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AFRY Insights

Management Consulting – Energy

Winter 2020

Interviews

Anja-Isabel Dotzenrath - RWE Renewables
Marie Trogstam - AFRY

Topics

All aboard for greener horizons
Put the hydro in the tank
The Nordic way

Imprint

PUBLISHER
AFRY Management Consulting

Matt Brown
matt.brown@afry.com

Roland Lorenz
roland.lorenz@afry.com

afry.com

linkedin.com/showcase/
afry-management-consulting

EDITORIAL TEAM
Matt Brown, Kjetil Ingeberg,
Antonio Nodari

AUTHORS AND SUPPORTING EXPERTS
Carl Benedict, Kjetil Ingeberg,
Bülent Mutlu, Riccardo Siliprandi,
Henrik Tegnér, Benedikt Unger,
John Williams, Stephen Woodhouse

Carlo Frevert, Kjetil Ingeberg,
Rob Lee, Robert Schwarz,
Abigail Speak

EDITORIAL STAFF
Filip & Grimm
Raquel Ogando,
Dean Jackson, Tim Pohlmann

THANKS TO
AFRY, Gapminder Foundation,
RWE Renewables

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Editorial

Dear reader,

In light of the Covid-19 pandemic and its political, social and economic effects, the continuous dialogue with our clients is now more than ever one of our main objectives. The “New Normal“ in our days has illustrated that a virus can have a more significant impact on our behaviour in terms of ecological change than all the ideas and approaches that were originally supposed to speed this change up. Stopping climate change is one of the most important goals of our generation despite the virus, which is why sustainability and deep dives into renewable energy are two threads running through these pages. We are very pleased that we can bring both topics closer to you with top-class interview partners.

“The current coronavirus crisis, with its ongoing dramatic health and economic impacts, should be used as a catalyst to get the world on a more sustainable track and to accelerate efforts towards reaching climate-neutrality,” states Anja-Isabel Dotzenrath, CEO of RWE Renewables in our interview. She also reveals why she and her main competitors are supportive of the 55% reduction in greenhouse gas emissions suggested by EU heads of government and what opportunities she sees for her company.

“When it comes to the climate and environment, we are already measuring our own impact, such as our internal CO_2 emissions, but we also see the importance of creating value for our clients with our sustainable solutions,” adds Marie Trogstam, Head of Sustainability, explaining AFRY’s perspective.

Please do read our features about hydrogen as game changer for the industry, about digital trends in the energy industry and how we at AFRY Management Consulting can help you creating a strong radar to hammer out scenarios and identify trends in your business.

Enjoy the read!
Your Management Consulting Energy leadership Team

Antonio Nodari

Matt Brown

Kjetil Ingeberg

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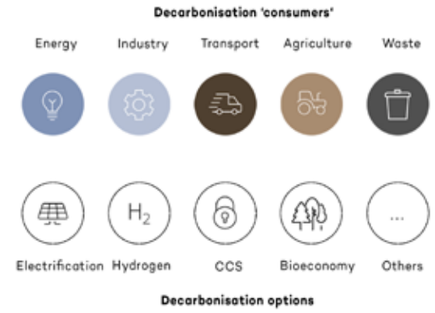
Taking the plunge

What's next in the decarbonisation of the European economy?

Studies have led to an increase in the knowlwdge about the economic sectors and their options to decarbonise



Following the 2016 Paris agreement the EU targets an 80 to 95% reduction in economy-wide greenhouse gas emissions by 2050 (compared to 1990).

Owing to a number of studies, the knowledge about CO_2-emitting sectors (=decarbonisation 'consumers'), has strongly increased and about the options available for lowering those emissions. It has been acknowledged that some sectors (e.g. aviation, cement, steel) will find it harder to decarbonise than others (e.g. passenger transport, most of the power sector).

This discussion has sparked many initiatives that will accelerate decarbonisation efforts. Several countries and the EU have recently published their hydrogen strategies. Vehicle manufacturers are incentivised to produce more all-electric cars. Companies are ramping up efforts to procure energy via renewable PPAs.

The conversation is shifting

Now that we have gained all this knowledge, the conversation is shifting into the next phase and new, more in-depth topics.

Focusing on industrial decarbonisation, it has become apparent that decarbonisation will have to be hyper-local. Optimal choices to decarbonise industrial processes need to be very specifically tailored to sites, and can even differ between one part of a site and another. Examples include steel, refineries, and chemicals, where all of the above options may play a role.

In order to enable these solutions, a supply infrastructure for decarbonisation products (e.g. renewable electricity, hydrogen, CO_2 capturing) needs to be established. Discussions focus on how to solve the 'chicken-and-egg' problem – i.e. the difficulty to develop demand without an infrastructure, and vice versa – especially for hydrogen and electric vehicle charging.

So, what are the most urgent topics that need to be addressed to capture the momentum that has been forming?

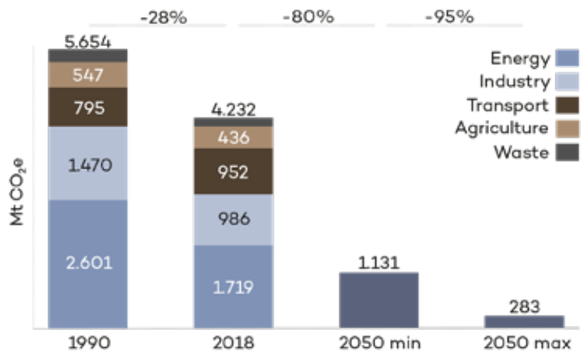
Decarbonisation consumers that are already under pressure to deliver – vehicle-fleet owners, manufacturing sectors, heating providers – need to investigate technical feasibility and business models for their preferred solutions. This will allow for conversations with energy utilities, network companies and regulators, in order to form relationships that do not exist yet to the necessary extent.

Decarbonisation providers need to be incentivised and enabled to provide the solutions and necessary infrastructure. Policy makers need to understand the impact of their push for specific solutions, and provide the necessary policy and regulatory environment for markets to emerge and deliver. In mid-2020, the EU introduced plans to dedicate a significant portion of both its COVID-19 response package (EU recovery fund) and its budget – 30% across both instruments – to climate-friendly projects – the highest green stimulus in history.

Finally, solutions need to focus on decarbonisation consumers – essentially everyone expected to lower their emissions, from the individual person to the large company. Forcing solutions based on pre-conceptions can be damaging and risk the success of timely and affordable decarbonisation.

On the next few pages, we will explore some of these specific sectors, technologies and regions to highlight their potential contribution to decarbonisation.

The scale of the challenge is well-understood by now



Benedikt Unger
benedikt.unger@afry.com

Put the hydro in the tank

Hydrogen as a game changer for industry, transport and utilities

John Williams
john.williams@afry.com

Unprecedented attention

The potential of hydrogen to decarbonise industry, transport and heat is receiving unprecedented attention. Where electrification is neither economic nor technically feasible, low-carbon and renewable hydrogen can replace both fossil fuels and existing hydrogen supplies. But low-carbon and renewable hydrogen are likely to be more expensive than existing supplies and natural gas, so how can industry decarbonise and maintain competitiveness?

The hydrogen value chain covers feedstock and production, through transport and distribution to end-use applications. Significant public and private initiatives will be necessary to deliver substantial investments in R&D, demonstration/ pilot projects and infrastructure to prove hydrogen can meet safety, technical and economic challenges.

In the Hydrogen Strategy documents recently published by the European Union and the Governments of France, Germany, Portugal, Spain and the Netherlands, policy markers have focussed policy makers – not just on the potential of hydrogen, but on the incentives and support mechanisms required to kick-start the hydrogen economy.

Options for low carbon and renewable hydrogen

Today, most hydrogen is used in refineries, in the ammonia and methanol production and is produced via the reformation of natural gas resulting in CO_2 emissions. The EU's Hydrogen Strategy identifies the chemical industry as the lead hydrogen market that should aim to decarbonise by switching to low-carbon and renewable hydrogen.

Low-carbon hydrogen combines methane reforming and Carbon Capture, Utilisation and Storage (CCUS) which capture of up to 95% of the CO_2. Other forms of low-carbon hydrogen include pyrolysis of methane resulting in a solid carbon by-product and, according to the EU Hydrogen Strategy paper, grid connected electrolysis.

Renewable hydrogen, is produced through the electrolysis of water with renewable electricity. Other forms of zero-carbon hydrogen include the gasification of biomass. If coupled with CCS, this could even result in negative emission hydrogen.

However, each of these potential solutions faces challenges. Not the least of these is the economic challenge and the need to balance decarbonisation goals with higher costs and the competitiveness of the refinery and chemicals sectors.

The economic challenge facing hydrogen

Switching to low-carbon or renewable hydrogen will be difficult for industry in the short or even medium term without some certainty regarding the future business models, the hydrogen value chain, as well as incentivisation and support schemes.

Whilst much has been said about the potential for renewable or 'green' hydrogen production to become able to compete with the existing hydrogen production – this misses a fundamental point: How can low-carbon and renewable hydrogen compete with existing hydrogen delivered at the point of use?

It is not just production-cost comparisons that are important but the delivered cost comparison that also takes into account transportation, distribution and storage of hydrogen. AFRY's estimates indicate that pipeline transportation could add between 25-30 €/MWh to the delivered costs of hydrogen. Storage costs would increase this further, as would long distance transportation via ship.

Wherever there are good renewable resources from wind or solar enrgy, it is possible to produce renewable hydrogen at the same or lower cost than existing hydrogen soon after 2030. However, it is not always the case that the locations with the best renewable resources coincide with the locations of hydrogen demand and this is at the heart of the issue.

Existing hydrogen supplies are currently produced on-site and this has several advantages for the end user:

- hydrogen is supplied at a steady flow to suit the relatively flat profile of the end-use application removing any requirement for hydrogen storage
- as production is co-located with demand there is little requirement for hydrogen transportation
- the 'delivered' cost of hydrogen is relatively cheap

Delivered costs for low carbon and renewable hydrogen will need to include transportation, distribution and storage elements. Where it is not feasible to co-locate sufficient renewable generation capacity at industrial sites - as these locations may have insufficient space and/or relatively low renewable load factors – the transportation of hydrogen will be required. In addition, the intermittent nature of renewable electricity production will necessitate hydrogen storage. Whilst renewable hydrogen may be cheaper to produce, it may have become more expensive by the time it is delivered to the end user.

The chemical industry needs to decarbonise, but given these economic and logistical challenges, how can this be achieved?

Market-based, technology-neutral incentives are the key

Whereas most existing hydrogen production will be subject to the ETS, it does not make economic sense to switch to low-carbon and renewable hydrogen with current carbon costs. Our estimate is the ETS carbon cost would need to be at least 70-80 €/ tonne to incentivise the switch to low-carbon hydrogen and above 100 €/tonne to incentivise renewable hydrogen. Incentivising the switch from natural gas to hydrogen would require a much higher carbon cost.

Market-based instruments such as carbon contracts for difference (CfD) may provide the answer alongside a stream of EU and national funding for projects. The design of a carbon CfD will need to carefully consider how it incentivises value-chain development, rather than just production or consumption. It should also be technology-neutral so that low carbon hydrogen solutions can compete with renewable hydrogen - a solution that could contribute to decarbonisation quicker and at a more competitive cost.

The industry will be watching national and EU policy developments with keen interest over the coming months as more clarity is provided. The co-existence of good demand potential, good supply potential and a supportive policy will be essential to kick-start the hydrogen economy.

Leading the energy transition

After the unique deal between E.ON and RWE – an unprecedented move in German economic history – Anja-Isabel Dotzenrath, CEO of RWE Renewables, has become the head of one of the world's leading renewable companies. In our interview, Anja-Isabel reveals why she and her main competitors are supportive of a 55% reduction in greenhouse gas emissions suggested by EU heads of government and what opportunities she sees for her company.

AFRY Insights: Ms. Dotzenrath, you already headed the renewables division at E.ON. What has changed for you personally since your move to RWE?

Dotzenrath: I was excited, when the asset swap between RWE and E.ON was announced in spring 2018 as the industrial logic of the transaction is very compelling. Scale is key in renewables. And with this historical transaction, RWE has become a global renewables major in one fell swoop. On the personal side, managing a trilateral merger with colleagues from E.ON, innogy and RWE represents a special kind of challenge - one that you typically do not face too often in your professional life. The technical integration is comparatively easy. The real task is to get the cultural integration right. We spent considerable time on understanding each other's cultural point of view, we asked ourselves, what to preserve from all our legacy organisations, what to leave behind as well as jointly defining the type of company culture we wanted to create together. Consequently, I had to reinvent myself too, as you cannot credibly manage a change process if you are not willing to change yourself and leave old habits and ways of working behind.

The power of RWE Renewables increased with a jolt. How do you rate your company after almost a year in office?

We have a good starting position: We are one of the world's leading renewables companies, for example in offshore wind, we are ranked as number two worldwide. We want to defend these positions - and preferably expand them. In the last few months, we have outlined our growth ambition for every technology – onshore and offshore wind as well as solar and battery storage. We have identified the core countries where we want to expand in the Americas, Europe and Asia-Pacific region and outlined the top strategic initiatives to get us there.

The integration process is still in full swing. We are making good progress to create the type of company we always wanted to work for: A culture of strong collaboration, caring and development as the foundation for high-performing teams, that act boldly and always deliver their best effort. I am convinced that our newly formed team will be stronger than the sum of its parts and that we will realise our full potential.

The global market for renewable energy is not yet as established as traditional energy sources and the market is more aggressive right now. Where do you see RWE Renewables in this market in the medium term?

The demand for electricity from renewable sources is increasing all over the world. There are very good reasons to be optimistic that RWE can play a key role in delivering what is needed. We have an experienced team with more than 3,500 people in renewables from across the world, known for their deep capabilities and focus on performance. We are fully integrated along the value chain from the origination of projects, to engineering, commercialisation, construction, up to the operation, so we can address all value pools to produce clean electricity as competitively as possible for society. We are spanning all relevant technologies: offshore and onshore wind as well as photovoltaics and battery storage. Our solid financial strength and project pipeline gives us the best options for growth.
In the medium term, we will have grown our business considerably in a smart, disciplined way. We will have delivered further attractive projects safely, on time and on budget.

The current corona crisis, with its ongoing dramatic health and economic impacts, should be used as a catalyst to get the world on a more sustainable track and accelerate efforts towards climate-neutrality.

We will have participated successfully in sea-bed lease and project auctions in our target markets. And we will be recognised as pioneers in developing new technologies such as floating offshore wind.

In a joint letter to the EU government leaders, you and 150 other CEOs, including Francesco Starace and Jose Ignacio Galán, call for a reduction of greenhouse gas emissions by at least 55%. How did the joint initiative get started and aren't both Enel and Iberdrola among RWE's toughest competitors?

Speeding up the green transformation of the energy system is crucial to combatting climate change. It is a global challenge and depends on the broad mobilisation of all available resources. That is why it is so important that despite the competition between energy companies, we join forces to address this issue collectively.

The current coronavirus crisis, with its ongoing dramatic health and economic impacts, should be used as a catalyst to get the world on a more sustainable track and accelerate efforts towards climate neutrality.

RWE is at the forefront of decarbonising the energy sector by investing heavily in wind and solar energy production as well as storage technologies. Without losing sight of affordability or security of supply, we are also paving the way for further emission reductions in the supply chain of energy-intensive industries like steel and chemicals, for example through the production of green hydrogen.

By 2040, the entire RWE Group wants to be climate-neutral. How do you combine more sustainability with more business at RWE and how do you intend to support this ambitious goal with your renewables division?

Our annual multi-billion euro investments in renewable projects as well as our initiatives in scaling green hydrogen production are key to achieving RWE‘s goal of being carbon neutral by 2040. However, for us, climate-neutrality is more than a goal – it is embedded in RWE's purpose: our energy for a sustainable life. It means much more than the electricity we produce, it is the energy everybody at RWE puts in every day to make the energy transition happen. And it's backed by a clear plan: RWE has already lowered its CO_2-emissions since 2012 by more than 50%; in 2030, it will be minus 75%, and by 2040, climate-neutrality will be reached.

That we are on the right track was recently confirmed by the Transition Pathway Initiative. The association confirmed for the first time that RWE's ambitious climate-protection plans were in line with the targets of the 2015 Paris Climate Agreement. This is an important recognition of RWE's climate protection efforts and underlines that the whole company is united and committed – both colleagues in conventional power-generation as well as in the renewables business. We are already a market leader with an electricity-generation capacity of around 10 gigawatts based on wind, solar and battery storage, in addition to our hydro and biomass portfolio and we want to expand our renewables-asset base ambitiously and in a value-accretive way in the years to come.

Renewables are the future for RWE. We will invest a minimum of EUR 5 billion net by 2022 to grow our renewables portfolio to more than 13 gigawatts of net capacity.

In what way do you implement the Sustainable Development Goals to promote these goals?

We have defined clear focus areas, affordable and clean energy naturally being one of them: RWE is pursuing one of the most ambitious CO_2 reduction programmes in the industry. By 2040, we will produce our electricity primarily with wind and solar power.

Another focus area is life on land. We support domestic agriculture and wildlife conservation through our recultivation efforts in the Rhenish mining area. In numbers: nearly 23,000 hectares have been recultivated to date. In total, more forest areas have now been created than are used for mining. Over 3,000 animal and 1,500 plant species are currently registered in the recultivation areas.

Also, being a responsible and fair employer is paramount to us. This starts with apprenticeships: we are currently training more than 600 young people in 18 professions. We also take responsibility for the employment of people with severe disabilities: these employees constitute around 10% of our workforce in Germany, twice the legally required quota. Another focus area is gender equality: We pay particular attention to diversity and to the advancement of women - something that has traditionally been a major challenge among companies with a strong technical focus. The Board of RWE Renewables is a good example: it consist of three women, three men, having four nationalities working from four different locations. In 2019 RWE was included in the Bloomberg Gender Equality Index, one of the world's most prestigious gender rankings. Some 6,000 companies from 84 countries were considered – but only 325 were included.

As a company delivering major infrastructure projects we are also committed to credibly demonstrating our commitment to local neighbourhoods. This is another key focus area for us. RWE has been promoting social commitment for over 15 years and has supported a total of over 15,000 projects.

Our good ESG (environmental, social and corporate governance) rating results demonstrate RWE's commitment to sustainability. Yet much more will be done in the years to come.

What if all decisions were based on up-to-date facts?

This year has seen the launch of a collaboration between AFRY and the Swedish Gapminder Foundation, an NGO founded in 2005 by Ola Rosling, Anna Rosling Rönnlund and Hans Rosling, authors of the best-selling book Factfulness.

What would we do if it suddenly became clear that a shift in our position on fundamental questions about life, society and economy was necessary?
Well, this might be the case...

What Gapminder discovered, by measuring people's knowledge about the world through fact-based questions, is that the majority of people get a lot of questions wrong – even within their own field of expertise.

“The world is so complex, and we need to see the bigger picture when we make decisions. If we want to change work on the climate to improve how we do things, it will not be enough to look at one aspect of society. We are pretty interested in what AFRY is doing differently from the others and we have a lot to learn from AFRY. It feels very good to partner up, because it looks like the experts at AFRY are actually more knowledgeable than the other groups we have met, in many different ways. There are also a lot of areas where we do not have expertise but AFRY does, which we want to combine with our Gapminder method to create really meaningful material.”

Anna Rosling Rönnlund
Vice President of Gapminder

Gapminder believes that we must all form a habit of double checking our knowledge, questioning it, trying to detect misconceptions and striving for more fact-based decisions. As a general trend, they have observed that people have systemic misconceptions about many parts of society, health education, infrastructure, climate and so forth. The aim of the long-term partnership between AFRY and Gapminder is to identify knowledge gaps around the major societal issues of our time and to increase public knowledge of our world and global development.

How and why?

From the outset, Gapminder has been promoting a fact-based world view and been working to make statistics and data more accessible so that more people can easily access an accurate understanding of the world we live in.

“For us as an engineering and design company we need to really make our decisions based on facts. And the need for facts has never been as big as right now.”

Jonas Gustavsson
CEO of AFRY

Developing fact-based questions to test the public with, is one tool Gapminder uses to achieve the objective and identify the most important areas to highlight. Gapminder's first knowledge test with 13 questions on global development has been used by over 1 million people around the world. Through the collaboration with AFRY, a new test is currently under development, with AFRY experts identifying subject areas, fact checking materials and providing advice and explanations.

There are roughly 7 billion people in the world today. What percentage of the global population have no access to electricity?

A 22% B 10% C 4%

For the solution please turn the magazine to the right.

10 % of the global population, 771 million people, have no access to electricity (IEA 2019 data).

All aboard for greener horizons

A new wave of initiatives in the maritime sector

Kjetil Ingeberg
kjetil.ingeberg@afry.com

While transport by ship is a highly energy-efficient way of transporting goods, the maritime sector still accounts for 13% of EU CO_2 emissions in the transportation sector. Most outlooks point to a steady growth in maritime transportation, and as with land-based transport, the decarbonisation of ships and ports is attracting more and more interest, both from governments, local authorities and companies.

Most of the maritime emissions take place at sea, possibly less than 10% in ports. However, ships at ports also emit other gases like NO_x, SO_2 and particles, that represents serious pollution problems in urban areas.

Decarbonisation therefore has multiple benefits, with regards to public health and urban development in addition to greenhouse gas reductions.

Connecting ships

We are now seeing a parallel development emerge of technology, business models, policy and regulations. The technology status is very different for use in ports – so-called cold ironing – and at sea. In ports, connecting ships to the electricity grid in order to replace power generation by ancillary engines is technically relatively simple. All main components, like transformers and frequency converters, are proven technology. The main challenges are related to standardisation of the connection systems, and not least to the costs. While electricity from the grid is much more efficient than the on-board generation of electricity from diesel engines, a combination of on-board retrofitting costs, electricity and grid tariffs as well as power taxes makes the business case for investments on shore challenging.

Adding to the uncertainty is the market risk: how many ships will actually become customers of a shore power system? Various studies underline the complexity. For example, shore power for cruise ships have been much in focus. However, cruise ships typically stay a short time only at each port, but require very high grid capacity. With low utilisation times, cruise ships often prove to be a poor business case of their own. Other ship categories, like ferries, container ships and ro-ro ships with fixed sailing itineraries, prove much more attractive for cold ironing.

Replacing marine gas oil (MGO) at sea is much more challenging. Batteries, charged at the port, can be used for smaller ships and shorter distances. However, to carry the same amount of energy as MGO, batteries require 20 times as much volume and weigh 20 times more. In practice, this means that batteries at the current and forecasted state of technology will be limited to a smaller segment of maritime transportation, including "last-mile" hybrid solutions to avoid emissions in particularly vulnerable areas, like close to cities and world heritage fiords and landscapes.

Fuel alternatives

To replace MGO in larger ships and at longer distances, other fuels are needed. The strongest focus is on hydrogen (H_2) and ammonia (NH_3), both of which are gases that are produced for industrial purposes today. In contrast to batteries, the volume and weight requirements on board are similar to MGO for these gases. However, the technology solutions for using hydrogen or ammonia on board are not yet mature: in principle, one would use either a fuel-cell-based solution, or modified internal combustion engines (ICE). Furthermore, almost all of today's hydrogen is produced from natural gas, which emits CO_2 in the process. In order to provide ships with emission-free hydrogen, carbon capture and storage (CCS) would have to be in place. Alternatively, hydrogen can be produced from electrolysis, using renewable electricity. This opens a potential synergy with cold ironing and local grid capacity: co-location of distributed electrolysis, compressed hydrogen supply and cold ironing may significantly improve the utilisation of the grid capacity.

There are some major challenges in respect to hydrogen and ammonia. The most important one is possibly the primary-energy factor. If using electrolysis and renewable electricity, the transformation losses are very high and less than 20% of the primary energy can actually be used for propulsion. Local heat offtake may somewhat improve the picture, but not substantially. Another issue is physical safety: both hydrogen and ammonia are extremely flammable, ammonia is also very toxic.

Oslo, oh Oslo

The issue facing companies and policy-makers alike, is how to promote and build sustainable business models under great uncertainty. For policy-makers, the question is balancing new requirements with incentives for both market and technology developments. Investment support for cold-ironing installations are already in place in many places. In some areas and countries, local emission-free or low-emission zones are created, for example, the city of Oslo has decided that the port of Oslo shall reduce emissions by 95% by 2030, including a 7 nautical miles (15 km) zone outside the port area. This will require at least widespread electrical hybrid solutions on board.

In South Europe, we see a joint initiative covering Italy, Spain and Greece to move forward with green ports, with partial funding from the EU's Recovery and Resilience Facility.

For the commercial players, we see several examples of new joint ventures between ports and energy companies investing in cold ironing and potentially charging facilities. The main uncertainty has proven to be customer interest. Ships are literally floating assets, that can rapidly be moved almost anywhere in the world. With short-time charter periods, it is difficult to invest in on-board installations. An emerging solution is the call for very long-term transport contracts, to secure the cashflow needed to defend the additional on-board investment cost. However, in light of the long life time of the existing shipping fleet, stronger incentives and regulations also for the ships seem to be required to meet ambitious CO_2 targets within the next decade. And, not least, coordinated action between ports, shipowners, energy companies and authorities should be high on the agenda .

Feeding the heat

Bülent Mutlu
buelent.mutlu@afry.com

Biomass and hydrogen, two potential pillars of mid to long-term decarbonising the heating sector of European Cities

The EU climate goals require a complete green-energy transition by 2050 in the electricity, transport and heating sectors. The national policies already in place today are mainly aimed at increasing the generation of renewable electricity, while the heating sector has been less in focus, despite higher primary-energy demand. In Europe, half of the total 12,300 TWh of annual final-energy consumption is used to provide heat in different forms and only around 800 TWh of heat comes from renewable sources. technologies already available for the generation of CO_2-neutral heat include electricity via heat pumps or power-to-heat solutions (P2H), solar- and geothermal energy, biomass, waste-to-energy and within upcoming years also hydrogen.

In the long term, green hydrogen could play an important role in decarbonising the heating sector, replacing natural gas in numerous gas-fired combined heat and power plants (CHPs). But in the shorter term, the availability of green hydrogen and lack of a developed transport and storage value chain will be obstacles.

The recently published EU hydrogen strategy does not envisage a widespread use of hydrogen in urban heating systems but indicates that its use would be suited best to industry, sector coupling and the transport sector. It is unlikely that renewable hydrogen will be produced very close to the heat demands and so, transportation and storage will have to be added on top of the costs of delivered hydrogen. Importing hydrogen from countries in North Africa or the Middle East will increase costs further.

Comparing the projected fuel costs in 2040 for renewable or other low-carbon hydrogen demonstrates the principle for the heating sector. The cost of natural gas will range from 20-35 €/MWh (including network and CO_2 charges), whereas renewable hydrogen is expected to cost between 60-80 €/MWh to produce, plus a further 25-30 €/MWh for pipeline transportation. Although renewable hydrogen production costs in MENA are much lower, the transport of hydrogen would be much higher, especially in liquid form, as liquification will add another 20 €/MWh and transport by ship another 60 €/MWh, depending on the place of origin and transport. The transport of hydrogen in the form of ammonia would be cheaper but conversion and reconversion costs also have to be added to the overall costs. Using low carbon natural-gas-based hydrogen could be cheaper to both produce and to import but this will depend on the acceptance of Carbon Capture and Storage (CCS) or the development of pyrolysis at a commercial scale. The EU hydrogen strategy only foresees a transitional role for low-carbon hydrogen produced from natural gas.

Lack of alternatives

If the priority is given to the development of renewable hydrogen, then there may be a limit on the volumes of hydrogen that can be produced in Europe – a point that is noted in the German hydrogen strategy. This could give rise to significant volumes of hydrogen imports just to meet demand in the industrial and transport sector where there may be a willingness to pay a higher price due to the lack of alternatives.

Generating heat by tapping the potential of environmental heat from water-heat pumps, solar or geothermal energy might be an option for specific locations, but is only available in limited quantities and is also often restricted in its output by seasonal constraints. On the other hand, biomass useful for district heating can cover the basic and medium heating load, when burned in both centralised or decentralised plants. It has thus got the potential of replacing natural-gas plants and becoming a decisive cornerstone in the urban heat supply of the near future.

Biofuels can be procured locally or be purchased on the global market. Their use must be continuously analysed on an individual basis, taking into account local availability and required supply chains. Examples of locally available biomasses are waste wood, straw and wood chips. Globally traded biogenic materials are, besides wood pellets, e.g. bio-ethanol or bio-methanol. The largest suppliers of wood pellets are the USA, Canada, and the Baltic States. The pellets can be obtained and are certified in relation to sustainable by-products and residual materials from the forestry sector. Thus, relying on certified biofuels does not compromise the UN Sustainability and Development Goals (UN SDG) and at the same time supports the goals of cheap and clean energy supply and sustainable cities.

Increasing competitiveness

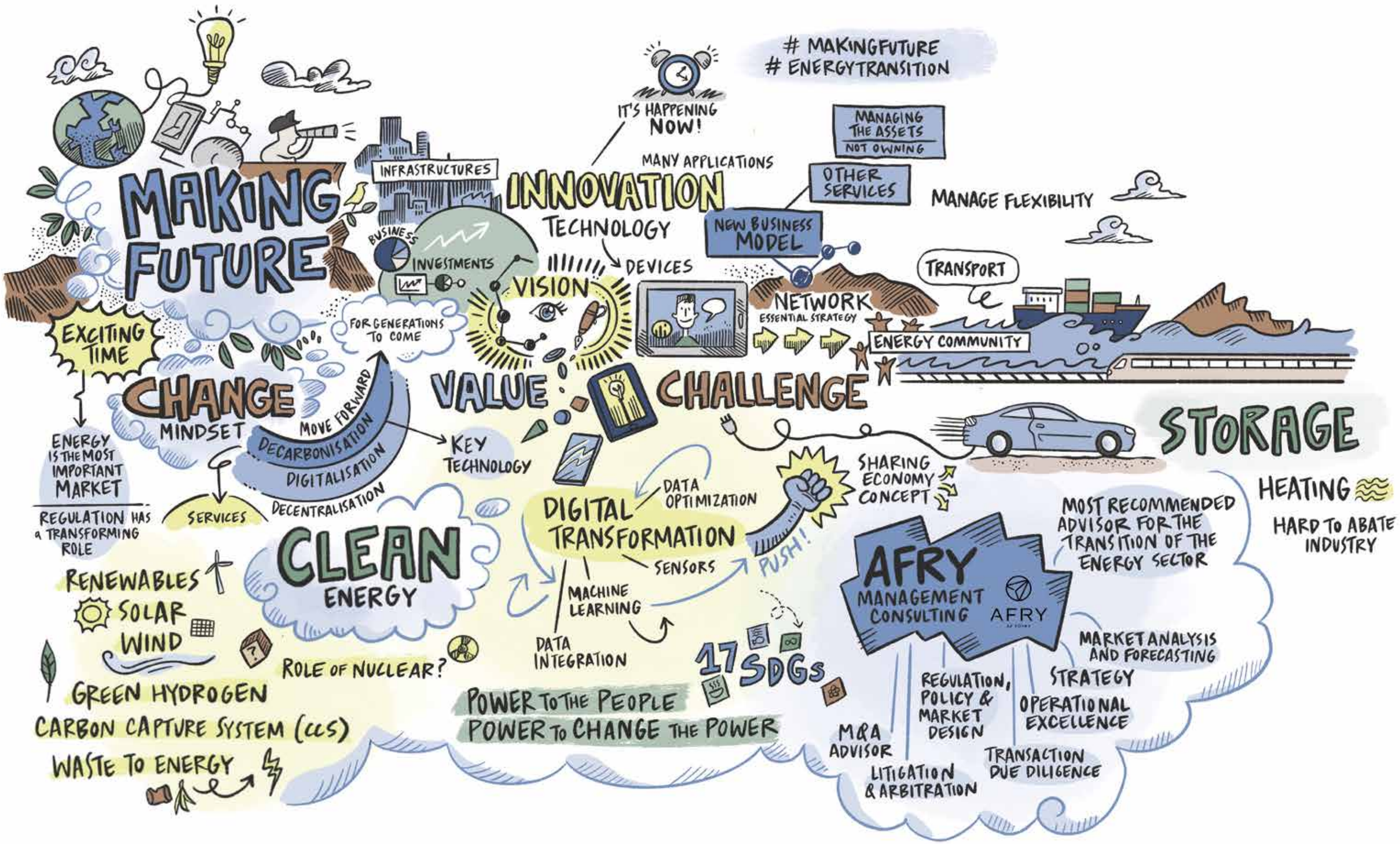
Currently, heating solutions based on biofuels are generally not economically viable without subsidies. Within the next decade, however, AFRY foresees a significantly increasing competitiveness of biomass as an alternative fuel for the heating sector. This change is primarily driven by rising CO_2 costs and sufficient availability of biofuels. Furthermore, the requirements for fuels for the future heat supply are well met by biomass owing to its base-load capability, flexibility and CO_2 neutrality.

In the medium term, the use of biofuels and, in the long term, the large-scale use of hydrogen will be a key component in the transition of the heating sector from fossil fuels to CO_2 neutrality, mainly for district heating. The implementation is becoming increasingly viable, even in areas where other fuels or technologies were used in the past.

In this changing environment, AFRY Management Consulting has successfully assisted various European cities in developing solutions for a sustainable reduction of CO_2 emissions and profitable heat supply. This was achieved by a threefold approach backed by technical expertise, profound knowledge of the energy sector and well-established models for energy and commodity prices.

AFRY
ÅF PÖYRY

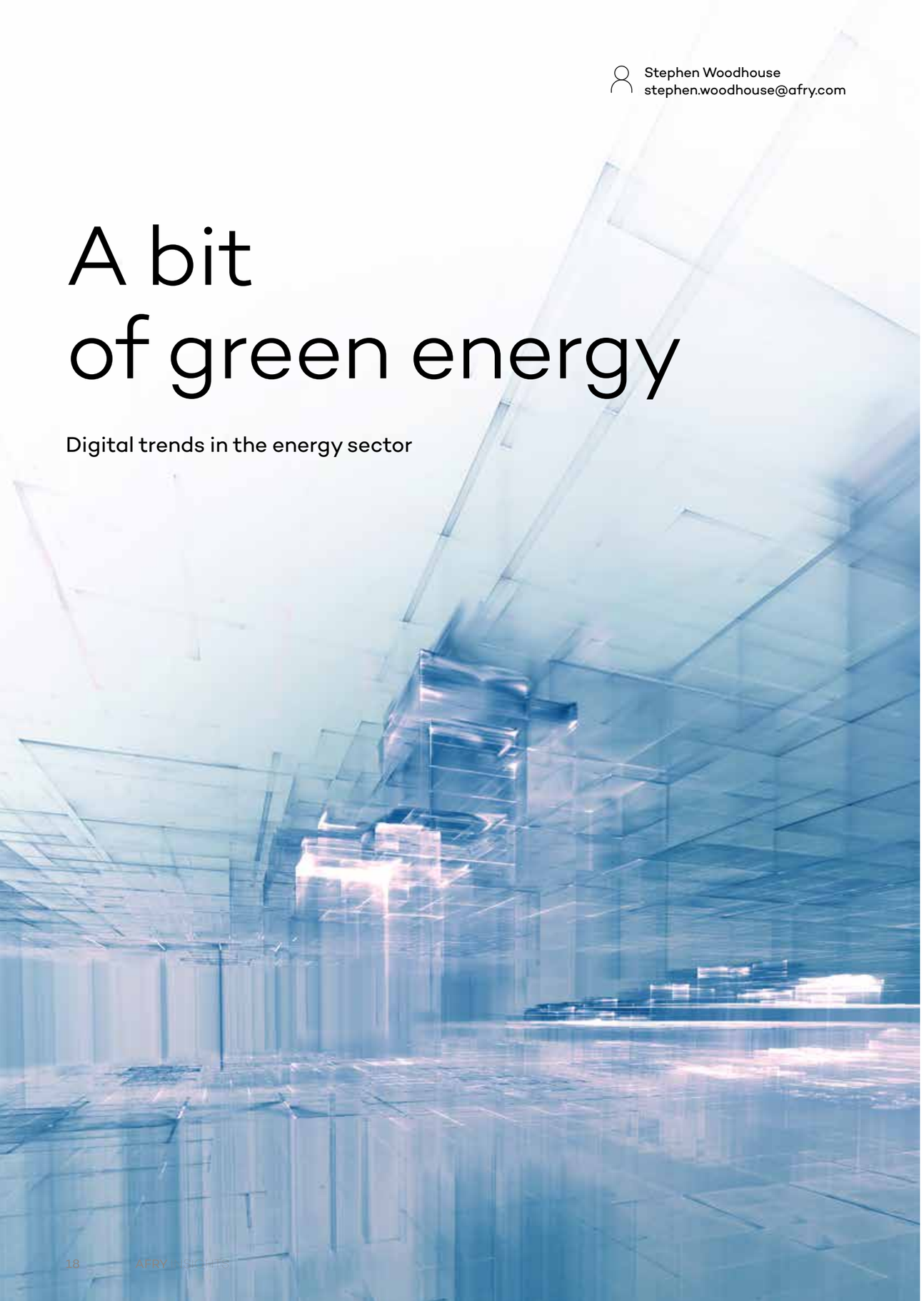
Driving the clean energy transition



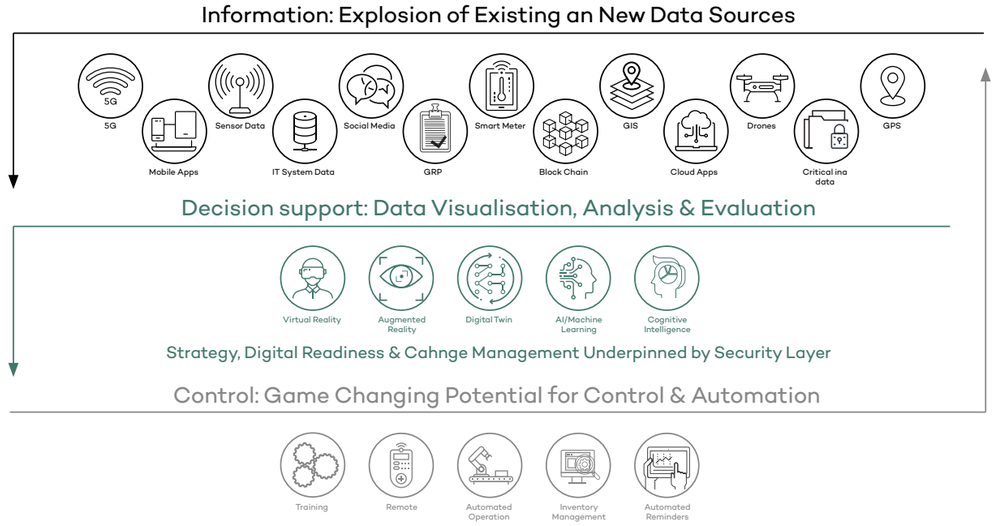
Stephen Woodhouse
stephen.woodhouse@afry.com

A bit of green energy

Digital trends in the energy sector



How digitalisation is impacting the way we do business



Greater efficiency | Substainable business | Unlock hidden value

The digital transformation of the electricity sector is more far-reaching than the one of the other sectors, entailing a potential to change our world. A digitalised energy system can deliver three outcomes: improved efficiency, deep decarbonisation of our energy system, and customer empowerment.

Digital efficiency

As in other sectors, there is scope to digitalise each aspect of the value chain, improving efficiency, streamlining existing processes and cutting out redundant steps and actors. These changes will unlock efficiency gains, with potential to change the energy landscape. For example, until recently, the most effective traders had the biggest portfolios and the best information. Now, data is accessible, and traders compete on the quality of their algorithms.

Digital technologies include new sources of data and communications, improved tools to analyse and visualise information and support decisions, and automation and control. The future digitalised system will allow decisions to be taken and executed autonomously, based on a wide range of uncontrolled data sources; and (cyber) security protocols must adapt to this new decentralised and autonomous reality.

These technological advances mean that parts of the value chain will be opened up to new players, by removing natural synergies or barriers to entry. Digitalisation will provide the tools to intelligently manage demand (and supply) from electrified buildings and vehicles, leading to a proliferation of new business models. In particular, platform businesses are likely to emerge, which connect large numbers of suppliers and consumers, but do not own the underlying infrastructure.

Case study: In power generation, predictive maintenance uses sensor data and advanced analytics to predict problems before they happen, avoiding time-consuming, preventative maintenance and reducing the risk of costly failures.

Together with Nokia and Infosys, AFRY is working on the predictive maintenance system KRTI, using RAMS engineering principles to target analysis to adds most impact. AFRY is helping many companies to manage their digital transformation. Our Digital Use Case approach allows companies to prioritise and collaborate on their digital initiatives.

Decarbonisation

A fundamental change is underway in the energy sector. Our centralised power systems, developed over the last century, are being decarbonised, which in turn allows for the transformation of heating, transport and process industries. The need for flexibility is growing, as renewables replace conventional power generation. Future networks will not be over-sized but instead managed effectively, with congestion management becoming normal even at distribution voltage levels. Future providers of flexibility will include micro-scale resources which must be integrated digitally.

Case study: Around the world, ancillary-service markets are being opened to new products and providers. AFRY is working in Singapore with the market operator to define protocols for aggregators, including metering and telemetry arrangements which are fit for purpose for micro-scale resources.

Case study: AFRY has cooperated with designers of local flexibility marketplaces to define users' requirements and shape their service offering.

Customer empowerment

Consumers are taking a more active and dynamic role in energy production and consumption. Not everything can be centrally controlled, but instead customers will respond to prices and other incentives. Many customers opt for self-production and even storage systems, as well as using new electric systems including heat pumps and electric vehicles. Smart meters and dynamic tariffs expose customers to variable energy prices, giving incentives to shift consumption from high-cost to low-cost periods. Digital management ('connected home') systems are the only effective way to allow customers to manage complexity and take control of their bills.

Case study: AFRY advises companies worldwide on the impact of new patterns of the energy demand. We support network operators in Norway by forecasting capacity-investment needs for electric-vehicle chargers. We are using AI deep-learning tools to forecast hourly customer demand for utilities, including changing demand patterns arising from COVID-19 and self-generation.

Future retail companies may entirely come from outside the energy sector. We are already seeing signs that companies like Tesla, with combinations of EV charging, batteries and PV systems, are entering the mainstream-energy world with grid-scale battery systems and power-generation licences. New players such as Octopus are creating new vertically integrated groups, combining renewable power generation, customer-centric retail offers and a smart-energy ecosystem which is being built by its own customers.

The electricity system of the future will be decarbonised, decentralised and digitalised. These elements are inseparable, and the new set of digital tools is the essential ingredient to allow our future energy needs to be met in a cost-effective way. The winning companies of the future will be digital natives and will know how to brand energy in a way that attracts customers.

AFRY EASY

A single solution for energy management

AFRY EASY (Energy Assessment System) is a new approach in energy management, combining various functions into one easy-to-use and flexible solution.

An innovative cloud-based digital tool, AFRY EASY is designed to optimise energy management costs and revenues, helping you to achieve savings in energy expenditure by improving sourcing, optimising energy consumption and efficiently insourcing key activities.

While it relies on very complex models and algorithms, AFRY EASY is simple to understand and gives tangible results in a short time. It is the ideal solution for industrial companies with significant energy consumption, energy service companies, industry associations, energy consortia or any energy management professional.

Find our more at afry.com/en/service/EASY

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Game changer

Creating a strong radar to elaborate scenarios and identify trends

As – for the most of us – the innovative power of ideas is normally too abstract to understand, innovations sometimes seem to come as a sudden surprise to us, be it in behaviour or in products. While for Cobb (Leonardo Di Caprio), the inspiring words from the irresistible Hollywood motion picture "Inception" make sense for the plot, they do mislead us a bit when it comes to innovation. The New Normal in our days has illustrated that a virus can in fact be much more disruptive than an idea. In terms of ecological change, COVID-19 has had much more impact than all our ideas and approaches that were supposed to speed this change up. But still, these words do make a lot of sense, for innovations do not look for ways, they create them – just like a virus. And those who do not or cannot change, no matter if on-screen in the movies or off-screen in real life, will eventually lose the freedom to change in a self-determined way. But do these disruptive events really emerge overnight?

To be or not to be

To give an answer, let us take a step back: "As we may think" – the famous essay of US engineer Vannevar Bush – inspired Ted Nelson and Douglas C. Engelbart in the 1960s and 70s to develop the hypertext and the user interface as well as the human-machine interaction with the personal computer, innovations that fundamentally changed the world we live in today. But Bush's ideas went back to the late 1930s. And he wrote his essay in 1945.

In the 1980s, video seemed to have killed the radio star all of a sudden (as the famous disco song deplored), as did iTunes and Napster with the compact disc a few years later. But in fact, all these ideas usually grow gradually, they do not pop up overnight. And beyond that, there is usually more than just one protagonist that causes the disruption. To develop its full potential, an innovation needs some supporting actors, an equally powerful and disruptive set of technologies or a platform. And even strategy has to play a certain role.

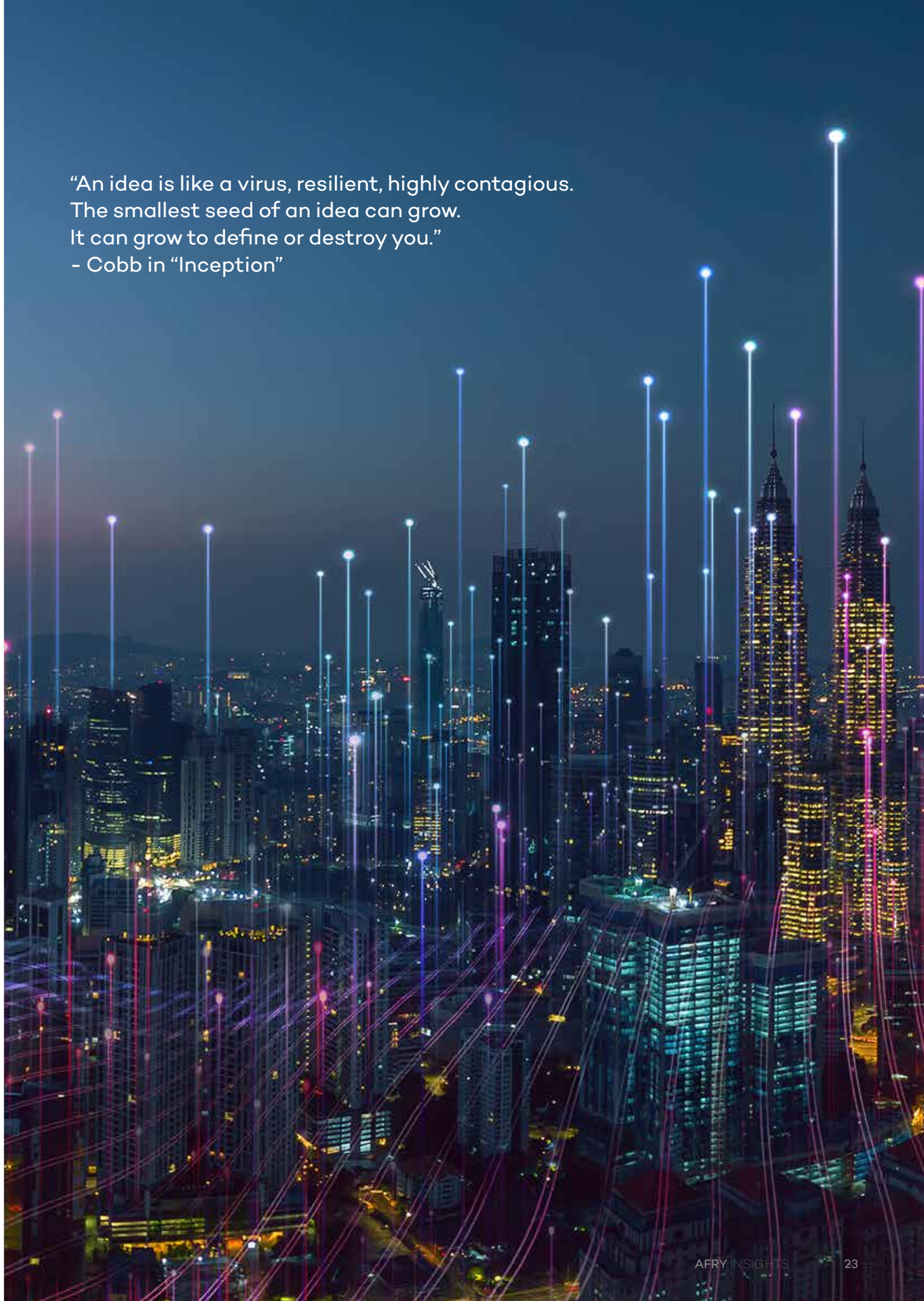
Think e.g. of the iPhone. There already were touchscreens in the 1990s and mobile phones were "Connecting People", as the slogan went at Nokia, which dominated the segment for more than a decade. But the combination of a touchscreen, a cutting-edge operating system, gesture control and the iTunes shop made the iPhone a game changer paving the way for the mobile internet, photography, gaming etc.

Even today, some might be overwhelmed when they read about Open AI's GPT3 writing poetry, recently even an article in The Guardian, about GPT3 coding apps and programmes as well as designing user interfaces on demand. But remember, almost three years ago, an algorithm called AlphaGo Zero, developed by a certain company called Google, managed to learn the world's most complex board game, Go, on its own in less than a day and to beat the world's best players after less than a month. While all this is fairly recent, the development of artificial intelligence already goes back to the 1980s. This also applies to immersive technologies normally referring to Augmented Reality or Virtual Reality, to the IoT and Blockchain: It is just that most people do not have it on their radar (if they have got a radar at all).

And this is where AFRY's expertise and its revolutionary Foresight concept comes in. Foresight means that our management consultants with their huge professional expertise are able to combine our industry insights and data with cutting-edge technologies like the "Futures Platform" to create a strong and broad radar, on the basis of which they can then elaborate credible scenarios that categorise trends and phenomena and their likely effects on any specific industry.

"We work daily with globally leading organisations that apply novel methods of foresight, horizon scanning and scenario work as an integral part of their strategy, as well their everyday operations. During the last 12 months, there has been a strong signal from these organisations to build continuously adapting and automated AI-based foresight systems and solutions. These organisations realise that information related to technologies of the future is vast, and that it should cover all domains, industries and ecosystems, and also be easy to convey and work with. At the same time, things are moving fast, leaving less time to spend on developing foresight, planning and strategies. One way to overcome this situation is through applying the right technology and tool set, with a sufficient and well-targeted leadership and lots of facilitation work."
- Saku Koskinen, Foresight Expert and Partner at Futures Platform

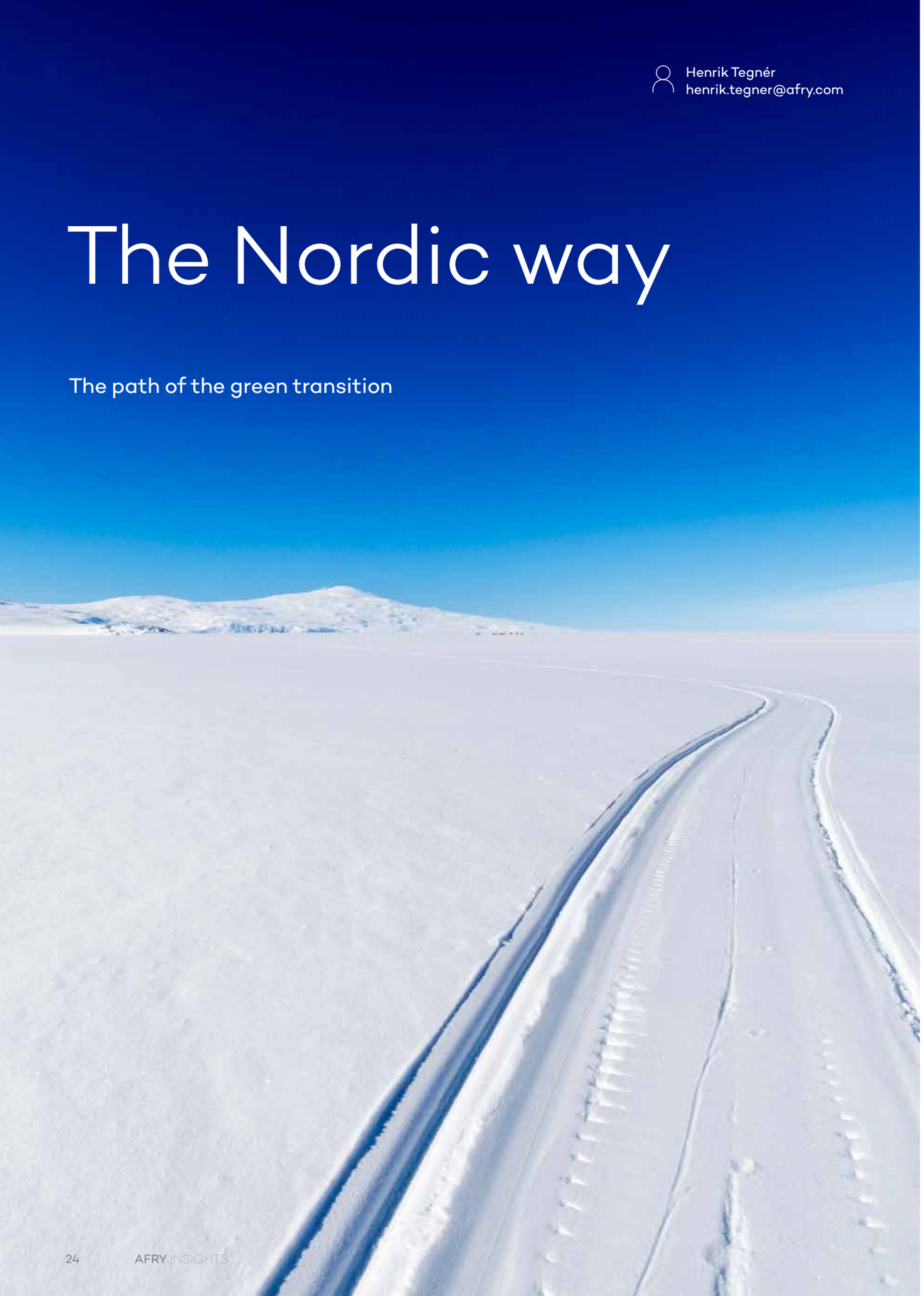
"Given the speed of technological disruptions in today's markets, it becomes increasingly important for players in the energy sector to have a comprehensive and up-to-date overview of potential game changers. We at AFRY Management Consulting are delivering exactly this to our clients: Combining the deep industry expertise of AFRY's consultants with the foresight technologies of partners such as Futures Platform, we are able to deliver broad innovation radars that include all cutting-edge developments within the market. Many of our clients actively seek such advice to be prepared for gradual and disruptive changes to the energy market within their strategy processes."
- Dr. Patrick Eser, Senior Consultant, Energy Practice at AFRY Management Consulting



Henrik Tegnér
henrik.tegner@afry.com

The Nordic way

The path of the green transition



The Nordic power-generation capacity is almost entirely zero-emission, with more than half of energy production from hydropower, 20% from nuclear energy, and 20% from renewable sources, mostly wind and biomass, but still some fossil coal in Denmark and Finland. With ample access to wind power locations, biomass and even large areas with good solar conditions, the region is well suited for further decarbonisation through electrification. Nevertheless, increased electrification raises a number of important challenges for the highly interconnected, Nordic power system.

The challenges cover a range of issues and questions, including

- What will replace the ageing nuclear capacity in Sweden, representing nearly 20% of current generation in the Nordics?
- What is the extent and nature of new power demand resulting from decarbonisation, including e-mobility, industry, maritime transport and aviation?
- What scope will the demand for new power-transmission and distribution capacities have?
- What market mechanisms can be developed to ensure efficient use of generation, grid capacity and system flexible resources?
- What other energy carriers than electricity can be introduced to cover part of the new demand coming from decarbonisation?

A lot helps a lot

Several studies have assessed the need for electricity for a society-wide decarbonisation. Based on previous work from e.g. Nordic Energy Research, the order of magnitude is 60-80 TWh of new-power generation. In addition, the current Swedish nuclear power plants, comprising some 60 TWh, will need to be replaced. With investment decisions being taken within the next decade, it is most likely that new power generation will be dominated by non-flexible renewable technology, wind and solar, in addition to biomass.

In the Swedish political landscape, building new nuclear capacity seems unlikely to happen.

Consequently, from today's situation with abundant access to flexible power generation, especially in the western part of the region, one will face a situation where access to inertia, fast frequency response and other system services may be scarce and more costly. In addition, while location that generate an especially high amount of wind power are governed by wind conditions and often found in remote areas or offshore, increased demand is concentrated in urban areas. This calls for construction of much more network capacity.

Without due consideration of alternatives and new market design, the Nordics risk ending in a very costly transformation with major investments in new generation as well as networks, in addition to facing the risk of lower system reliability.

There are three fundamental measures that can be considered to reduce investment requirements

- Mobilise demand-side flexibility
- Develop storage assets for electricity
- Substitute electricity with other energy carriers.

Flexibility is king

Today, power generationis triggered whenever end-users want to use electricity. In future, we need to see more demand-side flexibility. E-mobility is a case at hand. Charging one's electric car can generally happen at night or during off-peak periods. Installation of energy and load management system in buildings can provide additional flexibility, and make it available to DSOs and TSOs. The same goes for industry, even though the flexibility in industrial processes and the cost of interfering with them varies.

Storage of electricity in batteries is possible, but not necessarily cost effective. However, both in connection to distributed PV installations, as well as in particularly vulnerable grid sections, batteries are an alternative to grid capacity investments.

Finally, using electricity to produce other, storable energy carriers like hydrogen, is a possible addition to electrification. There is a keen interest in so-called Power-to-X initiatives, where intermittent power can be used for electrolysis in periods with weak electricity demand.

Hence, there are options to achieve a successful transition to a decarbonised Nordic region without excessive costs to end users and destroying the competitiveness of Nordic industry. To ensure that the best decisions are taken, new and well-designed market mechanisms must be put in place. These include both closer integration across the Nordic TSOs for cross-border arrangements, balancing models, pricing and bidding zones, as well as Nordic level-transmission capacity planning and investments. Further, access to flexibility will shift from being entirely generator-dominated to a much stronger reliance on end users. Both the market design for ancillary services as well as the regulatory framework must be adapted to accommodate for a new set of active power-market participants. Some of these issues are already being addressed by the Nordic TSOs, but not to the extent required.

Also, on the local and national level new approaches are needed. In particular, this applies to coordinated planning processes, where network and power-generation planning need to be aligned with decarbonisation planning in industry, mobility and other sectors. Lack of grid access risks seriously delaying the transition to decarbonisation, as can be seen e.g. in the Stockholm area, where the lack of network capacity impedes the establishment of new, electricity depending industries.

Riccardo Siliprandi
riccardo.siliprandi@afry.com

Keeping the levels up

Why storage has a key role to play

The world is shifting away from traditional methods of generating electricity. The old paradigm of big centralised power stations burning fossil fuels to meet an unrelenting rise in demand is outdated, and with advancements in low-carbon technology – expensive. As climate change has crept up the agenda, a concerted effort has been taken by people and governments to move towards a greener future. As a result, we are becoming increasingly reliant on intermittent sources of power generation such as wind and solar energy. Combine this with trends for minimising the waste of energy through efficiency measures, the direction the industry is to take is clear.

Storage and technology

The challenge is shifting towards the question of integrating such large volumes of renewables with often unstable generation patterns. Flexibility that can be provided by market players at both the local and regional level is becoming increasingly important. Storage has a key role to play in this aspect of the energy transition. 'When' and 'where' electricity is produced and consumed is critical in an electricity system where production is governed by the weather. The choice of which technology to deploy to meet the needs of the system must be given careful consideration, there is no 'one-size-fits-all' approach when it comes to managing the power system of the future, a challenge that brings opportunities for all types of market players.

To bring about the amount of flexibility required at scale compatible with a net zero-carbon world, power storage offers an ideal solution owing to the (increasing) range of technologies at our disposal. However, technology selection will need to match the specific challenges being addressed. It is not cost effective to deploy a lithium-ion battery with a duration of 4 hours (the length of time it can be dispatched continuously at maximum output before becoming depleted) to charge in the summer and store energy until it is needed in the winter. However, if you need something that can quickly respond to changes in the system for a limited time (such as for frequency response) it makes for a persuasive option. The production of hydrogen produced overnight from excess renewables to used at peak times during the day is equally uneconomic as the round-trip efficiency (total energy lost in conversion from electricity to hydrogen and back to electricity) is only around 40% - however as a seasonal store for very large volumes of energy, the practical and business case is more compelling. The 2020 coronavirus pandemic has offered a glimpse at future challenges of operating a system with high levels of intermittent sources of generation. The reduction in the demand attributed to a slump in the economic activity has resulted in a large number of periods in which renewable generation has dominated the system in many countries, in some cases leading to negative prices and resulting in challenges for system operators in managing the physical electricity system.

How to manage your system

Across Europe different countries have seen the cost of managing their systems spiral as low demand and high renewables output has resulted in increased problems with locational constraints, inertial constraints and other balancing issues (in the UK for example, April and May in 2020 saw a doubling in the cost of managing the system for National Grid versus the previous year). However, not all issues faced by grid operators are a manifestation of our current situation. Issues with wind in northern Germany or power flows from southern Italy towards the North, transferring power from the enormous hydropower stations in the provinces of Sichuan and Yunnan in China to the centres of the demand, along with many others are a reality today and have existed before the direct challenges raised by the pandemic. Different types of energy storage can help solve these problems, and the business case already exists today. Employing the right technology in the right place to meet these challenges will be one of the defining success factors for market players.

For example, pump storage may trouble the system through inertia whilst pumping and dispatching, as can mechanical batteries. There is a need for longer-duration storage to manage large locational grid constraints and shorter duration storage to manage more localised critical peaks in the transmission or distribution networks to defer expensive and potentially underutilised investment in the grid. Some of these challenges have led to the development of innovative products and solutions. Local flexibility markets offer targeted contracts for services in particular regions of the grid and are gaining traction as more of these issues emerge.

Business case for storage

Whilst there is clearly a business case for investment in storage today, these opportunities only represent a small proportion of what storage can offer and how much will be needed in the future of the low-carbon global energy system. The key to unlock this value will be in designing markets and products that deliver the system stability and flexibility required by the energy transition at the least-possible cost to consumers through providing the correct price signals to investors. Technical challenges also remain, for instance, how will a system with hundreds of gigawatts of storage ensure that the resources available are used at the right time? The careful management, and availability of information and data will enable operators and traders to make the right decisions at the right time. Digitalisation of the sector will also help to encourage consumer participation and we are already seeing the beginnings of this today with apps on your smartphone telling you when electricity is cheapest. The cost reductions that come with digitalisation in communicating complex messages to end consumers in simple ways or, more likely, automatically optimising consumers' use of power (including inherent storage in electric vehicles) will lead to a revolution in the way that people think about and manage their energy usage.

It is clear that electricity and energy storage will have an important role to play as we transition to a low-carbon economy. The winners of the transition will not just be those that are investing in the right technology at the right time, it will be those with a high degree of exposure to climate change – all of us.

Guided by the SDGs

We met with Marie Trogstam, AFRY's Head of Sustainability, to discuss the evolution of the AFRY brand and what steps AFRY is taking to live up to its brave commitment: Making Future. Marie joined AFRY in Autumn last year, coming from her role as Manager for International Sustainable Business at Business Sweden, where she was responsible for supporting Swedish companies in developing their business in a sustainable manner, also through cooperation with organisations such as the United Nations, SIDA and Save the Children.

AFRY Insights: Marie, please, tell us a bit about what attracts you to AFRY as a company?

Trogstam: I joined the company just two months before we launched our new brand and ÅF and Pöyry became AFRY. What has impressed me from the start is the deep and broad industry expertise that we have in many of the sustainability focus areas that businesses can make a difference in. Being the Head of Sustainability within a company that truly wants to make a difference is a great opportunity.

The AFRY brand stands for brave leadership and building a better world for future generations, and sustainability plays a central role in that ambition. This approach is very much in line with what I believe we at AFRY can achieve.

How have you seen the company evolve over the last year in respect to the sustainability topic?

I bring my perspective of a holistic view on sustainability and it is impressive to see that all three dimensions of economic, social and environmental sustainability are significantly present within AFRY.

Now we need to focus on the climate and the environment at large, including biodiversity, and this should be happening without losing sight of the economic and social side of sustainability. For example, when we work on road safety, we keep in mind the child's perspective or when we plan for future cities, we consider factors like gender.

When it comes to the climate and environment, we are already measuring our own impact, such as our internal CO_2 emissions, but we also see the importance of creating value with our sustainable solutions towards our clients and finding proper ways of measuring the positive impact gained through our collaboration with clients.

The way we humans live, work and interact is complex, as is the approach to making these processes more sustainable. Why do you believe in a holistic approach?

In 2015, the 17 Sustainable Development Goals (SDGs) and the 2030 agenda were adopted by all United Nations Member States. This universal call to action, to achieve a better and more sustainable future for everyone, promotes prosperity while protecting the planet. At the time when the 2030 agenda was launched, the idea was to better understand what needs to be done in many different areas. Now, in 2020, we are in the decade of action.

One of AFRY's non-financial targets is to develop engineering and design solutions that contribute towards the SDGs.

It could be argued that it would be better for a company to focus on just a few of the SDGs, but they are all interconnected. If we speak for example about "Ensure access to affordable, reliable, sustainable and modern energy for all", which is absolutely key for a global transformation, we need indeed to look at the whole value chain; We need to know about the generation of power and basic infrastructure. How will energy be stored? There are many related aspects that need to be analysed and taken into account to create, develop and implement solutions that build a sustainable society, environmentally as well as socioeconomically.

What is really new and affects the business model of modern companies is the value creation perspective, as well as looking both upstream and downstream – through the whole value chain. In order to reach truly sustainable development, we need to think holistically and address the complexities.

Why is it crucial to find new approaches for measuring sustainability?

Based on the importance of both minimising the negative impact (the footprint) and maximising the positive impact (the handprint), we at AFRY are already reporting according to some of the existing frameworks, for example the Carbon Disclosure project (CDP), and we follow the development of the EU Taxonomy closely.

When it comes to the climate and environment, we are already measuring our own impact, such as our internal CO_2 emissions, but we also see the importance of creating value with our sustainable solutions towards our clients and finding proper ways of measuring the positive impact gained through our collaboration with clients. Only with this comprehensive view of footprint vs. handprint can we understand how to leverage the full potential of our position.

As you say there is a lot of interconnectivity. How do you get collaboration around this complexity?

On a strategic level, working in an aligned way with our top clients and stakeholders as well as our employees is essential to succeed. Walking the talk and engaging others who can make a difference plays an important role.

Training will be key internally, to empower our 17,000 experts to make the biggest difference they can, from climate awareness to understanding the latest technologies and opportunities within our areas of expertise. We are beginning to see requests from clients that require a sustainability focused approach and we must prove that our consultants possess the leading-edge knowledge to fully enable our clients to reach their goals.

How can cooperation or partnership between different organizations help AFRY and other companies to go further in sustainability?

As one concrete example, during the climate change conference COP 25, that our Group Executive Management team attended last December, I was moderating a seminar where we had the Swedish Minister for Development Corporation, a representative from WWF and some major clients and partners, such as Ericsson, Scania, ABB and Ragnsells, all talking together about how we could scale up Nordic experiences and knowledge to be useful in a global context when it comes specifically to the energy transition. For me, having that type of join up is really important to make progress.

Providing insights, sharing experiences and maintaining a dialogue with different types of partners is key and would allow us to get going fast enough to have the exponential development that we really need to reach both the 2030 agenda and the Paris climate agreement.

This year, AFRY announced a collaboration with Gapminder and signed up to the 1.5°C Business Playbook. How do you see these partnerships supporting AFRY's progress towards more efficient sustainability work?

The 1.5°C Business Playbook is a concrete tool that guides companies and organisations to exponential climate strategy and action, helping them align with the 1.5°C ambition to halve emissions by 2030 and reach close to net zero by 2050. The 1.5°C Business Playbook helps companies shift business focus to zero-carbon solutions and is designed to work in harmony with existing standards and key initiatives such as the Greenhouse Gas Protocol (GHG), Science Based Targets initiative (SBTi), and CDP.

Our collaboration with the Gapminder Foundation allows us to address the complex nature of the world, so that we can actually make progress in our understanding of the transformation from a linear to a circular society, which requires us to be brave and stay close to the facts that drive our decision making. If we can contribute to providing facts and dismantling global misconceptions around our areas of expertise, we also contribute to creating a framework that allows other decision-makers to be able to make accurate decisions. Information is key as well as proving the impact of different types of solutions, illustrated with figures and concrete cases.

You attended the 2020 High-Level Political Forum (HLPF) on sustainable development in July. Are there any insights you would like to share?

The UN plays a key role in driving global transformation and fulfilment of the 2030 Agenda. On this occasion, the HLPF focus was on accelerated action and transformative pathways and realising a decade of action and delivery for sustainable development.

Sweden was represented by an e-delegation, chaired by the Swedish Secretary of State Eva Svedling. Representing AFRY, I had the great honour of presenting the Swedish official statement on the importance of the relaunch being both socioeconomically and environmentally sustainable, during and after the current COVID-19 crisis. Sweden fully supports a green and inclusive recovery and is committed and ready for delivery on the SDGs.

I think that Sweden and other Nordic countries offer a combination of large companies and small scale-up companies with skilled workers, together with an active civil society and then also the government initiatives needed to support progress. For example, on 10th of July this year, the Swedish government adopted circular economy as a national strategy and "Fossil Free Sweden" is a government initiative with over 20 roadmaps within different segments in industry, that bring together all the different stakeholders in a specific sector, for example within buildings or mining.

What is your advice to leaders across different companies, countries and industries to get involved in the implementation of sustainability goals?

Based on the development I have seen over the years, being transparent and making a point of talking about the challenges are two very important factors. I encourage companies to be brave enough to recognise the complexities, support each other and share best practices. I believe it is a win-win way forward if we cooperate, between public and private actors as well as within a multilateral context.

marie.trogstam@afry.com
Find out more at afry.com/sustainability

Making Future

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