatre for Broadway shows, a water-slide complex, an escape room, a Boardwalk Arcade, a 'Central Park' complete with live trees, seven distinct 'neighbourhoods' and 20 dining venues.

Naturally, packing in so many flash features requires a lot of space, which goes a long way to explain how this massive ship came into being. Many of today's passengers – a decidedly more age-diverse group than their counterparts of 15 years ago – are expecting onboard action and adventure between ports of call. The bigger the ship, the more 'wow' experiences it can hold.

"Having this kind of volume is really what enabled us to build the 'neighbourhoods' and have these offerings throughout the entire ship, from forward to aft, top to bottom," explains **Janne Lietzen**, Associate Vice President for New Building at Royal Caribbean Cruise Lines. The super-sizing came with other important advantages, not least of which were economies of scale, ultra-smooth handling and 'world's biggest' bragging rights. But, according to Lietzen, RCCL's key impetus for building *Harmony* boils down to one thing: meeting customer expectations. It fits with the company's long-held strategy of incrementally increasing the ship size to both generate and accommodate an ever-growing thirst for onboard fun.

Harmony is, in fact, the third nearly identically sized 'Oasis-class' vessel that the company has launched since 2009. A fourth is due to arrive in spring 2018. Each outdoes the last for headline-grabbing attractions.

"It's obvious that, with the larger ships and the bigger concepts, you can widen your product offering a lot. That's how you can feed the expectations that are coming from the guests," says Lietzen.

SLICING THE MARKET

Providing these seemingly over-the-top features might still seem like overkill to outsiders, especially considering the exotic ports of call included in the cruise ticket price. To better understand the dynamic, it's helpful to look at cruising's place in the travel market as a whole.

As **Fred Danska**, Wärtsilä's Director for Cruise Business, points out, cruise lines are competing directly with land-based vacations like trips to Orlando or New York, but have so far grabbed a relatively tiny market share. "As one of the cruise executives said, it's one of the best-kept secrets in the vacation world. You get the most bang for your buck when you spend money on a cruise," he says, referring to the all-inclusive nature of the offer.

To compete more successfully, the cruise lines have constantly been upping their game with new destinations as well as with the onboard thrills and comforts. Evidence shows that their efforts are paying off. Worldwide passenger numbers have

shown a strong, steady growth over the past three decades. Cruise Lines International Association (CLIA), the world's largest cruise industry trade association, expects the figure to hit a record 25.3 million in 2017 – a growth of 21% over the 2012 figure.

Launching large ships like *Harmony* helps, Danska says, not only because of the attention they generate, but because the market is capacity-driven. Build a ship and travel agents will work deals to make sure every cabin is filled, which also guarantees a secondary revenue stream from onboard spending.

BELLS, WHISTLES AND BEYOND

Of course, the strategy of reeling in customers with ever-bolder and more sophisticated forms of onboard entertainment requires constantly dreaming up new concepts and making them workable from a technical standpoint. In Wärtsilä, that task falls to Wärtsilä Funa, the company in Marine Solutions responsible for entertainment systems.

Maik Stoevhase, Director of Automation, Navigation, Communication & Integrated Systems at Marine Solutions Electrical & Automation, says that the creative work is an eternal process. "We never stop looking for innovative solutions on the entertainment side."

Sometimes Funa will suggest concepts for an up-and-coming vessel. Other times the shipowners themselves will come to Funa with an idea they want turned into reality. "It's both push and pull," Stoevhase notes. In either case, he says, it's critical that Wärtsilä's design teams work closely with the shipowners' design teams to bring the ideas to life.

While Wärtsilä Funa's role in the *Harmony of the Seas* project itself involved less attention-grabbing systems such as architectural lighting and CCTV, in other builds it has taken centre stage. Funa's repertoire includes, for instance, a motorised kart track with state-of-the-art sound and control systems for Norwegian Cruise Lines and a unique system of LED balcony lights that allows *Genting Dream*, Asia's first luxury cruise ship, to display messages across its sides.

In *Harmony*, on the other hand, the most impressive Wärtsilä tech supplied is the kind that the passengers will likely never see. This includes Nacos Platinum, a cutting-edge navigation and dynamic positioning system that brings together all the latest functionalities such as intelligent route planning, state-of-the-art human-machine interfaces and more. It's the favourite among cruise shipowners because it delivers gains in efficiency and scores high in the one area they care about above all else – safety.

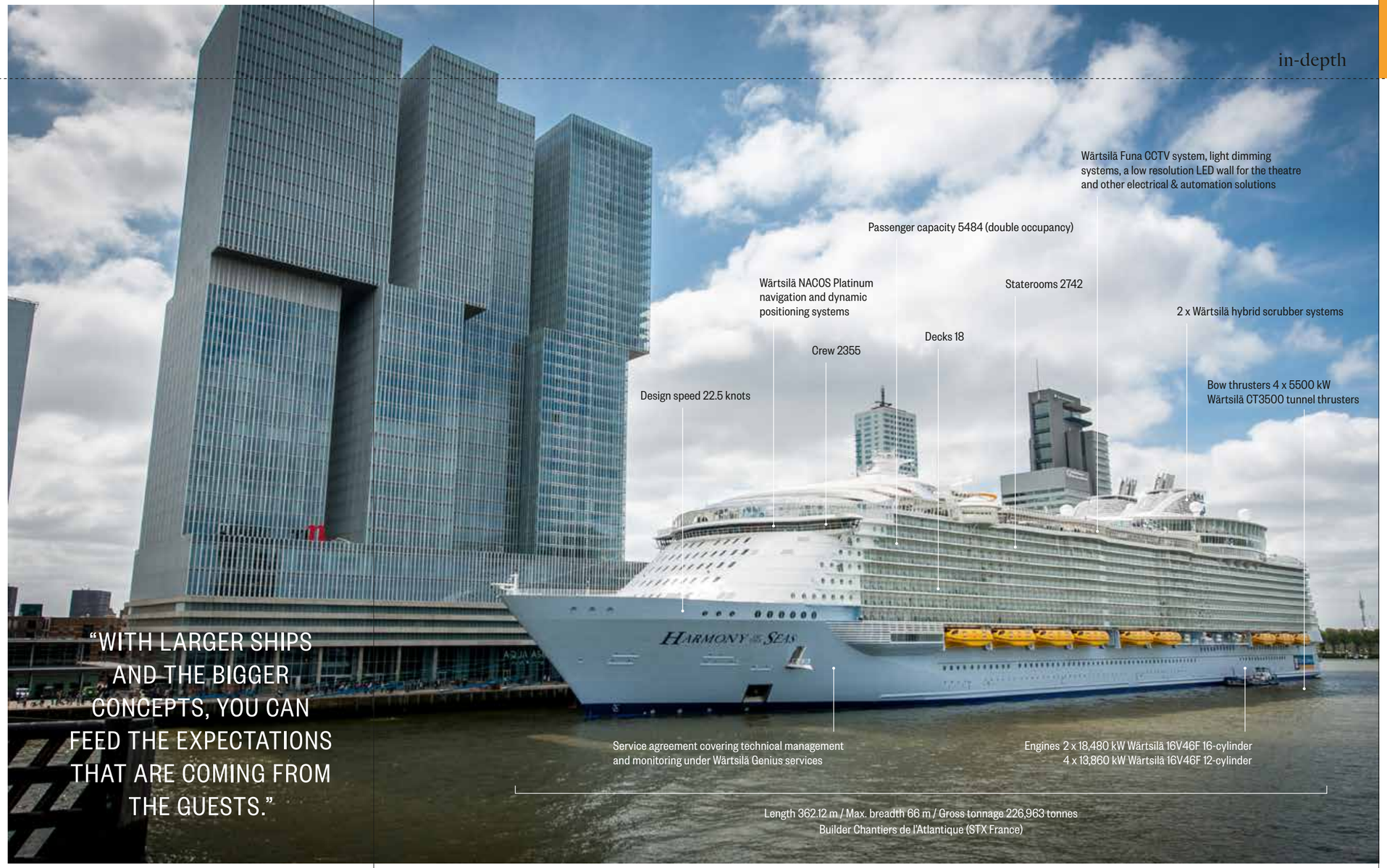
There's a lot more Wärtsilä engineering under *Harmony*'s hood, including the six main engines that give the ship close to 100 MW of power, four of the world's most powerful bow thrusters and the world's largest SO_x scrubbers.

PLOTTING NEW COURSES

Harmony of the Seas is decidedly a product of the trend towards larger, more experience-packed cruise ships, and considering that the industry shows no signs of slowing down, one has to wonder how far the trend can go. Is the future of the industry really going to be mammoth, floating amusement parks?

Not likely, according to both Danska and Lietzen. While the average size of new builds may be getting larger, these experts note that we're now approaching the upper boundaries of practical ship size given limitations in ports and available dry-docking facilities.

And as **Cindy D'Aoust**, president and CEO of Cruise Lines International Association (CLIA), points out, there are other trends in the industry that need to be taken into account. "While it is clear that larger ships are often able to offer consumers the latest and greatest features, each traveller is looking for their own unique experience which doesn't always equate to a larger ship."



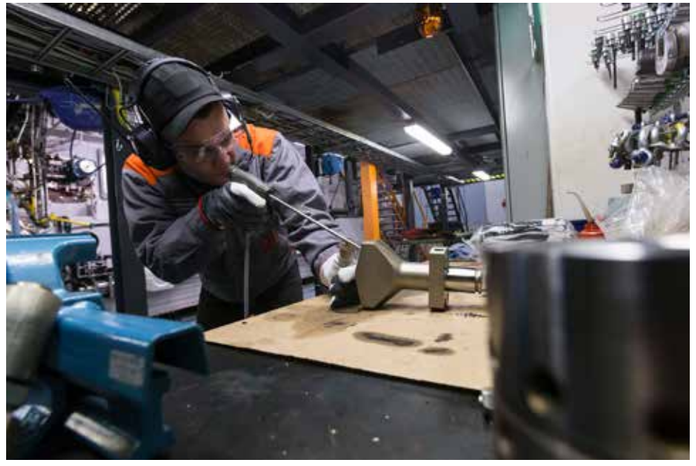
For instance, there's river cruising, which continues to grow in popularity, as does the luxury cruise market. Younger generations, D'Aoust says, are looking for more authentic experiences which may not equate to crowds, water slides and 3D cinema.

There may soon also be cultural perspectives to consider. While the Caribbean, where *Harmony* and most other megaships roam, is the still world's most popular cruising destination, the real growth story right now is in the third-place Asia market. Passenger volume there jumped from 775,000 to nearly 2.1 million between 2012 and 2015, according to CLIA data. Only as that market develops further will it become clear how passenger expectations in the region are shaping up.

Only time will tell, of course, what new trends emerge in the industry in coming decades and what new areas of the world come online as enticing new destinations. For those already established now, in any case, the outlook is promising.

"The order book continues to be at all-time high, with 26 new ships (ocean, river, and speciality) in 2017, and an even more impressive 97 new cruise ships expected to be introduced to our industry from 2017 to 2026," says D'Aoust. "So right now is an extremely exciting time for the cruise industry."

TEXT: SILJA KUDEL **PHOTO:** JOHANNES TERVO



"THIS IS THE MOST PROMISING ENGINE I HAVE EVER WORKED ON. IF WE CONTINUE PERFECTING THE DESIGN, IT WILL BE THE BEST EVER."

THE ENGINE BREAKER

Fredrik Grönlund has every little boy's dream job: he breaks engines – or tries to – for a living. His mission is to make Wärtsilä engines as close to unbreakable as possible.

Since computer simulations can never rule out every malfunction that can occur in a new engine, there's a special engineer whose job it is to test every conceivable (and inconceivable) situation in which an engine could fail.

Fredrik Grönlund has been doing this job, with a smile, for almost 10 years. As an engine breaker, he is responsible for ensuring that every new engine developed by Wärtsilä can withstand the most rigorous punishment, from extreme weather conditions to peak-load pressures.

Grönlund leads a team of four mechanics, one electrician and a test engineer, who perform a variety of tests on running engines, to ensure that they function exactly as they should under various conditions, such as different temperatures and humidity levels. The normal testing programme includes variable engine-speed tests spanning the entire expected loading profile of the engine.

"We also push different components to their absolute maximum-calculated stress capacity. This can involve a part as simple as an individual bolt or crankshaft," explains Grönlund.

"We follow an internal validation procedure that is based on lengthy experience at Wärtsilä. We constantly update our test plans to cover as many situations as possible."

Test programmes can range in duration from a couple of seconds to endurance validation lasting up to 1000 running hours, or sometimes even longer.

OBSTACLE AS OPPORTUNITY

Engine testing is a key pillar of Wärtsilä's R&D process. The company's state-of-the-art testing facilities are equipped with sophisticated rigs and digital measurement systems to help in optimising engine performance and emission control.

Although it is Grönlund's job to tease out flaws and defects, a test failure always means a schedule setback.

"Every time a component fails, or we get an unexpected test result, it's important to analyse the root cause. First, we have to understand whether it's an issue related to design, quality or engine operation, but we also have to double-check that the result is not due to a measurement error," says Grönlund.

If the root cause points to a design flaw, the next step is to modify the design or limit the component load by means of engine tuning. Grönlund sees such 'failures' not as obstacles but as an opportunity to improve.

"Without continuous development, you fall behind quite fast. The best part of my job is working with motivated people, who see problems as a possibility to make things better."

LEARNING EVERY DAY

To understand exactly what is being tested, an engine breaker needs an intimate knowledge of how different components work – and a passion for machines is a definite advantage.

"Ever since I was a young boy, I have been disassembling machines and putting them back together again. My first machine was a homemade steam engine," recalls Grönlund, who joined Wärtsilä in 2007, after studying welding and machining at vocational school and later earning a bachelor's degree in engineering.

"Even after almost 10 years as an engine tester, I still learn something new every day," he says with a smile.

Among the most inspiring products he has worked on is the Wärtsilä 31, a new-generation engine platform that was developed from scratch to set new standards in energy efficiency.

"We began developing the new platform over six years ago, harnessing all our prior experience gained from many years of research on earlier experimental systems."

This, combined with rigorous testing of various engines over a period of decades, has contributed to what is hailed as the world's most efficient engine, delivering the lowest fuel consumption of any four-stroke engine in existence.

"The Wärtsilä 31 is the most promising engine I have ever worked on. If we continue perfecting the design, it will be the best ever. But as long as fuel efficiency requirements keep getting stricter, it will never be ready," quips Grönlund.

MAKING OF THE WORLD'S BEST ENGINE

Grönlund sees the Wärtsilä 31 as proof of the company's dedication to top-quality R&D. This view is heartily endorsed by **Juha-Matti Myllykoski**, head of the Wärtsilä 31 development team.

"Developing a record-breaking engine is not a straightforward business. We encountered multiple challenges during the journey. Luckily, we have skilled, hard-working people with a passion to make things better. The Wärtsilä 31 represents what our R&D team is capable of creating."

The creation of the Wärtsilä 31 involved a front-loaded R&D process, starting with sophisticated simulation models and virtual validation. A single-cylinder engine was used for performance development, and the first multi-cylinder version was built during the concept-testing phase.

Grönlund's testing team made a critical contribution to the R&D process. "Although Wärtsilä 31 testing began at a very early stage, with rigs and technology demonstrator tests, prototypes were still needed to verify performance, reliability and system functionality in relation to expectations," explains Myllykoski.

Four prototype engines were built: one diesel, one multi-fuel and two pure gas engines. Cumulative running hours in rig testing totalled over 40,000 hours.

PAYBACK TIME

"Tests confirmed that we exceeded our technical targets, bringing maximal flexibility and optimal cost of ownership to our customers. As the first configurations of the Wärtsilä 31 platform are now going to market, there is still work to be done before the entire range of products is delivered to customers. That's keeping us busy right now. During the coming years, there will be further development of new features and performance stages," says Myllykoski.

After months of gruelling testing, retesting and reiteration, Grönlund is gratified to see the positive response of customers.

"Engine testing can be quite demanding, but in the end, it's worth it when you're able to solve a problem. And it helps to have a fiancée who understands when you have to put in long hours at work."

TEXT: ANNA AISTRICH **PHOTO:** JUHA MYLLYMÄKI & TEGLA LOROUPE PEACE FOUNDATION

A mighty warrior for peace

As David's classic victory over Goliath shows us, physical size is not a measure of how much we can accomplish. Petite Tegla Loroupe tells Twentyfour7. what drives her to take on challenges far bigger than herself – and win.

One of the greatest female long-distance runners in history, **Tegla Loroupe** from Kenya, has spent her life battling against the odds on many fronts: in childhood, in sport and in advocating for peace, women's rights and education, especially for children from war-torn nations. Though once criticised for being too small and thin to succeed at running, she has proven that her capabilities are not limited by her stature.

When Loroupe started elementary school, she had to run 10 kilometres to get to and from school each day. She soon realised, after winning races at school against larger, older students, that she had potential as an athlete. When she decided to pursue a career as a runner, no one besides her mother and older sister supported the idea, and at one point, her father even forbade her to run, claiming it wasn't ladylike.

Even Athletics Kenya, the country's athletic federation, didn't have much faith in her abilities, due to her diminutive size. But she quickly proved them wrong in 1988, when she won a prominent cross-country barefoot race. Then she began to train to compete internationally and started climbing the cross-country rankings. At the Goodwill Games in both 1994 and 1998, Loroupe won gold for the 10,000 metre race, which she also ran barefoot.

In 1994, Loroupe ran her first major marathon, the New York City Marathon, against some of the greatest runners in the world. And won – proving to everyone who had doubted her that she was a true champion. Furthermore, as the first African woman to win the prestigious race, she also served as a great role model to many young people in Africa, especially girls.

Loroupe confirmed her running prowess by winning the New York Marathon again in 1995 and going on to win many major marathons around the world, including Rotterdam, Berlin, London, Rome and Lausanne. She is a three-time World Half-Marathon Champion, has held the world marathon record and still holds the world records for 20, 25 and 30 kilometres.

PAYING PERSISTENCE FORWARD

So what kept her going despite her obstacles? "Because I'm a fighter," she says, which sounds a bit ironic since she is now a global advocate for peace.

But she, of course, means it in the sense of someone who is resilient and does not give up. Perhaps she got plenty of practice growing up in a family of 24 children. Or perhaps it was the challenging living conditions in a pastoral environment where warring tribes stole one another's cattle. Whatever helped her build her tenacity, it certainly benefitted her running career, and it carried over into her other endeavours as well.

In 2003, Loroupe founded the Tegla Loroupe Peace Foundation, which promotes peace building, human rights and socio-economic development of people in Northern Kenya and the Horn of Africa region. She wanted to give back to the community in which she grew up and has focused on bringing members of conflicting tribes together. In 2006, she founded the 10km Peace Race, where over 2,000 warriors from six different tribes took part. She says that her motivation in creating the race was to use her fame to help bring about greater harmony, by uniting people through sport.

SPORTS UNITES HEARTS AND MINDS

"Sports bring people together on neutral ground and give them purpose," Loroupe says. She explains that sports also serve as a way to bring people together who would not otherwise meet, so that politicians or other leaders can come and talk with the people. She clarified that they are not allowed to talk about politics, but they can come to see and hear what is happening in the community.

Loroupe's efforts even got people to give up their guns, and she signed a Memorandum of Understanding (MOU) with the government that they would not imprison those who did. Instead, it are rehabilitated to be productive members of society and are called 'reformed warriors'.

PHILANTHROPY IN SPORTS

As **Tegla Loroupe's** work demonstrates, sport can be a powerful connecting force. At the local level, involvement in sport helps put children and youth – and even adults – on a positive life course. It promotes inclusion and collaboration, even among groups that would not traditionally come together, and generates a deepened sense of belonging within communities. Furthermore, by improving individual health and well-being, sport can help in building healthier, stronger and more vibrant communities, which may also contribute to economic vitality.

Particularly at the global level, sport helps transcend cultural barriers to create a platform for collective dialogue and action. Projects can use sport as a framework to train future generations of leaders and to influence local and national governments.

CREATE CONNECTIONS

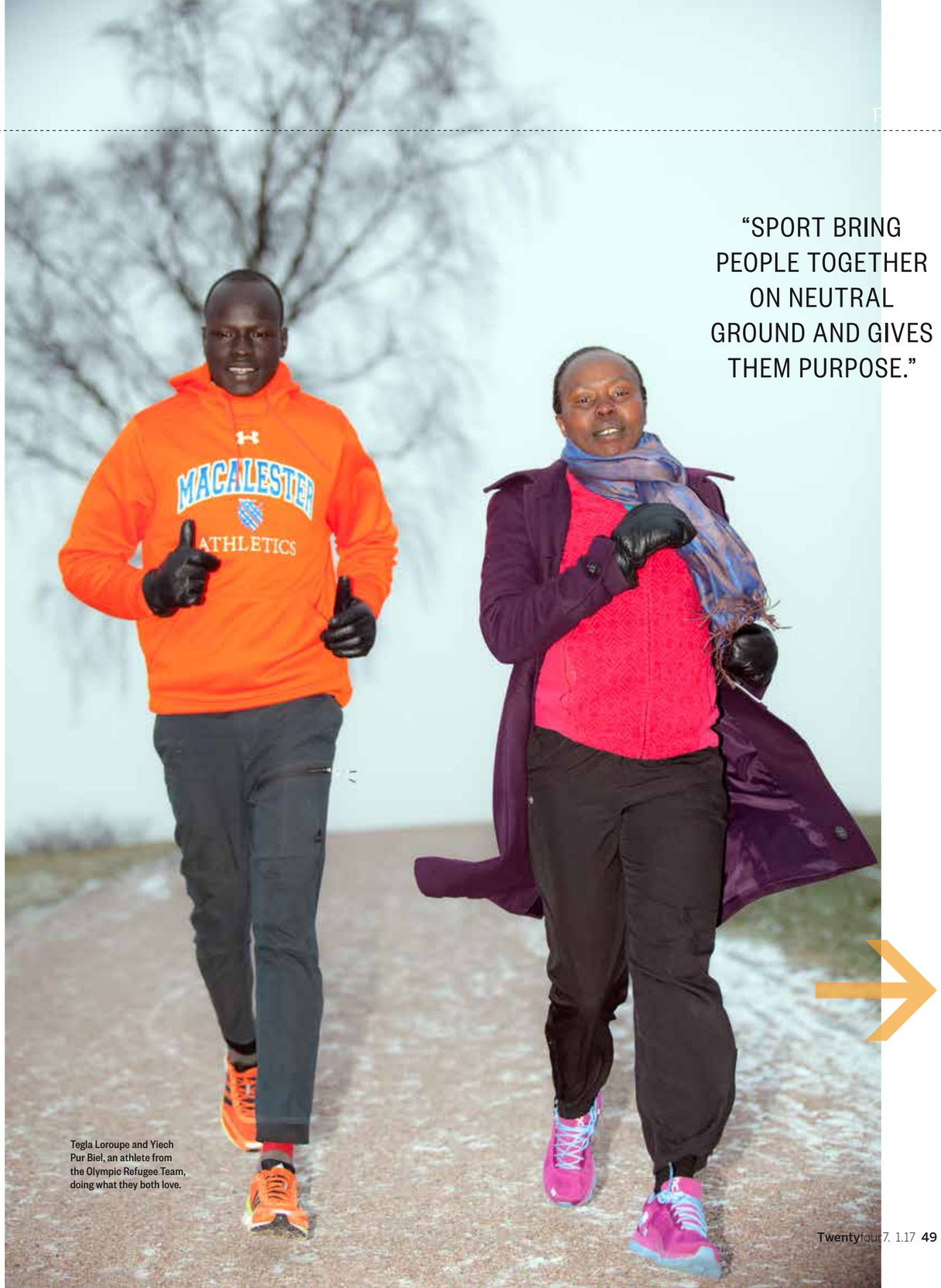
As **Antti Pihlakoski**, former President of the Finnish Athletics Federation and now Council Member of the International Association of Athletics Federations (IAAF) and European Athletics, points out, "Participating in organised sports helps make the world smaller and creates friendships from all over the world."

Pihlakoski first met Tegla Loroupe in 2005, when she happened to pick Finland's presentation spot in the selection process for the host country of the World Championships, and he has stayed in touch with her ever since. Now he serves as host for her visit to Helsinki to receive – along with **Yiech Pur Biel**, an athlete from the team – the Philanthropy in Sport Award on behalf of the Refugee Olympic Team.

GOING TO BAT FOR PHILANTHROPY

Pihlakoski participated in the development of the IAFF's social responsibility plan, Athletics for a Better World, which provides leadership to member organisations to create projects that support health, environmental sustainability, social inclusion and peace through sport. It was in response to this effort that Wärtsilä became interested in sponsoring the Philanthropy in Sport Award as part of the awards given by the Finnish Athletics Federation at their annual Sports Gala.

Atte Palomäki, Executive Vice President, Communications & Branding, affirms that Wärtsilä's commitment to corporate citizenship is a key part of the company culture: "In our business we build basic elements of a sound society by making clean and affordable energy possible. To provide even more value, we want to support activities, like those of the Tegla Loroupe Peace Foundation, that are aimed at creating a better world. We are very proud to play a part in funding organisations to do this essential work."



Tegla Loroupe and Yiech Pur Biel, an athlete from the Olympic Refugee Team, doing what they both love.

passion

Loroupe feels that it was her athletic success that opened the door for the community to listen to and support her. She says she told them, "I am one of you, and we need to help ourselves and show others the good in us." And she feels that the ongoing fight has been worth it for the successes.

In serving as a bridge to bring the security sector and the community together, she has enabled both sides to build trust, which then makes it possible for people to resume normal life: to move around, conduct business and allow kids to get to school. And that, in turn, supports another of Loroupe's key efforts: peace through education.

Her foundation also started the Tegla Loroupe Peace Academy Center in Eastern Kenya as a school for orphans and children from poor families, who would otherwise not have the resources to get an education. The children attending the school are encouraged to learn but also to run and play sports.

"The Tegla Loroupe Peace Academy has had over 800 pupils since it began. The school provides boarding facilities, nutritious food and sports opportunities, among other things, to ensure children selected from cattle-rustling-prone areas of Northern Kenya, Eastern Uganda and South Sudan receive quality education and become future leaders and ambassadors of peace in their communities," says Loroupe.

FROM RURAL KENYA TO THE WORLD STAGE

In acknowledgement of all her many achievements, Loroupe was awarded with a Philanthropy in Sports award from the Finnish Athletics Federation in 2014. The award money was put to good use in acquiring basic supplies for the dormitories at the Tegla Loroupe Peace Academy. In spring 2016, the academy saw its first 18 students pass their final exams and move on to study in high schools around Kenya.

Loroupe is now back in Helsinki – her third visit – to collect a second Philanthropy in Sports award. "This time," says Loroupe, "it's not just about the local communities but about the global community of refugees."

From her work promoting peace through sports in refugee camps in Kenya, Loroupe saw that athletes in the camp had talent but no options to create or further a career. So, in 2013, she decided to speak with **Thomas Bach**, President of the International Olympic Committee, about the possibility of creating a refugee team, as a joint initiative with the United Nations Refugee Agency.

Loroupe recalls, "When he said OK, Thomas Bach asked me, 'Do you really think this will happen?'" She says she really wasn't sure how to take her efforts beyond Kenya, but her classic determination convinced her that she just had to keep trying to make it happen.

In 2014, Loroupe held trials in two major refugee camps in Kenya: Kakuma, with refugees mostly from South Sudan and the DRC, and Dadab, close to Somalia and Ethiopia. More than 200 people tried out, and 35 were selected to participate at her training camp in 2015 in the Kenyan capital of Nairobi.

At the camp, athletic training was paired with education to empower the runners to develop other skills. Loroupe says this was key because, coming from a conflict area herself, she was aware of the problems that come from not having an education or direction in life.

In addition to coordinating and leading the Olympic Refugee Team, Tegla Loroupe serves as a positive role model in sports and in life.

There were five runners from Loroupe's own camp who went on to participate in the 2016 Olympics in Rio de Janeiro as part of the first refugee Olympic team, lead by Loroupe herself. In total, there were 10 athletes from Syria, Congo, Ethiopia and South Sudan on the team. For her role in coordinating and leading the team, Loroupe was honoured as the 2016 UN Person of the Year in Kenya in October 2016.

With the prize money from this year's Philanthropy in Sport Award, Loroupe plans to continue leading and supporting the refugee team, at least until the 2020 Olympics. She feels she has enough energy to do it at least once more, and she has faith that some of the other runners who qualified for for her camp – but who were not yet ready to compete in 2016 – may get their chance in 2020.

Furthermore, just as her athletic success earned her respect back home in Kenya, Loroupe hopes the same for the athletes she supported (and will support) at the Olympics. "I want them go back to their home countries and show their world records and the evidence of their education as motivation for others and for themselves to continue onwards."

FIGHTING FOR THE FUTURE

Meanwhile, Loroupe hopes to pursue a master's in political science at the University of Nairobi to extend her knowledge of world politics and to get ideas for new opportunities to make an impact, at both a local and global level. For one, she already knows she would like to extend the educational opportunities at the Peace Academy by building a polytechnic sector for those who want to learn a trade.

By forging the kind of social capital that will support communities, she hopes the results of her efforts will last for generations.

To all those who have supported her work, Loroupe says, "I invite everyone to Nairobi to see what their funding has helped me to do and to thank them for their empowering support."

TEXT: LOTTA HEIKKERI

KEEPING UP WITH THE DATA

ALMOST ALL THE DATA IN THE WORLD HAS BEEN CREATED DURING THE PAST COUPLE OF YEARS. NOW, AS MORE AND MORE MACHINES ARE CONNECTING TO THE INTERNET, HOW MUCH DATA WILL THERE BE – AND WHERE WILL IT ALL BE STORED?

Getting cloudy

Cloud computing was invented in the 1960s. As early as in the 1980s, some companies offered their users a small amount of disk space accessible online. During the 1990s, all web-based-data storage was commercially available. As the amount of data grows exponentially, bigger capacity and reliable power generation have become major concerns for data centres across the globe.

For companies, cloud storage offers obvious benefits, but it also presents concerns about data protection and safety. It is estimated that, by 2020, businesses will spend USD 191 billion on cloud services.

MEMORY

1949
The Selectron tube has a memory capacity of 32 to 512 bytes.

1956
RAMAC 305, the world's first hard drive, holds 5 megabytes of data – the equivalent of an MP3 music file. The hard drive is the size of two refrigerators, and it costs USD 10,000 per megabyte.

1980
IBM's hard disk drive is the first to break the 1 gigabyte barrier. It can store 2.52GB and is the size of a refrigerator.

2016
USB storage devices can now store 1 terabyte of data in a drive the size of a keychain, weighing only about 30 grams (1.1 oz).

DATA

1996
Digital storage becomes more cost-effective than paper for storing data.

2010
In two days, as much information is created as during the period since the dawn of mankind through 2003.

2016
According to IBM, humans create 2.5 quintillion bytes of data every day – the equivalent of half a billion HD movie downloads.

2020
More than one third of data will be stored by or passed through cloud services.

INTERNET

1969
ARPANET is established. Its protocol becomes the technical foundation of the Internet.

1971
The first electronic mail in ARPANET. It is believed to say "QWERTY."

1995
Less than 1% of the world's population has access to the Internet.

2016
More than 45% of the world's population has access to the Internet.

INTERNET OF THINGS (IoT)

1982
A Coke vending machine becomes the first device to be connected to the Internet.

1985
The term "Internet of Things" is coined by Peter T. Lewis.

2020
According to Gartner, the Internet of Things will consist of nearly 20.8 billion devices.

Reality bytes

1000 megabytes = 1 gigabyte
1000 GB = 1 terabyte
1000 TB = 1 petabyte
1000 PB = 1 exabyte
1000 EB = 1 zettabyte
(amount of annual global IP traffic in 2016)
1000 ZB = 1 yottabyte
(equivalent of 350 trillion DVDs)

The official prefixes end at yottabyte – but more are needed. Most likely we will talk about brontobytes and gegobytes in the future.

In 2016, a typical cargo ship generates 2.5GB of data a day.

1940 1950 1960 1970 1980 1990 2000 2010 2020

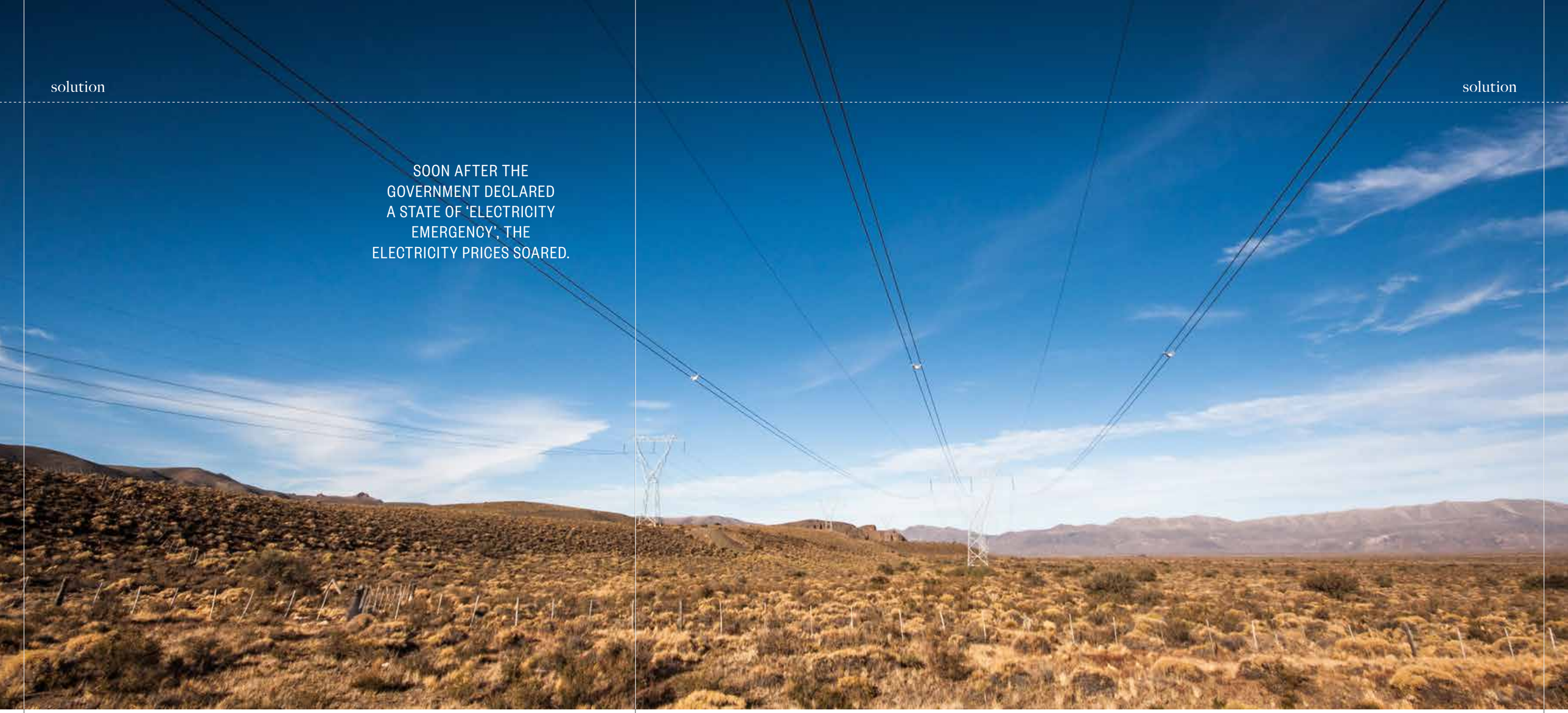
TEXT: PAYAL BHATTAR **PHOTO:** iSTOCK

LET THERE BE LIGHT

Argentina is in a state of 'electricity emergency' until 2017. The administration has put the focus back on energy security via reforms and capacity expansion. Read on to see what this means for the country's energy market.

solution

SOON AFTER THE GOVERNMENT DECLARED A STATE OF 'ELECTRICITY EMERGENCY', THE ELECTRICITY PRICES SOARED.



A few months ago, Argentina woke up to a harsh reality. The country could barely meet its peak demand of 25 GW in 2015, despite having an installed capacity of 33 GW. Reserve margins had been wiped out from almost 30% a decade ago to less than 5% in a few instances in recent times.

"The latest decade introduced a large distortion," says **Alberto Fernandez**, Regional Director, Latin America South, Wärtsilä Energy Solutions. Contracting, he says, was practically dismantled.

Until last year, industrial and residential consumers were paying tariffs lower than what it costs to generate electricity. Electricity prices in Argentina were the lowest in the region and in some instances were almost 1/10th that of the rest of Latin America.

According to PricewaterhouseCoopers (PwC), in 2015 alone, energy spending and electricity subsidies amounted to 3% of the country's GDP & 12% of the total federal spending. The crisis had been foretold, but not the shock therapy.

SHIFTING GEARS

In 2015, the government declared a state of 'electricity emergency' until 2017 and slashed subsidies to reduce the deficit. Soon electricity prices, which were insulated from the world energy markets for a decade, soared between 300% and 400%. The country's average growth in electricity demand, which was at 4–5% in 2015, came to a grinding halt.

"The challenge for the administration was to remove the subsidies from energy prices and to increase the tariffs. But it is moving in the right direction, and this will take time to complete," says **Peter Knight**, Partner, Bird & Bird, an international law firm which advises large corporations across the world including those in Latin America.

Now, the focus is on investment and capacity expansion, enhancing efficiency across energy generation, transmission and distribution and reducing the dependence on fossil fuels for energy generation so that such a crisis does not occur again.

Renewables are thus a priority area.

Marcos Patrón Costas, Partner at Allende & Brea, a specialist in energy and natural resources and mergers and acquisitions says, "Argentina needs to diversify its electricity generation matrix to reduce its high dependence on natural gas to produce electricity. Renewables will have a significant role in the diversification of said matrix."

The government has set a target for the renewables segment to service close to 20% of the electricity demand by 2025. Argentina is now looking to grow its installed capacity by investing USD 15 billion in 10 GW of renewables, USD 5 billion in transmission infrastructure and USD 6 billion in building an additional 8 GW of thermal power. Of the additional thermal capacity, 3 GW has already been awarded and is expected to be operative in the second half of 2017.

FIRING ON ALL CYLINDERS

The problem with thermal power generation is that on one hand, natural gas is not available for large parts of the year and on the other, the availability of fossil fuels is declining.

According to reports, domestic oil and natural gas

THE GOVERNMENT IS USHERING IN AN EFFICIENT AND TRANSPARENT POWER SECTOR REGIME.

production in 2015 dropped by 12% and 20% respectively compared to the 2005 levels. But during the same period, gas consumption increased by approximately 18% from a decade ago. This growing demand and a shortage in supply mean that Argentina has to import fossil fuels to meet its energy generation needs.

Wärtsilä has a unique solution to this problem. Its power plants are run on dual-fuel engines that can generate electricity round the year at a lower cost by using a combination of natural gas and locally produced heavy fuel oil (HFO).

"Since Wärtsilä technology is able to burn HFO, a cheaper fuel than the light fuel oil (LFO), it has a better cost-benefit for the electrical system," says **Gaston Giani**, Business Development Manager, Americas, Wärtsilä Energy Solutions.

This explains why the company has been awarded six power plants (482 MW) in Argentina. Its solution has the ability to be the game changer in the country.

LOST IN TRANSMISSION

Apart from new power plants and technologies, the government is also working on enhancing the ability and efficiency of the existing regulatory framework.

In the past few years, power generation companies have been saddled with volatile cash flow because they sell power to government-owned CAMMESA, which is in turn dependent on subsidy payouts by the government. But help is now at hand. The Ministry of Energy and Mines has set up a temporary compensation scheme for generation companies and increased tariffs to help the sector reduce its deficit. It has also helped some of these companies with financing working capital by eliminating fuel costs. But this may not be enough.

"It is noted that the roles and responsibilities of the different public and private players should be more clearly defined, rendered transparent and less susceptible to discretionary practices so that certainty comes into the market," Knight points out.

The government agrees and is trying to usher in an era of an efficient and transparent power sector regime. Its effort seems to be paying off. Recent tenders for generation of 1000 MW of thermal energy and 1000 MW of renewable energy were overwhelmingly oversubscribed by more than six times.

Investors back the government's intent but the big question is whether Argentina's 13.4 million domestic electricity users will make the switch. For now, there is reason for many to believe that there is light at the end of this tunnel.

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ON SEA OR ON LAND
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INLAND TREASURE
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Twentyfour7.
in detail

WÄRTSILÄ FUNA'S FLEXIBILITY

▶ **TEXT:** HANNA-KAISA MARKKANEN & MARY GAYEN **PHOTO:** CHRISTOPHE VISEUX

BY APPLYING ITS EXPERTISE to projects on board vessels or for land-based attractions, Wärtsilä Funa demonstrates its flexibility in creating integrated entertainment and communication systems to suit virtually any type of customer.

Wärtsilä Funa brings together music, video, communication and effect lighting solutions both on sea and on land.

"DEPENDING ON THE CUSTOMER, WE ARE ABLE TO PROVIDE THE WHOLE SERVICE PACKAGE FROM DESIGN TO COMMISSIONING."

Wärtsilä Funa is an audio-visual (AV) systems integrator which provides design, engineering, integration and consulting services to cruise ships, theme parks, airports, hotels, museums and specialty attractions. Prior to being acquired by Wärtsilä in 2015, Funa was already an established market leader in the marine AV sector with over 40 years of experience.

To date, Wärtsilä Funa's business has catered to the cruise industry, where it provides local entertainment systems that bring together music, video, communication and effect lighting solutions on superyachts and cruise ships. In its latest venture, the company diversified to enter the theme park business, with its first project for Dubai Parks and Resorts (DPR) in the United Arab Emirates (UAE). "Our interest in theme parks is a natural progression of our business line offering. Theme park development is strong throughout the world," explains **Vivek Balagopal**, the General Manager of Electrical and Automation Services, Wärtsilä UAE.

EXPERTS AT CREATING EXPERIENCE

The technology used for the various applications and systems is basically the same. But it is the expertise at Wärtsilä Funa that is the cornerstone in making its high-quality, integrated systems special.

"Usually, announcement systems and professional music systems are separate. With our expertise, we can combine these two systems, and our customers can save money. This kind of integration saves cable, and the solution is architecturally nicer than two separate systems. It also sounds better and is easier to maintain," explains **Andreas Köhler**, Sales Manager, Wärtsilä Funa GmbH, Wärtsilä Marine Solutions.

Furthermore, Andreas notes, "Novelty is a desired quality to attract new customers and to provide an unforgettable experience. We like to improve the customer experience."

Paul Weber, Managing Director for Wärtsilä Funa, adds, "Our clients count on us not only to figure out how to do something spectacular but also to deliver it. In the process, we often create new solutions to old problems."

Wärtsilä Funa focuses on providing the entire solution, not just the system equipment. "Depending on the customer, we are able to provide the whole service package from design to commissioning," Köhler says. The service package includes design, engineering, rack fabrication, installation and commissioning. In addition, Wärtsilä Funa even can provide training for the crew on how to use the systems.

"There are different aspects that need to be taken into consideration when designing and installing systems for any public area. With our equipment and long experience, we can provide our customers reliable and safe solutions," tells Weber.

MIDDLE EAST MEGA-MARKET

Interest in the Middle East is not surprising because tourism is one of the sectors into which the region is diversifying to limit its dependency on oil. Dubai is making headway in this, and DXB Entertainment, formerly Dubai Parks and Resorts, is working on big theme park projects such as Legoland, Motiongate, Bollywood Park and IMG. "It's a busy place. They're spending literally billions on their parks and the infrastructure in building up this entertainment mecca," said Guy Nelson, the president of Dynamic Attractions, in an interview with Orlando Sentinel.

According to The Economist, "In Dubai, Sony Pictures and Lionsgate are among the studios collaborating with local developers on a huge complex of parks that is set to open later this year." Thus, Wärtsilä Funa's collaboration comes at an opportune time.

Success among the Middle Eastern airlines, in bringing in visitors from the world over, adds to the tourism frenzy. For middle class Asians located not far from the UAE, it is a popular holiday destination. Hence, there is further growth potential.

ON THE GROUND

David Cline, the project manager at Wärtsilä Funa said, "The scope of work provided to DPR in this project was to design, engineer, procure, install and turnkey commission all audio, visual and control systems for Bollywood, Motiongate and River Land." Although on land rather than sea, the DPR project perfectly aligned with Wärtsilä Funa's strengths.

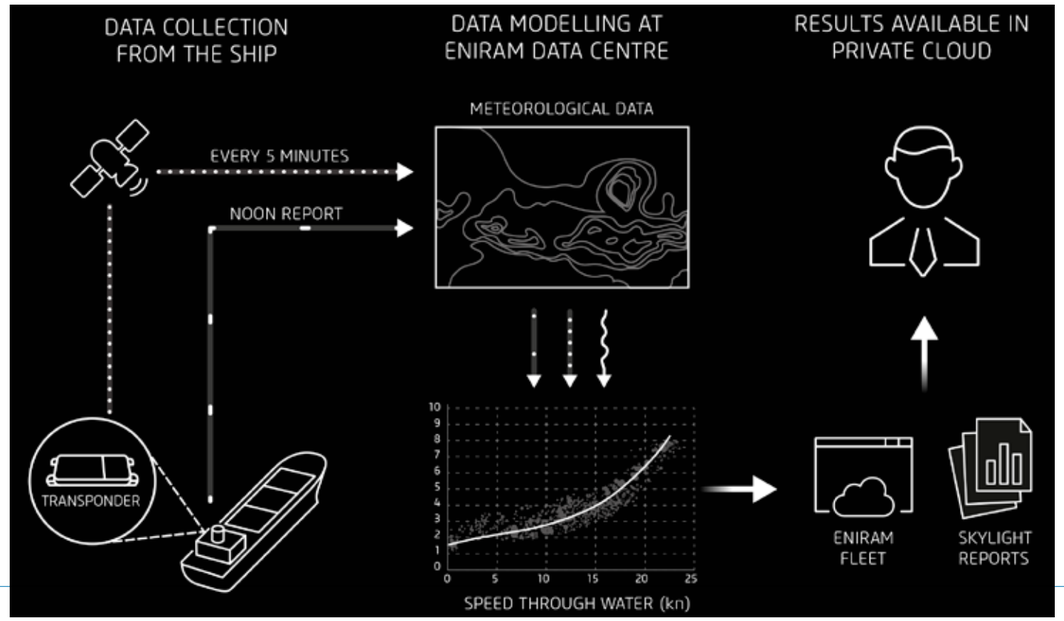
To secure the project, Wärtsilä Funa worked closely with the Wärtsilä Gulf FZE Electrical and Automation (E&A) team. Collaboration between Funa and the local E&A experts on the ground made it possible to start work sooner and provide local assistance.

The advantage of Wärtsilä's global network makes project implementation straightforward so that Wärtsilä Funa solutions can be provided all around the world. "Our global flexibility is a strength," concludes Weber.

RETHINKING PERFORMANCE MANAGEMENT

▶ **TEXT AND PHOTO:** WÄRTSILÄ

WITH THE LAUNCH of SkyLight, a cost-effective, next-generation fleet performance monitoring service, Eniram and Wärtsilä harness connectivity and the Internet of Things to enable commercial ship operators to manage their business intelligently.



The SkyLight transponder starts the flow of performance-monitoring information from the ship to the customer's private cloud.

"WITH OPPORTUNITIES CREATED BY CONNECTIVITY AND THE INTERNET OF THINGS, WE CAN PROVIDE TOOLS FOR OPTIMISING SHIP PERFORMANCE AT COST LEVELS NEVER SEEN BEFORE."

In September, Eniram and Wärtsilä released SkyLight, a fleet monitoring service that facilitates the optimisation of a vessel's performance. This next-generation solution offers vastly improved and more accurate information compared to manual performance reporting with the Automatic Identification System (AIS), which is common amongst providers offering similar services. SkyLight also makes Charter Party monitoring transparent and nearly real-time, monitoring the vessel's voyage and comparing the fuel and speed performance of the vessel to the terms of the Charter Party.

What before took several man-hours, plus information from up to three providers, for the operator to investigate, SkyLight now solves in one report. It will also deliver an enhanced, normalised fuel curve that can improve the optimisation of commercial operations, giving the customer an accurate insight into the vessel's fuel consumption. This forms the basis for all ship and performance optimisation.

Not only does SkyLight allow for faster and more effective planning, but it also creates transparency for possible, money-saving cuts in Charter Party margins. The cost-effective approach of SkyLight makes energy and performance management accessible for all operators, owners and charterers, regardless of the size of their fleet.

REAL-TIME DATA FUELS ADVANCED ANALYTICS SERVICES

With SkyLight, commercial operators can cost-effectively monitor their fleet and compare in detail the fuel, speed and nautical performance between their vessels. The software keeps records of the ships' performance, enabling more prompt reporting, planning and cost optimisation.

As with any type of monitoring, both tracking and measuring variables make it possible to control them. Real-time access to fuel, speed and nautical performance data increases visibility and supports the overall optimisation of the vessel's performance. "In this way, ship operators can manage their business more effectively, resulting in money saved, instant insight in the performance of their assets and time reduced to supervise their day-to-day operation," says **Jan Wilhelmsson**, Vice President Commercial Shipping at Eniram.

Wilhelmsson adds, "Delivering performance monitoring through portable equipment as a service enables operators with shorter business cycles, like dry and wet bulk operators, to get the benefits of advanced data analytics. As satellite connectivity is rapidly improving, this type of service is a natural first step in the use of real-time data for fuel performance optimisation."

PERFORMANCE MANAGEMENT AVAILABLE TO ALL

SkyLight is a subscription-based service delivered via a portable two-way transponder, which is attached to the rail of the ship by the crew. The customer has instant access to the collected and analysed performance data via Fleet, Eniram's cloud-based software interface. In addition, reports are sent to the customer in PDF format for easy storage.

"With opportunities created by connectivity and the Internet of Things (IoT), we can provide intelligent sensors, integrated satellite communication and web-based analytics tools for optimising ship performance at cost levels never seen before. This, combined with the vast amount of data Eniram has collected over several years, makes us able to deliver advanced modelling off the shelf as well as bring cost savings to our customers and help them make the right business decisions," Wilhelmsson concludes.

2017 – THE YEAR OF SKYLIGHT

Already before the launch in September, SkyLight attracted attention and brought in customers who signed up for trials, which confirms an existing gap in the market for cost-effective, high-quality performance-monitoring solutions sold as a service. By the end of November SkyLight had reached its sales target, and the potential for fleet-wide rollouts in 2017 could employ 10 times the number of units that are on the market today. With a merchant fleet of around 40,000 vessels worldwide, the potential of SkyLight is enormous.

Setting the commercial progress aside, the technological development of Eniram's innovation continues, and we can soon expect to realise the true potential of SkyLight. Abstract concepts such as virtual sensing, real-time monitoring and low-cost connectivity, which not long ago seemed like science fiction, are already incorporated into SkyLight today and are yesterday's news. Below are examples of new services that will be included in the SkyLight offering during 2017:

- Fouling analysis, giving the customer insight into the effectiveness of the vessel's coating and allowing for more efficient dry dock planning
- Route benchmarking to assist economic voyage planning
- Monitoring, Reporting and Verification (MRV) readiness, assisting the customers with their emission reporting requirements under the new EU regulations
- Interactive apps for immediate alarm notification and predictive analysis, giving the customer the ability to take instant action when needed

This and much more will be added to SkyLight during this year. Other features, like nautical maps in the software interface, will also be available soon. 2017 will indeed be an exciting year for SkyLight customers.

POWERING UP THE MEDITERRANEAN LNG MARKET

▶ **TEXT:** ISABELLE KLIGER **PHOTO:** iSTOCK

NEW STRICT EMISSION LEGISLATION will incite power plants and ships operating in and around the Mediterranean to switch to alternative fuels, thereby increasing the need for liquefied natural gas (LNG) in the region.

The status quo in the Mediterranean energy market is about to change dramatically, following the introduction of the Medium Combustion Plant Directive (MCPD), which limits emissions of pollutants from medium-sized power plants, and the update of the Large Combustion Plant (LCP) Best Available Techniques Reference (BREF) document for large combustion plants. LCP BREF is likely to be approved by the European Union by mid-2017. The new LCP BREF document will contain, among other things, Best Available Techniques (BAT) emission levels for large new and existing liquid and gas-fired internal combustion engine plants. The BAT conclusions in the LCP BREF will provide the reference for setting the permit conditions to installations covered by the IED (Industrial Emissions Directive).

Tord Johnsson, Area Business Development Manager Europe and Africa with Wärtsilä's Oil & Gas Business, explains that these regulations will be major game changers for the Mediterranean energy sector. "Whereas up to now there were exemptions for isolated power generation systems, such as those on the Mediterranean islands, the MCPD stipulates that they will no longer apply after January 2025."

"This means, if the power generation companies on the islands want to carry on operating, they will have to switch to LNG, or implement a treatment solution, the latter of which is not economical in the long run," he continues.

EXISTING LNG PLANTS

Despite the existing exemptions, LNG is not an entirely novel concept in the region in or near the Mediterranean. In fact, some power plant operators are already ahead of the curve.

As early as 2008, Wärtsilä began delivering LNG-ready, dual-fuel engines and related equipment to the island of Madeira, after winning a tender with Empresa de Electricidade de Madeira (EEM), a publicly owned energy company that generates and sells electricity throughout the island. (While just outside the Mediterranean, as part of the Portugal, Madeira has many features in common with islands inside the Mediterranean.) The plant is currently running on LNG, which is supplied to the island via the virtual LNG pipeline.

Later, in 2014, Wärtsilä signed a major contract with Shanghai Electric Power for the conversion of the Maltese Delimara Power Station Phase III to operate on natural gas. The first phase of the project to convert this 140-MW power plant, located in the eastern part of the island of Malta, was completed in October last year.

THE FACT THAT BOTH THE POWER GENERATION AND MARITIME SEGMENTS WILL COME UNDER NEW REGULATORY REQUIREMENTS MEANS THAT THE TWO INDUSTRIES COULD BENEFIT FROM SETTING UP A COMMON LNG INFRASTRUCTURE WITH SHARED COSTS.

Meanwhile, tenders are currently ongoing for power plant projects in the Greek archipelago and the Spanish Canary Islands.

MARINE REGULATIONS

It is not only in the power segment that the state of affairs is about to change as a result of new emissions legislation. In an unrelated move, the International Maritime Organisation (IMO) recently announced the Marine Environment Protection Committee's (MEPC 70, in London) agreement that a global 0.5% cap for fuel sulphur content for ships will come into force in 2020. This means that operators using residual fuels need to change to higher-quality liquid fuels, LNG or use a SO_x scrubber.

LNG is widely recognised as the preferred fuel choice to simultaneously reduce all vessel exhaust emission components. Running on LNG reduces emissions of greenhouse gases by 5–10%, while NO_x emissions and particle emissions are reduced by 85–90%. Meanwhile, sulphur emissions are close to zero.

Johnsson says that the timing of these two legislative moves can be seen as a fortunate coincidence.

"The fact that both the power generation and maritime segments will come under new regulatory requirements at around the same time means, in theory, that the two industries could benefit from setting up a common LNG infrastructure with shared costs," he comments.

LONG-STANDING EXPERTISE

With its extensive experience in the delivery of both power plants and ships that run on a combination of conventional fuels and LNG, Johnsson explains that Wärtsilä is uniquely positioned to support the transition that will need to take place in the Mediterranean over the coming years. Moreover, he adds that there are clear advantages to bundling together the delivery of the LNG infrastructure and the power plant, as it makes it possible to execute the project as one. This, in turn, allows the operator to save time and money, reduces energy consumption, and optimises the LNG input to electrical output performance.

"Wärtsilä can provide the expertise and industrial know-how to enable customers to identify the best solutions for their operations," he says. "Regardless of whether operators want to build from scratch or convert an existing installation, we can provide both the necessary LNG infrastructure and the dual-fuel solutions for the power plants and the vessels."

BRAZIL'S INLAND TREASURE

▶ **TEXT:** MICHAEL LEVITIN **PHOTO:** WÄRTSILÄ

GAS DEPOSITS IN BRAZIL'S interior could be a treasure trove for generating power, but the lack of infrastructure inland to move it has been prohibitive. But Wärtsilä found a way to tap into these caches, bringing about electricity and employment at the same time.

Brazil's pipeline infrastructure runs only along the Atlantic coast, stranding many inland deposits like the kind found in Bahia.

When the Brazilian oil company Imetame Energia discovered gas fields in the interior of Bahia five years ago, it saw no way of turning the gas into money. Brazil's pipeline infrastructure runs only along the Atlantic coast, stranding many inland deposits like the kind found in Bahia. As a small and independent producer, Imetame attempted to sell the fields to the state-run oil giant Petrobras but couldn't reach a deal. It was considering closing the fields.

PROBLEM-SOLVING POWER

That's when Wärtsilä approached the company and offered a solution: to build a power plant running on natural gas, based on internal combustion engines, now known as UTE Prosperidade I, very near the fields. Using a "Gas to Wire" concept, Wärtsilä promised to monetise the gas by generating electricity on location with a baseload power plant, then feeding the energy through transmission lines directly into the national grid.

Completing the deal, however, wasn't such a straightforward process. Wärtsilä's primary value was its knowledge of the electricity market. So it presented Imetame a package and worked as a consultant, helping the company build the project plan and win a 2015 government auction that enabled it to buy power capacity. "They took the risk, they analysed the situation, and they were very successful," Wärtsilä's Business Development Manager, **Gabriel Cavados**, says of Imetame.

Finally, in May 2016, Wärtsilä signed a EUR 10 million contract with Imetame to supply three Wärtsilä 34SG gas engines and equipment for the 28 MW natural gas plant. Scheduled to be completed by January 2018, the plant will help supply energy to the industrial city of Camaçari, located 50 kilometres northeast of Salvador. "Our technology combines high-efficiency engines with low cost – a good cost-benefit value for the auction. The solution makes it very feasible to find gas inland and turn it into electricity," says Cavados. Above all, "it's a great opportunity for the developers to turn gas into good money."

"THIS SOLUTION MAKES IT VERY FEASIBLE TO FIND GAS INLAND AND TURN IT INTO ELECTRICITY."

ONLY THE BEGINNING

This isn't the first time Wärtsilä has implemented a successful Gas to Wire concept in Brazil; in 2013, the company's 56 MW Parnaíba IV flexible, gas-fired plant opened in the northeastern state of Maranhão. Brazil currently pays a high price, between USD 7–8 per million British Thermal Unit (BTU), for liquefied natural gas (LNG) used for power generation. But by monetising gas found in the country's interior, producers can cut the cost of energy to USD 1-2 per million BTU, which translates into enormous savings for consumers.

Now the Imetame deal could point the way toward future inland gas exploration across the country, using Brazil's strong transmission infrastructure and interconnected system for power generation. "If you find a natural gas field in an isolated area, you won't be able to connect to the pipeline grid," says Cavados, "but you can build a power plant, connect to the electrical system and turn that gas into money."

After Imetame won the 2015 auction, it discovered more gas in the same area. This means that Prosperidade II and Prosperidade III are likely to follow soon. The plan will lower the electricity load in the region while helping to supply the load in nearby Camaçari. Moreover, the plant is expected to create around 500

Wärtsilä will provide 34SG gas engines and equipment for a 28 MW natural gas plant that will serve the industrial city of Camaçari.

jobs in a poor and underdeveloped state where additional household income is badly needed.

POSITIVE PARTNERSHIP

From a sales perspective, Cavados says the lengthy process of negotiation and collaboration between Wärtsilä and Imetame resulted in "a very good experience. We helped them a lot, supported them during the development, and in the end, they bought the equipment from us. It was a very good partnership – exactly the type of relationship that we try to build with our customers," he adds.

According to **Roberto Baptista**, Director of Imetame, "Wärtsilä was crucial in providing technical support on the project design and also in helping Imetame understand this new business of power generation. A power plant based on Wärtsilä's technology proved to be the best solution to turn the gas into money."

Opportunities for new discoveries of gas in Brazil's interior are promising. The country's Oil and Gas Regulator (ANP) is organising tender rounds each year, offering onshore areas with an exclusive focus to increase exploration of inland natural gas fields. So the future Gas to Wire market in Brazil has powerful potential.

"A POWER PLANT BASED ON WÄRTSILÄ'S TECHNOLOGY PROVED TO BE THE BEST SOLUTION TO TURN THE GAS INTO MONEY."

TEXT: ANNA AISTRICH **PHOTO:** TIM BIRD

One hundred years together and counting

Since it began in 1834, Wärtsilä has been at the frontier of engineering innovation. At first a small sawmill in Värtsilä, a village in Eastern Finland, it later transformed into an iron works called Wärtsilä, and its business marched along into the 20th century, just as Finland gained its independence (in 1917). Then, following the collapse of the Soviet Russian market, it hit financial trouble. In 1926, a young engineer named Wilhelm Wahlforss came in to restructure the company with unprecedented speed and efficiency, earning him the nickname Speedy Ville.

Foreign acquisitions were prohibited by law. So, confined to domestic expansion, Wärtsilä became a diversified conglomerate of some of the most iconic names in Finland, like the Arabia porcelain factory, Iittala glassworks and the lock and key company Abloy.

During his 43 years at its helm, Wahlforss turned Wärtsilä into the biggest company in Finland, and its long tradition of firsts put it at the forefront of innovation. Responding to ever-changing global influences led to new directions, such as moving into the engine and propulsion business, which became a focus on making the world's most efficient engines running on gas.

The last 10 years saw the addition of maintenance services, liquefied natural gas (LNG) solutions, innovative ship and power plant designs that use fuel alternatives like propane, ethane and biogas, and the integration of solar power. And, with the dawn of the digital era, the most rapid changes have been virtual ones. Genius Services and other digital enablers are constantly progressing to help customers improve their profits and pave the way for Wärtsilä's future, too.

Much as Wärtsilä took shape – and, in the process, helped shape the nation – during the last century, it is ready to mould the world of tomorrow, both in Finland and across the globe. Wärtsilä has overcome obstacles to deliver ever-smarter solutions that keep its customers one step ahead and will build on this momentum as the world advances ever more swiftly into the future.

*Sign off

TEXT: ISABELLE KLIGER PHOTO: ANDY SMITH

[AT YOUR SERVICE]

New age of connectivity

AS THE NEWEST MEMBER of the Wärtsilä family, Eniram brings with it extensive expertise in developing dynamic tools and solutions for use onboard ships and ashore. **Melvin Mathews**, Director Maritime, Eniram, says that what all these systems have in common is that they optimise maritime operations using digitalisation, connectivity, data and analytics.

1 HOW DOES ENIRAM COMPLEMENT THE WÄRTSILÄ PRODUCT OFFERING?

While Wärtsilä has mastered asset optimisation, Eniram focuses on operational optimisation. Considering the synergies when they come together, they form a winning combination. Jointly our products seek to increase visibility, transparency and insight, seeking at a high level to optimise the customer's assets over the entire lifecycle and facilitate efficiency in business. What is unique about the onboard product portfolio is that the technology is based on real-time data and analytics. Eniram's solutions also support the efficient operation of ships from shore, offering unprecedented visibility and transparency to vessel managers, that enable them to optimise operations across their entire fleet. By their very nature Wärtsilä and Eniram's businesses are quite complementary – together, we offer customers a seamless one-stop shop for all their machinery, maintenance, operational and efficiency needs.

2 WHAT DOES THE FUTURE OF SHIPPING LOOK LIKE?

The world is moving towards a future that is more and more connected, and with increased connectivity and communication comes better visibility and transparency. The shipping sector has begun this journey, starting with an industry-wide drive towards digitalisation, which will form the cornerstone of its future evolution. Digitalisation leads to connectivity, which will link ships to ports, terminals, cargo suppliers and receivers, factories, containers, customers and warehouses, enabling them all to communicate with each other digitally. In other words, the entire supply chain from the raw material to the end user will be connected in one seamless digital communication loop.

3 HOW WILL DIGITALISATION AND BIG DATA BENEFIT WÄRTSILÄ'S CUSTOMERS?

Digital technologies and data alone offer no significant fiscal benefit. The data, when processed in real time with integrated diagnostic or predictive analytics and cumulative expertise, changes things dramatically. Data contains a wealth of information on issues ranging from performance and efficiency to resource utilisation, as well as customer, supplier and employee behaviour, and gaps in processes and procedures. These insights are invaluable in a globally competitive marketplace. When made available in real time, they can lead to precise, faster decision-making, which can improve profitability and facilitate corrective actions to curtail costs. Companies that are agile and use real-time big data analytics can react to market fluctuations far more quickly than companies that are not digitally interconnected.

[SIGN OFF]

[CLASSIC]

When computers got personal

Though PET officially stood for 'Personal Electronic Transactor', the name was chosen to evoke a warm, fuzzy image and capitalised on the pet rock fad of the time.

The 8K model originally retailed for USD 795, about USD 3200 in today's money.

Production delays with PET nearly bankrupted its BASIC operating system supplier, a fledgling company now known as Microsoft.

The 9-inch, monochrome blue screen could display 25 rows of text, 40 characters across.

Loading programs or saving work was done via the clunky, built-in cassette deck, which no doubt led to the sacrifice of countless Rod Stewart tapes.

The front-mounted cassette deck left room only for a tiny keyboard that was notoriously hard to use, particularly for anyone with less-than-dainty fingers.

ORIGIN

This year, the computing world celebrates 40th birthday of the legendary **Commodore PET 2001**. Positively paleolithic by today's standards, this early PC was once the darling of the tech industry, thanks mainly to a cutesy, all-in-one design and relative user friendliness. Together with the Apple II and TRS-80, the PET's arrival marked 1977 as the year computers escaped the confines of labs and offices and truly began their march into the homes of the masses.

TECHS & SPECS

Processor
1MHz MOS Technology 6502

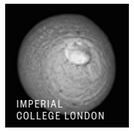
Memory
4K or 8K of 8-bit RAM

Operating system
BASIC in ROM

Designer
Chuck Peddle

[CULTURE WATCH]

[SCIENCE]



Valuable clues to the history of our solar system have turned up in a surprising spot: Europe's rooftop rain gutters. Norwegian amateur scientist **Jon Larsen** spent five years sifting through gutter gunk in Oslo, Paris and Berlin to find particles of space dust, tiny bits of asteroids and comets left over from the time our sun was formed 4.5 billion years ago. Comparing the size and shape of these newly fallen particles with those found in Antarctic ice could shed light on how planetary orbits have changed over the past millions of years.

[LITERATURE]

Are your choices really as rational as you think? In *The Undoing Project: A Friendship That Changed Our Minds*, renowned author **Michael Lewis** (*Liar's Poker, Moneyball*) presents the endearing story of collaboration between Israeli psychologists **Daniel Kahneman** and **Amos Tversky** and their work that unravelled long-held assumptions about the decision-making process.

[TECHNOLOGY]

Bionic, bomb-sniffing spinach could one day become an ally in the fight against terror. MIT researchers have embedded nanosensors into the plants' leaves to capitalise on the plants' natural ability to quickly absorb and concentrate tiny amounts of nitroaromatics – telltale components of explosives – that land in the soil. The developers foresee similar technology being used by urban farmers to detect pollutants.

[SIGN OFF]

TEXT: ATTE PALOMÄKI & NIKHIL SIVADAS **PHOTO:** iSTOCK

"THERE IS AN OPPORTUNITY FOR FAST-MOVING COMPANIES TO COME UP WITH TECHNOLOGICAL ANSWERS TO CHANGES IN DEMAND."

[AMBITION]

2040 and beyond

There are huge changes in store for the power generation sector, says Bloomberg's Angus McCrone.

This is a time of rapid change across the globe, with technologies arising that are making hitherto exotic products and services increasingly commonplace. As recently as 10 years ago, renewable energy using solar, wind power and other sources were thought to be an interesting, but ultimately cost-intensive way to generate power, and many believed it would not form more than 5% of the overall generating mix. But with the technologies behind this becoming cheaper and more efficient, **Angus McCrone** of Bloomberg New Energy Finance says that number could be wide off the mark.

"I think there are several countries that are generating 20% or more of their electricity through wind, solar and other renewable technologies. And people are now looking at electricity systems that have much higher percentages of renewable penetration."

ONE OF THE CHIEF challenges to using renewable energy has been its intermittent nature. Many companies have developed systems for analysing when supply might drop and switch to traditional energy sources to make up the difference. This need to balance out the power grid has led to the extension of the shelf life of older coal-fired plants in many countries, which in turn could reduce the adoption of renewable energy. However, Angus feels this could be an opportunity that power generation companies should capitalise on.

"Obviously, that brings challenges. How do you integrate that? How do you ensure there is electricity available during a resurgence in demand? So, there is an opportunity for fast-moving companies to come up with technological answers to that issue."

In the meantime, gas is expected to play a key role in helping renewable energy adoption across the world. Countries like the USA have already taken a lead in gas production using innovative technologies to tap into shale gas. Angus expects the next two decades to see gas-fired generation increase exponentially, but not at the scale that he expects renewable energy to grow.

"Where gas will come into the play in a lot of places is as a key balancing technology to enable the grid to operate better when you've got variable renewables being used. You can also add a lot of small-scale, rooftop cellular generation to the mix, making this a more complex grid than it has been before."

ADDING TO THE COMPLEXITY will be the rise of electric vehicles, with an increasing number of companies deploying technologies that will make their use more commonplace. Angus believes this will fuel a parallel drive in economies of scale in the manufacturing of batteries, which will reduce their cost, allowing them to be used in other forms of transport like ships. All of which will have a radical impact on energy consumption patterns.

"Electric vehicles will mean a lot more demand on the grid for electricity, and we think by 2040, electric vehicles will add about 8% to overall world electricity demand, so I think it is an overall transforming technology and clearly that is something to watch."

Angus expects demand from electric vehicles, increased adoption of renewable energy and the growth of key balancing technologies to be the major drivers of growth over the next two decades.

"I think over the medium term, there is still going to be significant investment in new generation technology. We reckon about 11.7 billion dollars between now and 2040 worldwide, a lot of that in emerging economies."

Even developed economies will be affected with generating plants reaching the end of their shelf life and being replaced by new technologies. All of which point to tremendous opportunities for companies selling into these markets.

[TRAVELLERS' GEAR]

If the risk of annoying your seatmates is an acceptable price to pay for protecting your personal space, then the **Create-A-Space** portable airplane seat divider is for you. The book-sized barrier clips onto your armrest, creating a no-touchy zone to keep out those errant elbows.

Power banks are a must-have travel accessory in this era of frenzied gadget use. The 6700 mAh **Zendure A2** not only holds enough juice to charge your phone two to three times over, but its shockproof, crushproof body can survive being run over by a car. Available in silver and black.

Luggage security goes high-tech with the **AirBolt**, a sturdy, Bluetooth-enabled travel lock that opens with an app on your smartphone. Its anti-tampering and distance alarms will foil would-be thieves. It can even ping you from the luggage carousel to let you know where your bag is.

TEXT: STEVE ROMAN

[LITTLE ENGINEER]

On Screen and Off

SCREEN ADDICTION IS A SERIOUS enough problem for us adults, but might prove downright detrimental to today's youngsters who, let's face it, spend way too many hours with their faces glued to glowing gadgets rather than interacting with the real world.

To bridge the gap between technology and healthy, hands-on play, California-based engineers **Pramod Sharma** and **Jerome Scholler** developed Osmo, an award-winning game system that enables your iPad to read the environment in front of it with the help of Reflective AI technology.

Setup is fairly intuitive. Just install the free apps, stick the tablet on its stand, pop the red reflector on top and let the brain development, er... fun begin!

Naturally, having a tablet that can "see" what's happening in front of it opens up endless possibilities for interactive learning games and other creative mischief. You can draw a picture and have it come to life on the screen, solve on-screen puzzles with real-world puzzle shapes or use your own toys to deflect a ball in a digital gravity game. That's just for starters. Specialised games focus on math, spelling, drawing, coding, running a pizza restaurant and more.

Different kits are available with the main variation being the number of games included. Nearly all games are aimed at the 5- to 12-year-old set, though there's also one for tiny tots. One drawback is that Osmo currently works only with the iPad (not included), but that shouldn't be a big deal for parents concerned that their children's life skills are limited to blasting away at pixelated zombies.

PHOTO: MARJA VÄÄNÄNEN

The speed of innovation requires a start-up mentality

NOWADAYS, YOU CANNOT MISS PEOPLE buzzing about start-ups and how great they are. Certainly, there is some excess hype around them, but don't let that misguide you – there are very good reasons for the buzz. And these reasons are their ability to get into customers' heads and their speed of innovation.

A culture of experimentation and the 'fail-fast' attitude derived from design thinking are at the very core of the lean start-up approach. But in the end, it is less about failing fast than about succeeding soon. It is about truly understanding just what the customer needs and providing exactly that in a faster manner – through prototyping, testing and iterating together, with constant customer involvement – and about taking user experience into account.

Luckily, this approach is not only the privilege of actual start-ups; corporations can benefit from it as well. We at Wärtsilä have taken several cues from the start-up world and adopted methodologies to help us understand how to gear up our speed of innovation.

One very good example of tapping into the mind-set of the start-up world is the Wärtsilä Marine Mastermind competition, where we invited the start-up community to come up with digital service innovations for the marine industry. We got to witness the start-up life in action and understand what it really means. We also got our hands dirty developing a new business concept during a six-week Lean Innovation Lab sprint together with the winner Marina Ahoy. This sprint, besides leading into a highly promising business concept, really was an eye-opener for many of us and a proof that, with lean start-up methodologies, it is possible to bring an innovation to life very rapidly.

We also organised two hackathons, the first of which was Digi-sauna . There, our cross-discipline experts teamed up with external partners for a 48-hour, intensive session to come up with new digital solution concepts for predefined business challenges. And these sessions were far removed from the image of nerds eating pizza while programming. Well, actually, both those aspects were included, but it was really about applying the same design thinking and lean start-up methodologies to generate rapidly something that the customer really needs. What's more, the customer for each team was a dedicated internal business owner who was involved directly in the development – so the teams could incorporate the customer's needs and feedback continuously.

The above examples are just the beginning in becoming a more start-up-minded organisation with a greater speed of innovation. We have taken the first steps, and after seeing the results it may bring, there is no turning back. So, there certainly is a lot more to come, and not least from our digitally infused organisation. Stay tuned!

Tero Hottinen
General Manager, Business Innovation

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