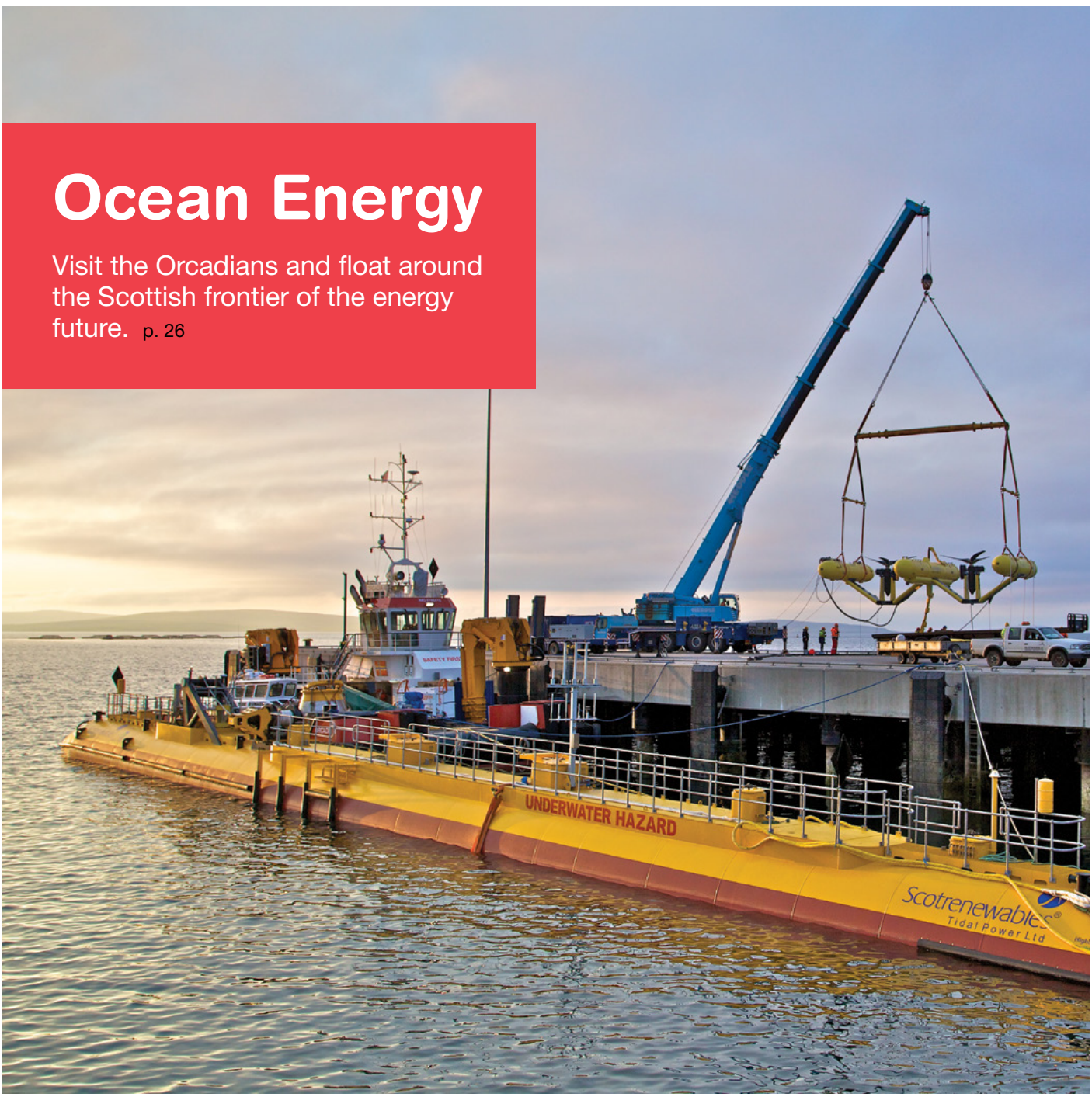
REVOLVE

QUARTERLY INSIGHTS INTO A CHANGING WORLD

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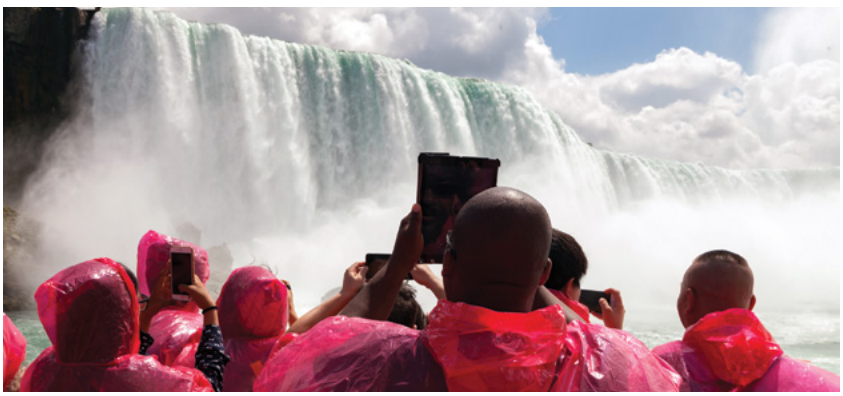
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Cover image: Floating tidal turbines being deployed by Scotrenewables Tidal Power Ltd and SME PLATO at Hatston Pier, Orkney Islands, Scotland, in June 2016. Photo: Colin Keldie, courtesy of EMEC



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Leading the Energy Transition

A Call to the EUSEW Community

It is my pleasure to welcome you to the European Sustainable Energy Week (EUSEW) 2019, taking place in Brussels and marked by Energy Days across Europe. Organized by the European Commission's Directorate-General for Energy, in close cooperation with the Executive Agency for Small and Medium-sized Enterprises (EASME), this fourteenth edition of EUSEW is the flagship annual event for those working to build a secure energy future for Europe. It brings together public authorities, private companies, NGOs and others, to promote initiatives to save energy and move towards renewables for clean, secure and efficient power.

Through the many activities in EUSEW, including the Energy Days, the Sustainable Energy Awards, the Networking Village and the policy conference, we highlight the successes and the challenges of the energy transition that is taking place across Europe. This transition to low-carbon energy systems is essential for reducing carbon emissions, limiting global warming and ensuring our common future.

There are many reasons to hope and continue working for a better world. Europe now has the most advanced climate and energy legislation in the world, as exemplified by the Clean Energy for All Europeans package. At the global level we are seeing a major shift in investment flows. This shift is supported in Europe and accelerated by initiatives such as the Sustainable Energy Investment Forums, which is bringing bankers, businesses and local authorities together to boost large-scale investment and financing.

These investments pay dividends at many levels: in our homes, our neighborhoods and our cities.

Take for example, the challenge of decarbonizing our buildings, a theme which is highlighted in several articles in this magazine. This requires a collective effort – and also represents a golden opportunity for us to improve sustainability and social inclusion and create job and growth opportunities. It means more comfortable, warmer homes, lower bills, cleaner air, quality jobs – and a livable future. This is just one way in which members of the EUSEW community are shaping Europe's future.

Over the past year, we have seen more and more of our citizens becoming increasingly concerned about the future, and actively voicing their concerns about climate change. Our children are marching every week in the streets of Brussels and in other cities (see "Taking to the Streets" VIEWS p.35), and this calls upon us to raise people's awareness of what we are already doing, such as the new highly ambitious targets for 2030 that have been agreed at EU level for energy efficiency and renewables, and keep up the pressure on national and regional governments to meet these goals. And to make a deeper, stronger personal commitment on what we can all do in the future.

The energy transition is not only a challenge, it is also a huge opportunity to improve sustainability, social inclusion and job opportunities across Europe.

The future is in our hands. But we cannot wait until tomorrow. I call upon the EUSEW community of practitioners who have chosen to work for a better world, to take the future into your own hands, to continue to lead the energy transition, to work collaboratively and to share best practices, and to take advantage of cross-border cooperation and highlight how we are better if we work together at EU level. The energy transition is not only a challenge, it is also a huge opportunity to improve sustainability, social inclusion and job opportunities across Europe. Together we can show the world the power of change.

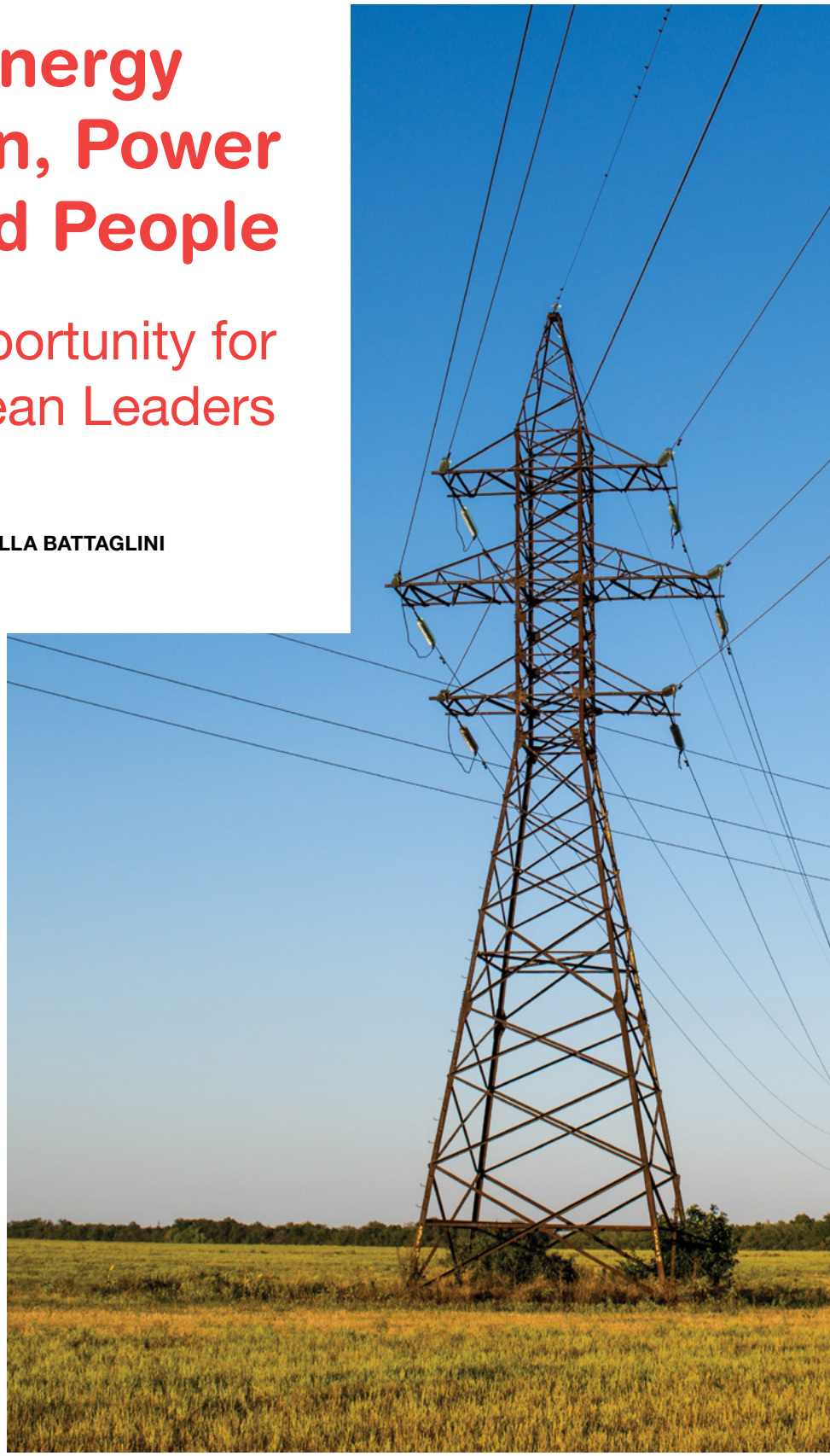
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The Energy Transition, Power Lines and People

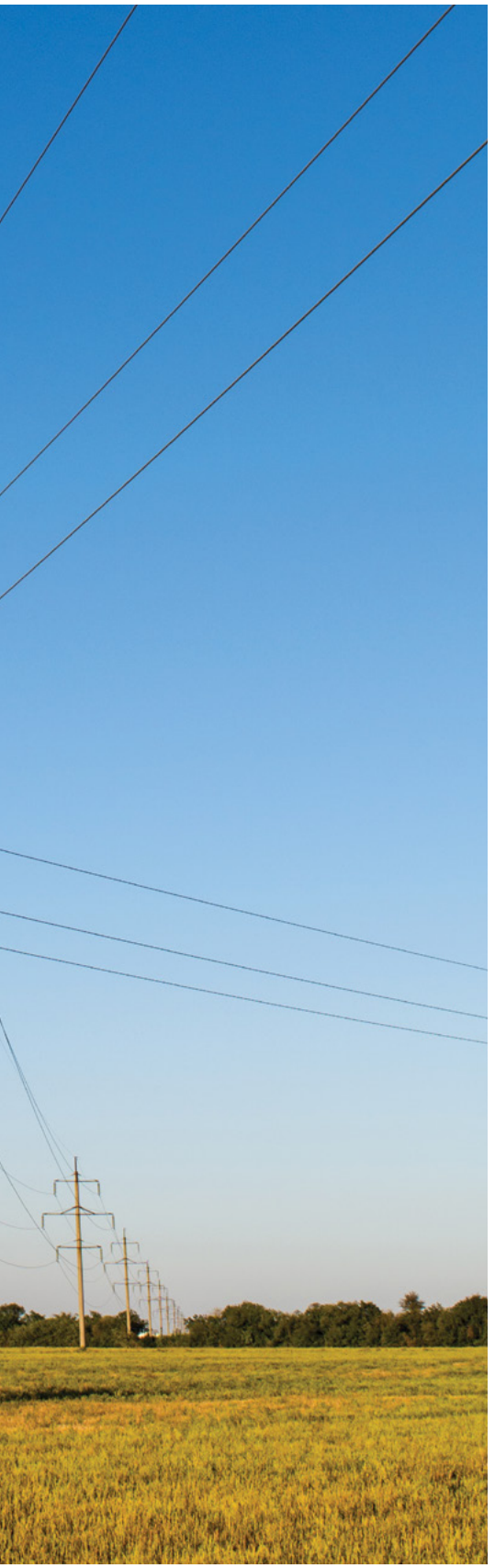
A Great Opportunity for New European Leaders

WRITER: **ANTONELLA BATTAGLINI**



The European energy landscape is experiencing a huge transformation and the Clean Energy for All Europeans package puts citizens at the center of this transition, but opposition to new energy infrastructure, grids and renewable technologies at the local level persists. Although this is not a new phenomenon, decision-makers remain uncertain on how to deal with the lack of social acceptability.

Technological developments offer citizens unprecedented possibilities to participate in the energy transformation – for example via the production and consumption of self-generated power. However, despite this, many social aspects of the energy transition are still hardly understood, insufficiently addressed and in some cases, also just simply ignored. We need to increase general communication efforts to better understand and address the societal elements of the energy transition.



1

How the changing energy system landscape is socially constructed and embedded will play a crucial role in its final functioning. This is of special importance, because the decarbonization pathway can only be successfully and timely achieved, if done with the support of society at large. Traditionally, there is a belief that involving civil society and citizens in decision-making processes, especially related to large infrastructure projects, is time-consuming, costly and often useless. This is wrong!

This belief has shaped policies and processes for decades, but in the past years forward-looking actors have started to realize that, although it is challenging, meaningful stakeholder engagement actually creates huge opportunities for all actors involved. Europe needs to discover and embrace its role in supporting local realities, protecting the interests of citizens not as a generic whole, but as individuals, while achieving the agreed targets of energy security and climate protection.

The energy transition is a unique opportunity for a new, more dynamic and local Europe.

Building electricity grids is a very complicated and lengthy process, and most often are confronted with strong public opposition. It is still not clear how grids contribute to decarbonization and how they support the growth of renewable energies. Many consider that in an increasingly decentralized world, where you can generate, store and consume your own electricity, there is no space for huge pylons and high-voltage transmission lines.

This, however, is a rather simplistic view of the world. Actually, we live in a world that is highly connected, relies on electricity and needs to be fully decarbonized in every single sector. This incredible connectivity will enable areas even with low renewable resources to contribute to a common decarbonization effort by accessing energy from a neighbouring country or “next door”. We should consider grids as one of the many enablers, some of which are yet to be discovered.

In Europe, the energy system is increasingly made up of many distributed resources, differing in size and scale that are all interconnected with each other. We are learning how to operate such a system while inventing it. The transmission system operators already play an important role in developing solutions, proving they work and are scalable. While they are not alone in this field, they have a special role in dealing with local communities when planning and deploying their projects.

The energy transition is a unique opportunity for a new, more dynamic and local role for Europe. Energy infrastructure is deployed among people, by people and for people. Decisions that lead to the definition of what is needed to realize a sustainable, affordable and secure energy future should also be taken together with people. This is not easy, but in the current political environment, in which trust in institutions is low and nationalistic sentiments are on the rise, we believe this is necessary.

Often energy infrastructure, like the projects of common European interests (PCIs) or national grid projects, are promoted for their European role or for meeting national needs and interests. The result is that local communities directly affected

by power lines and increasingly by large wind and solar projects, feel that they bear all impacts, but share no benefits. Policies in most of the European countries, foresee stakeholder engagement processes to be carried out in different phases of grid planning and project development.

Similarly, renewable energy siting is also consulted with the general public. This has been an important first step, but it is not sufficient. Meaningful stakeholder engagement processes should be designed to co-create solutions with local communities, which would recognize and combine the European and national energy targets with local needs. There is no single ready-made recipe on how to do it and there never will be universal "one-size-fits-all" solutions that can be applied at local levels.

We do have a clear understanding that time and resources should be allocated to explore, with creativity and flexibility, how to define and achieve common goals. If in place, such activities and processes provide a huge learning opportunity for all parties involved and mutual learning helps to reduce power asymmetries, by avoiding the Dunning-Kruger Effect, where positions of "better-knowers" and often underestimated local knowledge from citizens, are balanced and smoothened.

A grid corridor, if connected to another, can provide a green area for migratory species and ecosystems protection.

All in all, an approach involving local actors to make better decisions related to specific projects and to more general energy, climate and environmental policies. Stakeholder engagement implies active participation in shaping decisions and finding joint solutions. It is an inclusive and holistic process, which can comprise and address a large number of topics. It is based both on facts and data, as well as on the values and perceptions of those involved.

Meaningful engagement requires a variety of skills, which are seldom found in single individuals or even in single organisations. However, this requires commitment at the highest level and long-term vision. The European Commission has a key role to play in providing an effective regulatory framework and guidance for implementation, showing the courage to experiment with new ideas and, above all, listening to what citizens really want and need, thereby enabling effective local benefits.



2

More specifically, each grid project can deliver multiple benefits beyond primary benefits that justify its construction. Imagine a power line built to transport electricity from A to B, the financing of which is decided on the base of social welfare, decarbonization potential and security of supply. This same line could be used, like in the pilot project of the Italian TSO Terna, to detect fire by equipping it with sensors and, thus, contribute to mitigation of forest devastation by increasing fire events.

A grid corridor, if connected to another, can provide a green area for migratory species and ecosystems protection, as in the case of the LIFE-funded project carried out by Elia and RTE, respectively the Belgian and French grid operators. We observe many new ideas being developed, but a systematic commitment of policy-makers and energy regulators to address the reasons for public opposition is lacking. The next step is to investigate new creative options to develop local benefits in order to win the interest and commitment of affected populations.

Inspired by the community payments of EirGrid and the involvement of impact investors like Citizens Energy in the U.S., the European Commission could facilitate a series of high-level pilot projects, possibly for projects classified as PCIs. The planning of corridors could be done in a collaborative manner, subject to constraints of environmental protection and the creation of local benefits from the very early stages, and not only as a reaction to opposition. This could lead to a standardized framework, to be individually adapted to local contexts, where people are at the center of the energy transition and where planning and realizing the energy future becomes in everyone's interest.



3

1. Power lines, Ukraine. Photo: Rodion Kutsaev

2. Power lines corridors could be used, like in the pilot project of the Italian TSO Terna, to detect fire by equipping it with sensors .Forest Fire, Greece, 2007. Photo: Lotus R.

3. Restoration of forest edges in Forêt d'Orient, France. As an alternative method of vegetation management, bushy species are allowed to grow while (taller) woody species are cut. The right side of the picture shows the vegetation after the cut of the problematic species. Photo: Elia



1

Winning Hearts and Minds for New Renewables Infrastructure

INTERVIEW WITH **KRISTIAN RUBY, SECRETARY GENERAL OF EURELECTRIC**

Electrification is set to play a major part in Europe's long-term decarbonization plans. Kristian Ruby, Secretary-General of EURELECTRIC, the leading European electricity industry association, "insists on being professionally optimistic" but major challenges lie ahead – in particular, public support for the necessary new infrastructure build-out. Are people ready to buy into the vision of a clean, affordable and convenient all-electric world?

Europe's low-carbon future is electric, according to the European Commission's strategy for a climate-neutral Europe by 2050, published in November 2018. The strategy is not a legislative proposal, but a strategic vision, supported by a detailed analysis, on how the European Union (EU) can deliver on the 2015 Paris Agreement to contain the rise in average global temperatures to well below 2°C above pre-industrial levels.

In the strategy, the Commission assessed pathways for the EU that can reduce greenhouse gas emissions reductions between 80% by 2050 (compared to 1990) up to net zero greenhouse emissions by 2050 – all of them in line with the Paris Agreement. All pathways converge on one central element: power generation should be fully decarbonized by 2050, with more than 80% of the EU's electricity produced by renewable energy sources. Currently, the EU gets more



2

than 30% of its electricity from renewable sources, up from 12% in 2000.

"I insist on being professionally optimistic about achieving a rapid and effective energy transition – but we shouldn't underestimate the magnitude of the challenge ahead," comments Kristian Ruby, head of electricity industry association Eurelectric.

Ruby has good reason to be optimistic – in terms of decarbonization targets, the electricity industry is already more than halfway there. "Of the electricity supply in the European Union today, 60% is low carbon generation – half from nuclear and half from renewables," he says. "We have gone a significant distance – and now people are seeing opportunity from this change rather than risk. The investments in the sector have shifted towards the new energy world."

In all the pathways to a low-carbon 2050, it is envisaged that the deployment of renewable energy will drive a large-scale electrification of the energy system, at the level of end-users (such as energy use in industry, buildings or transport), or to produce carbon-free fuels and feedstock for industry. Decarbonizing the power sector will therefore be central to the transformation of other economic sectors.

Citing recent "landmarks" including major policies like the Energy Union and the Clean Energy for all Europeans legislative package, Ruby says, "These will drive decarbonization of the power sector, of the industrial

"In the future you will rely more on electricity in your daily life. Hopefully though, you won't even think about that much. You'll just have this feeling of convenience that things are working for you."

1. Rise for Climate, 8 September 2018, Turku, Finland. Photo: 350.org

2. Anti industrial windfarm protest, 2014, Ireland. Photo: Sinn Féin

sector, and of the transport sector; but the overall transition will take longer. It is a positive direction – but it is very important that we now start 'walking the talk' and going in that direction and see the vision become reality."

Public support

Public support will be critical to ensuring that the vision becomes reality. This includes consumer decisions, such as buying electric vehicles, committing to low energy housing renovation, and the uptake of low carbon technologies like heat pumps. Eurobarometer polls have shown that the majority of Europeans are in favor of national governments setting targets to increase renewable energy use by 2030 (89%) and to provide support for improving energy efficiency by 2030 (88%). But in some cases, public acceptance of the necessary new energy infrastructure is lacking.

"We need citizens to understand that the prerequisite to a more affordable, more convenient, cleaner electric society is allowing the construction of generation assets that can power it."



3

Ruby explains, "For more renewable energy supply, we need quite a lot of new machinery. We need to put up new wind turbines and new solar panels. Success here really relies on people accepting those new infrastructures. One of my greatest concerns these days is that we are seeing a rise in public opposition to new renewable energy projects – it's not only the conventional technologies that are facing public opposition."

For example, public opposition to offshore wind has been growing in Denmark – despite the fact that 30,000 people are employed in the country's well-established wind industry. In March 2019, the energy company Vattenfall requested a three-year extension to the commissioning deadline for two near-shore wind farms due to protests and permitting issues.

The developer secured the rights to develop the two projects in an auction in September 2016, but protests against the placement of the turbines has prompted renewed consultations and hindered the final approval.

Commenting on the case, Ruby says, "If people cannot accept even new offshore installations that are ten kilometers away, then we really have to have a dialogue about this. We need citizens to understand that the prerequisite to a more affordable, more convenient,

cleaner electric society is allowing the construction of generation assets that can power it."

Previously, popular support for Denmark's wind farm developments was in part enabled by local community co-ownership, building on the country's long tradition of collective ownership. However, Ruby sees thorough public consultation as a more likely driver of public acceptance.

"The power of community is a very strong driver and it's one that we should leverage, but it's not going to get everybody on board. The nature of the public consultations matters a lot, how sub-stations and cables are designed, placed in the landscape and what is put around it. Others will prefer not to do that – they will have other priorities than spending time on their electricity supply," he says. "The fundamental principle is that people need to see a direct benefit."

Going local

Much of the electricity industry's focus is on providing direct benefits to consumers through added-value services, according to Ruby. "What used to be a very technical sector focused on the generation of electricity is turning into a more competitive customer-focused sector which is about providing value for customers," he says. "The utilities see that this is where they can make money because this is where they can create true value."

To take one example, utilities can enable the installation of rooftop solar at household level, through projects like Project Sunroof, a joint venture between Google and E.ON which involves German software firm Tetraeder. The project is underpinned by a solar calculator from Google which uses machine learning to estimate how much solar potential a house has by examining the property's features, such as its roof area and angle, and weather data.

Ruby explains: "the utility is helping customers, firstly to assess the solar potential of their roofs, then to help with installing solar panels, and then to buy the electricity supply from the households. This is the kind of thinking that we now need to develop – helping the customer from the first moment that the customer comes in contact with the company and ensuring that they are guided to get the optimum value from their interactions with the company."

Eurelectric's own study of options for increased electrification (Decarbonisation Pathways, published in November 2018) identifies the active involvement of citizens as a "key enabler" in a more decentralized power market of the future. However, citizen involvement in enabling this market will be mostly through purchasing decisions and acceptance of new technologies, according to Ruby – and convenience will be the selling point.

"In the future you will rely more on electricity in your daily life. Hopefully though, you won't even think about it that much. You'll just have this feeling of convenience that things are working for you," says Ruby.

"For example, as you get into your car the door will open automatically and you won't have to start it manually. When you come home you won't have to plug it in – say it's using inductive charging – and it will charge automatically at off-peak hours. You might have a better-insulated house that uses an electric heat pump, and this will help to drive down energy costs for you."

"Costs however will remain highly dependent on regulation, and on our collective choices – if, for example, there continues to be public opposition to new renewables installations, then all of a sudden we could have a situation where there is scarcity of supply," he concludes. ●



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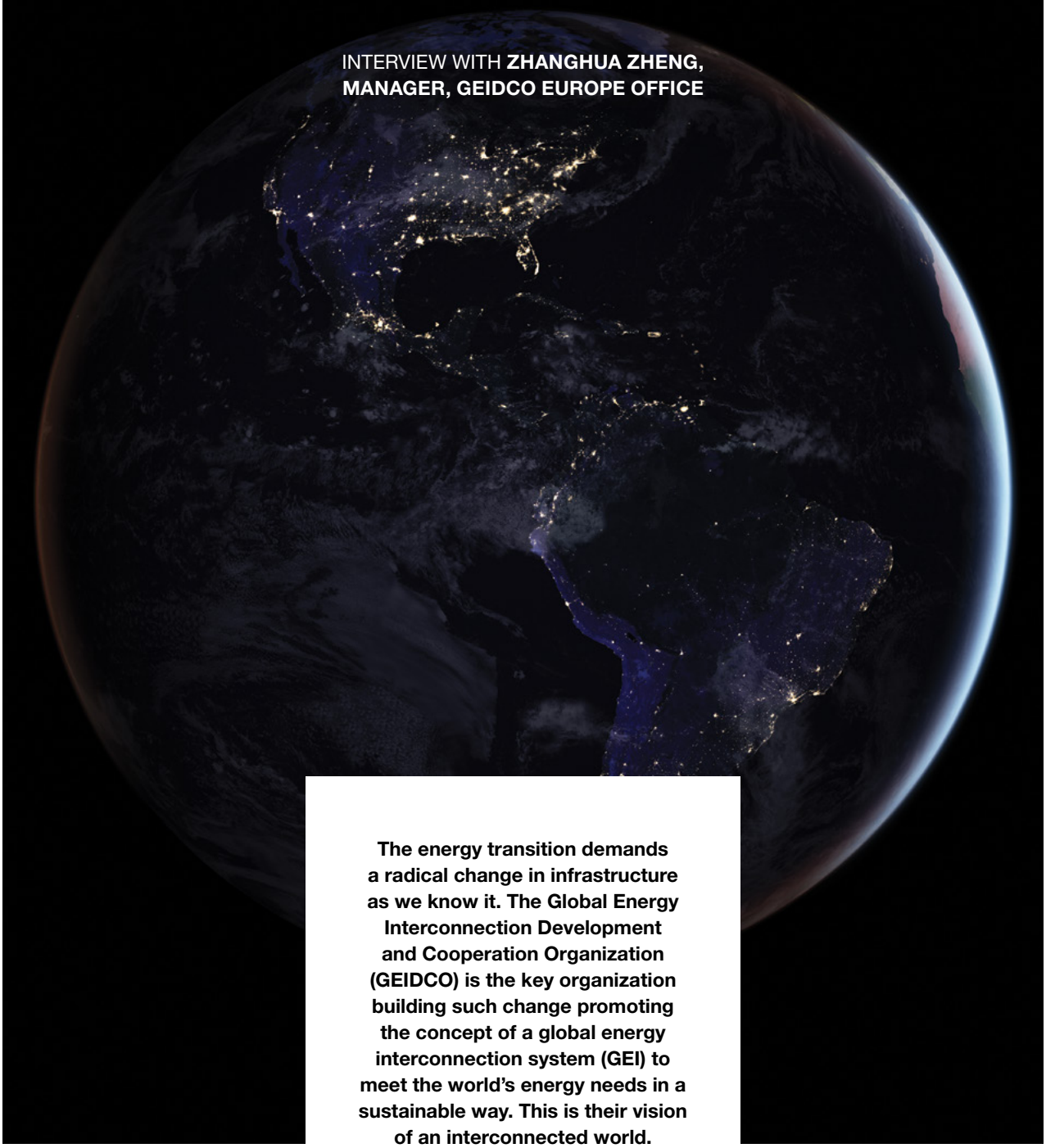
3. Middelgrunden offshore wind farm 3.5 km outside Copenhagen, Denmark. Photo: Arnoldius

4. Convenience will be the selling point for acceptance of new technologies, like wireless inductive charging for electric cars. Photo: BMW

Is a Global Grid Possible?

The Vision of an Interconnected World

INTERVIEW WITH **ZHANGHUA ZHENG, MANAGER, GEIDCO EUROPE OFFICE**



The energy transition demands a radical change in infrastructure as we know it. The Global Energy Interconnection Development and Cooperation Organization (GEIDCO) is the key organization building such change promoting the concept of a global energy interconnection system (GEI) to meet the world's energy needs in a sustainable way. This is their vision of an interconnected world.

1

Why is GEI pivotal to combating climate change and implementing the Paris Agreement?

GEI is a globally interconnected smart grid with Ultra High Voltage (UHV) grids as its backbone. It is an infrastructure platform on which clean energy can be developed, transmitted, and consumed worldwide. The core idea of GEI development is to promote the world's energy transition from high-carbon to low-carbon, low efficiency to high efficiency, and local power balance to optimal allocation over long distances and large areas. The construction of GEI can promote energy and economic development in developing regions and is a fundamental way to ensure energy access to the 1.2 billion people without electricity.

Under the current climate governance framework, implementing the 2015 Paris Agreement requires the pooling of global wisdom, strength and carrying out of a systematic, comprehensive solution that is implementable, scalable, and replicable. GEI is designed to realize the global optimal allocation of clean energy through power grid interconnection and turn the differences in resources, time zones, seasons, and electricity prices into a sustained power source that drives clean development. GEI will greatly improve the scale and speed of global, clean energy development, its utilization and reduction of clean energy costs.

What future does GEIDCO envision for an interconnected world?

GEI promotes the comprehensive implementation of the 2030 Agenda for Sustainable Development by guaranteeing sustainable energy for all. By 2030, global generating capacity of clean energy will reach 24,000TWh and the number of people without access to electricity will drop from 1.06 billion to 650 million. The proportion of clean energy in primary energy consumption will rise from 18.5% to 37%. The construction of power grids within countries and transnational and transcontinental power grids will be accelerated and upgraded.

The World in 2050 with GEI:

Clean energy =
72%
of primary energy consumption

Electricity =
44%
of final energy consumption

Fossil energy =
30%
of final energy consumption

GEI can effectively reduce greenhouse emissions. By accelerating replacement of fossil fuels with clean, electric energies, by 2025, global carbon emissions are expected to peak. By 2030, the global CO_2 emissions will drop to 30 billion tons, lower than the current emission reduction targets noted in the Paris Agreement's Nationally Determined Contributions (NDCs).

GEI can realize sustainable production and consumption. Between 2015 to 2030, the annual average growth rate of clean energy consumption will be about 4%. By 2030, total energy consumption will be capped at 8.5 billion tons of standard coal and the proportion of power in terminal energy consumption will increase to around 30%. This progress can help realize coordinated, harmonious development between economy, environment, human beings and nature.

What is GEIDCO doing to make this a reality?

GEIDCO is ensuring that the GEI initiative is endorsed and supported by the international community by spreading the vision, organizing and contributing to high-level discussions and conferences. GEIDCO delegations have promoted GEI in 70 countries to form a broad consensus that GEI is major approach to promote the global energy transition and a fundamental solution to tackling climate change. GEIDCO regularly hosts international conferences and has spoken to audiences of over 300,000 and counting. Through continued coverage and in-depth reports by global well-known media, the idea of GEI has reached over 100 million people and will only continue to grow. ●

For the full interview, visit:
revolve.media/interview

1. Earth at night. Photo: NASA.

Turning Off the Falls

WRITER: **JENNY CHRISTENSSON**
PHOTOGRAPHY: **ALAN GIGNOUX**

The drive to tame the wild waters of Niagara Falls has had devastating unintended consequences on the environment and society – all in the name of progress and the quest for more green dollars. This is the story of innovation, energy, greed, waste, power, nature and our role as humans in trying to control absolutely everything, as told by collaborators Alan Gignoux and Jenny Christensson as part of their project *Human Accumulations.*





1

At midnight on 16 November 1896, Edgar Boardman Jewett, Mayor of Buffalo, pulled a power switch and in doing so, made history. Electricity produced by turbines at Niagara Falls at the Westinghouse power generation plant was successfully transmitted some 20 miles downriver using Nikola Tesla's then ground-breaking alternating current technology. The modern era of electricity had begun.

Jewett and his entourage, nervous that the transmission would fail, scheduled that epochal moment for the middle of the night and left it unadvertised to avoid a potential public relations disaster. They need not have worried. As Tesla himself had confidently proclaimed, the principles behind his discovery were "as firmly established as the air itself."[2]

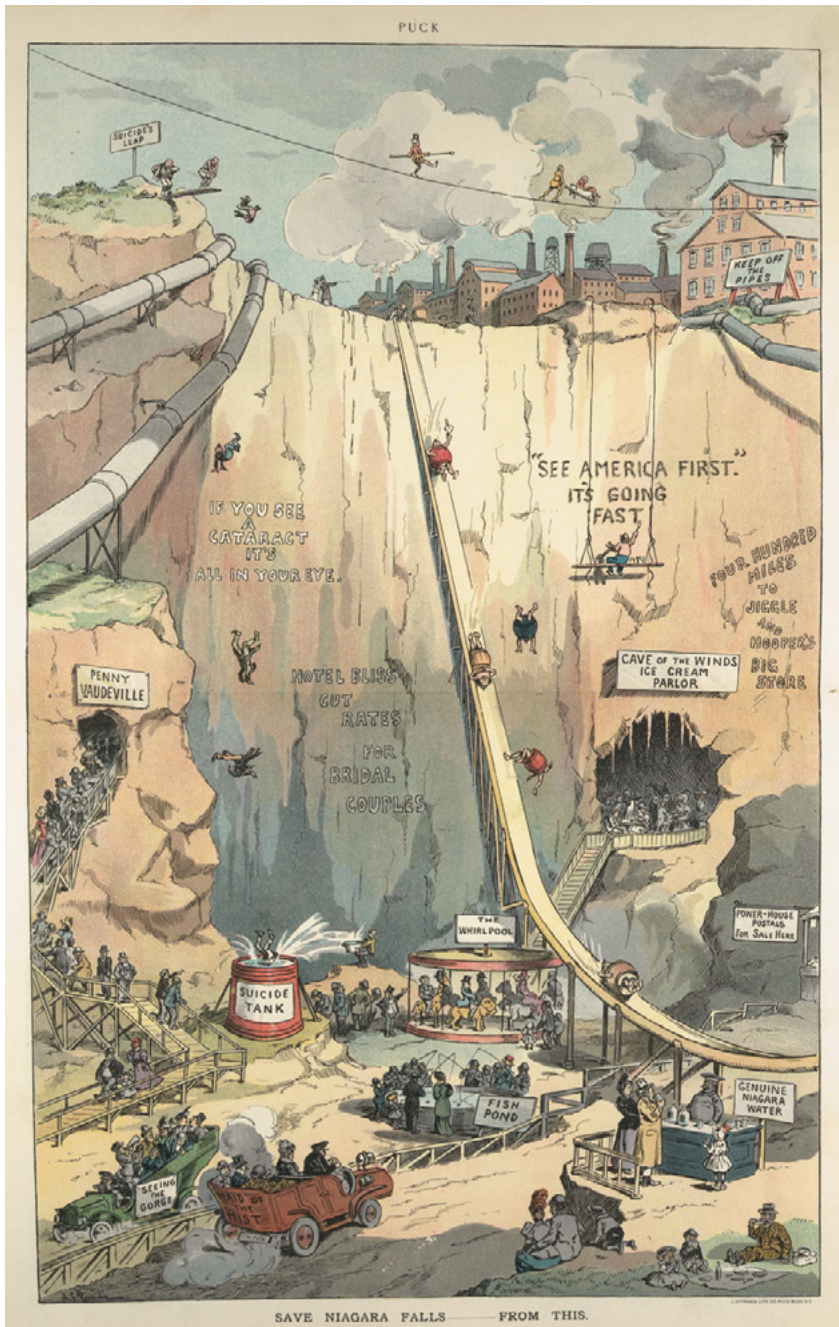
To be fair, the mayor had some reason to be worried. The development of hydro-electric power at Niagara Falls was peppered with ambitious, but ultimately failed, projects.

Power generation at Niagara Falls began in 1758 when the French colonists introduced saw mills using Niagara water above the crest. Approximately one hundred years later advances in technology encouraged entrepreneurs to seek a means by which the immense power of the Falls could be used to generate electrical power. By 1885, the strip of land running alongside the river just above the American

Falls, as well as Goat Island, had been appropriated by the State of New York and declared a preservation area, forcing engineers to find a means by which the power of the Falls could be harnessed without access to the water at the riverbank. In 1886, Thomas Evershed, the divisional engineer of the New York State canal system, devised a solution that involved boring a tunnel to carry water from a point above the Falls to a discharge point far below.

Evershed's ambitious project solved the problem of shoreline access but the immense cost of the project ($1.4 million – equivalent to $42.4 million today) frightened off investors. Even if the engineering challenge could be met, there were insufficient customers locally to warrant the investment. Edison's direct current, the prevailing technology of the time, could not transmit electricity over large distances. Until a means of transmitting the electrical power generated at Niagara Falls to nearby Buffalo (and beyond) was found, the project could not go ahead.

In the competition for the contracts to participate in the development, transmission and distribution of power generated at Niagara Falls proposed by the International Niagara Commission, the established North American inventor Thomas Edison and the young Serbian upstart Nikola Tesla, backed by Westinghouse, went head-to-head in a battle over Edison's direct current and Tesla's alternating current. In the end, the commission backed Tesla's technology and the future of electricity was secured.



3

Electro-chemicals production

Entrepreneurs lost no time in taking advantage of cheap power at Niagara Falls. By the end of the 1890s, 11 major companies had arrived in the city and by 1909 the number had risen to 25. Within a decade, Niagara Falls became the center of the nascent electro-chemical and electro-metallurgical industries in the USA. The companies that arrived in the Falls at that time merged to become industrial giants with household names: Union Carbide, Anaconda, American Cyanamide, Auto-Lite Battery and Occidental Petroleum.

One of the leaders of the chemicals industry at the Falls was Elon Hooker, the founder of Hooker Chemical. The chemicals produced at Hooker, including bleaching powder, caustic soda, degreasers, rubbers, explosives, defoliants



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1. Maid of the Mist cruise boat approaching the Horseshoe Falls, April 2017.

2. Berton, Pierre. Niagara: A History of the Falls. Albany: State University of New York Press, 1992, p.220.

3. "Save Niagara Falls – From This!" PUCK Magazine Temperance Cartoon, New York, 1889. The cartoon imagines a waterless Niagara following the diversion of water from the Falls to produce hydro-electric power for the factories on the shores.

4. Tourists on the Canadian Hornblower cruise alongside the Horseshoe Falls, August 2017. In peak season during the day less water is diverted for power generation to optimize the tourist experience.

5. Robert Moses Niagara Power Plant, Lewiston, New York, April 2018.

6. Newman, Richard S. Love Canal: A Toxic History from Colonial Times to the Present. New York: Oxford University Press, 2016, p.54.

and plastics, "helped win wars, explore space, and fuel American consumerism."[6] Between 1939 and 1950, company sales increased 390% and net income by 850%.

One important consequence of Hooker's enormous expansion was the issue of chemical waste disposal. In the first few decades of the twentieth century, industries at Niagara Falls had disposed of the by-products of their chemical production by burying them in containers on their industrial properties. From the 1940s, Hooker's on-site disposal capacity was overwhelmed. With the permission of the city, in 1942 they began a massive burial operation at Love Canal – a disused, partially completed section of canal on the outskirts of the city, and the remnant of a failed Utopian project that was the brainchild of a nineteenth century entrepreneur called William Love. Over the course of the next decade, Hooker deposited roughly 22,000 tons of chemical sludge in steel drums at the site.

Unintended consequences

Back in the 1950s and '60s, the now unoccupied blocks between 97th and 103rd Streets in Love Canal were home to 950 families. Tree-lined streets with affordable, suburban-style housing were within easy commuting distance to the city's thriving chemicals factories. It was a happy, hard-working and prosperous community. Life in this idyll changed irrevocably in the 1970s. After heavy rains, basements in the neighbourhood were flooded with a foul-smelling black sludge. Children playing in the school playground and in and around the nearby creeks suffered burns.

The bark began to peel off trees and gardens and vegetable plots withered and died. Residents complained of serious medical problems, including epilepsy, liver disease, rectal bleeding, miscarriages and birth defects.

The source of these problems was traced back to a buried section of canal at the heart of the neighbourhood.

Thirty years after Hooker had started using the Love Canal site as a landfill, the rusting and leaking drums of waste had started to surface. Local residents at Love Canal, led by housewife Lois Gibbs, staged a protracted grassroots campaign initially seeking evacuation and compensation. Over time, their activities took on a wider significance as the Love Canal activists began to see their struggle as a fight for environmental justice.

"Love Canal was not just a national, but a global story," says Paul Dyster, Mayor of Niagara Falls, New York, in an interview with the author. "At one level, it was a catastrophe. On the other hand, it gives us the opportunity to claim that the modern environmental movement, as we understand it globally, was really born here at Niagara Falls."

In December 1980, US Congress approved the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as Superfund. It made substantial government funds available for the immediate clean-up of the most harmful hazardous waste sites, while also allowing for the government to identify and seek compensation from those responsible for the waste. Love Canal was named as priority number one, on the National Priority List (NPL) of sites identified as most urgently in need of attention.

This was only the beginning.



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The nature of the beast

It is misleading to talk in terms of "cleaning-up" a Superfund site. The most common form of remediation is containment – sealing the affected area off and closing it with a clay cap. Superfund sites are removed from the NPL list when the remedial system has been put in place and the only remaining activity is monitoring. Today, Niagara Falls is home to 89 Superfund sites, of which two are active NPL sites, 14 are active non-NPL Superfund sites and 73 are archived sites.

All over the city there are unmarked, fenced off areas containing large grassy mounds. These are dotted with monitoring wells in the form of yellow pipes that protrude from the ground forming the four corners of a square, or black pipes that pop out here and there like periscopes from underground submarines. While the aim of remedial action is to prepare the land for re-use, the sites with the worst history of contamination have limited future use possibilities. Of the five NPL Superfund sites within the city limits of Niagara Falls, only one has any recorded redevelopment.

There are also many acres of brownfield sites, and land scarred by disused and rotting factories. Environmental regulations introduced after the Love Canal disaster chased away the chemicals industries that sustained the Niagara Falls economy, creating mass unemployment and accelerating the city's decline from boom town to Rustbelt casualty. If Niagara Falls is to move beyond its post-industrial present it needs to repurpose its land.

Tom DeSantis, Acting Director of Planning and Economic Development at Niagara Falls, thumps the table in his office repeatedly with the sides of his hands to underline his arguments: "The problem is that the land that doesn't get used tends to stay fallow. And while the current multinational chemicals companies will tell you they never mothball property, it's something they don't do – they, in fact, do it all the time. They don't want to deal with the environmental regulations that would apply… it's clean up for future use."

Under current legislation liability for cleaning-up polluted sites lies with the perpetrator. For this reason, many companies prefer to do

It seems unimaginable that 85,000 cubic feet/sec or 3,160 tons/sec of water can be controlled.

7. Love Canal monitoring well inside the fenced off Superfund, April 2017.

8. Love Canal, view from the Superfund towards 100th Street, which was evacuated following the discovery of hazardous waste in an uncontained landfill in the area, April 2018.

9. Former site of National Carbon Division of Union Carbide, Niagara Falls, New York, October 2018.

10. Observation Tower, Prospect Point, Niagara Falls State Park, New York, May 2018.



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nothing with their properties, rather than clean-up and sell. This problem affects many sites in the city – in particular those along the river above the Falls in the once world-renowned industrial area known as Buffalo Avenue. DeSantis says: “We have this kind of place that’s known for nature, parks and all of that. And we also have this place that’s known for pollution and Superfund sites and… Love Canal. How can these things exist simultaneously? But they do and that’s just the nature of the beast that we deal with.”

In 1969, the flow of water over the Falls was stopped entirely exposing the rock-face beneath. It seems unimaginable that 85,000 cubic feet/sec or 3,160 tons per second of water can be controlled, let alone stopped in its tracks, but the engineering method used to achieve this is straightforward.

Now, there are plans in motion to stop the flow of water over the Falls once again so that engineers with the New York State Office of Parks, Recreation, and Historic Preservation can scrap two 115-year-old bridges that have reached the end of their useful lives. The works are proposed to take place in 5-7 years at an estimated cost of $3 million. Officials anticipate that when the day arrives, turning off the Falls will draw crowds in the thousands. The sight of human ingenuity taming the beast of Niagara still has the power to stir the imagination; but the beast was tamed many years ago and we – not nature – became the engineers of our own misfortune.

11. CECOS Superfund, Niagara Falls, New York, October 2018.

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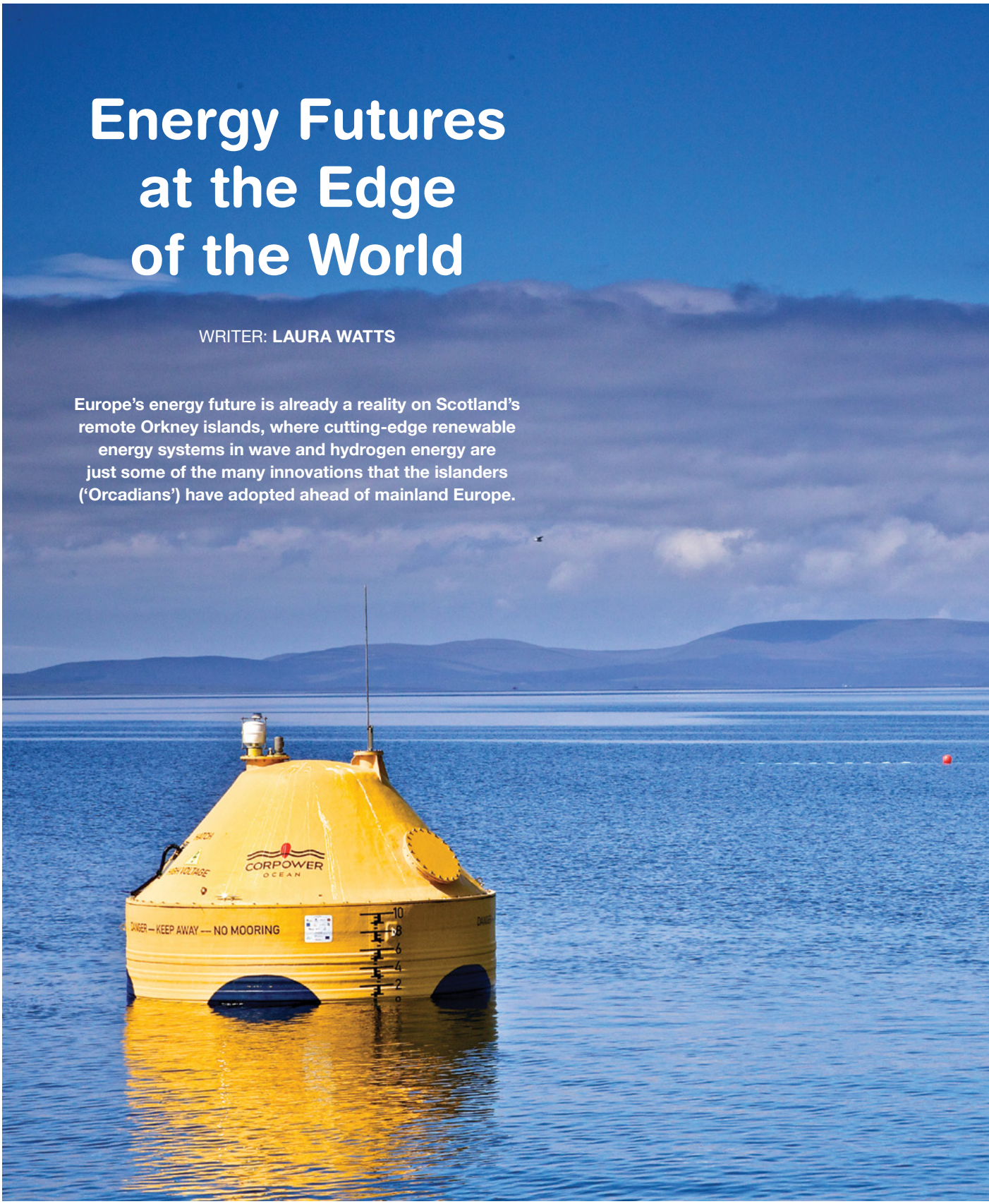
The modern environmental movement, as we understand it globally, was really born here at Niagara Falls.”

– Paul Dyster, Mayor of Niagara Falls

Energy Futures at the Edge of the World

WRITER: **LAURA WATTS**

Europe's energy future is already a reality on Scotland's remote Orkney islands, where cutting-edge renewable energy systems in wave and hydrogen energy are just some of the many innovations that the islanders ('Orcadians') have adopted ahead of mainland Europe.





1

Note to reader: This article is an abridged extract from Energy at the End of the World: An Orkney Islands Saga by Laura Watts.

We are a company of poets, exploring an old electricity test site where Orkney electrons were generated half a century ago. Our local guide is Alistair Peebles, an Orkney-based artist and writer. The third person, Alec Finlay, Scottish artist and poet, is bagging and tagging renewable energy landscapes. Together, the three of us seek a mythical location, the first of the many renewable energy test sites in the islands: Costa Head.

We stop the car on the north-east coastal road of West Mainland and begin our hike up the side of the hill. A winding tractor track takes us up through incurious cows and onto a headland. On the far side, the hill drops hard into the sea. We pause with cameras, notebook, and pencils and take in the striking view along the coast. The air is light and high and glorious. Along the heather-brown ridge, we see distant wind turbines working the air. Over the narrow sound, dark Rousay rises. Alec writes a short poem on a packaging tag in response. He ties it to the rusted remains of a





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fence and Alistair takes a photograph of the impromptu poetry installation—the poem flapping, the turbines catching the wind behind. We walk on.

On the scrubby summit of the headland there is an abandoned flat-roofed bunker, windows empty from long years of wind and rain. I peer inside the bunker and see the concrete walls are painted green with moss. Resting beside the open doorway is a slate painted with the words View Point. Today it speaks true and I spend some time watching sacred Eynhallow below (the little holy island left for birds, ruins, and the fairy finn-folk), which rests in the sea between us and Rousay.

50 years of sustainable energy projects

Somewhere, amongst the buildings and broken old naval defenses from the Second World War, must be what we came for. Somewhere here on Costa Head, there are the remnants of the UK's first experimental wind turbine, built and installed in the early 1950s. The North of Scotland Hydro-Electric Board sponsored the 100 kilowatt wind turbine, installed here on Costa Head in 1951. The structure seems to have struggled in the intense Orkney wind and collapsed after operating for just a short time.

We stand on the hallowed hill where sustainable Orkney electrons began their saga, long ago. I write a memorial poem:

mica encrusted
tomb
to an unknown
turbine

Here lie the remains of the Energy Islands' first renewable energy test site. For so long, Orkney has been chosen as the national and international laboratory for testing experimental sustainable energy devices. The islands have been a test site for sustainable energy generation for more than half a century.

I count the test sites. We stand on Costa Head, the UK's first site from the 1950s. From here I can see Burgar Hill, the site of the UK's largest experimental wind turbine in the 1980s. In Kirkwall, I have seen the silver boxes in the SSE car park that contain the UK's first national grid battery. Somewhere in those buildings, too, are the smarts





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that manage the UK's first ANM (active network management) system. Down the street to Kirkwall harbor, I can find the hydrogen fuel cells converting electricity made by tide energy turbines and a community wind turbine, which must be a world first. Then, off the coast, I can see the European Marine Energy Centre grid-connected wave and tide energy test sites, established in 2003 and another world first.

The list could also include a myriad of quieter community-led sustainable energy projects, no less significant to the Energy Islands—from the hydrogen fuel, to the individual investments in electric cars, to the installation of Tesla Powerwall home batteries and photovoltaic panels in affordable housing in the islands.

There is a tension between this extraordinary list of Orkney electron test sites, some celebrated for their national and international significance, and the failure to address the crippling transmission charge and the constrained grid. When the UK National Infrastructure Commission released its roadmap for the future development of the national grid, it ignored the grid futures being made in Orkney.

The Orkney Islands have been a test site for sustainable energy generation for more than 50 years.

Islands at the edge are often overlooked as sites of technological innovation. The chair of the Orkney Renewable Energy Forum (OREF) attempted to transform this perception to representatives visiting from the National Grid: "We are keen to show how it all works here. Orkney is a living laboratory for a sustainable energy system. We aren't there yet, but we a lot closer than most, and we have valuable insight into what works and what doesn't."

A living laboratory

The phrase "living laboratory" has been circulating in the islands as a brand to promote them as a living test site, with its long test site history embedded in the story. Used in conversation with the National Grid representatives, it is intended to evoke the islands as a lived experimental energy future.

1. CorPower and EMEC microgrid at EMEC Scapa Flow test site. Photo: Colin Keldie, courtesy of WES

2. Stromness harbour, Orkney. Photo: Laura Watts

3. Mooring at EMEC Fall of Warness tidal test site. Photo: Colin Keldie, courtesy of Ocean_2G

4. Green Marine install Wello Penguin at EMEC wave test site at Billia Croo. Photo: Colin Keldie, courtesy of CEFOW

Orkney is tackling the energy management challenges that the rest of Europe will face in the future.

But "living laboratory" also carries within in it some serious tensions. The islands are both a significant national energy test site and an overlooked energy region, a paradox exemplified by the energy operator, SSE, which celebrates and uses the islands as a test site for its smart grid technology, while abandoning them to a cable-constrained grid.

When I have talked about the islands as a "living laboratory" to people in Orkney, there is a simultaneous agreement that this seems right, capturing the inspirational qualities in the place, along with a strong aversion to being seen as a "lab rat."

Orkney islanders' ambivalence to being a living laboratory is understandable. The energy operator SSE can be seen in imperialist mode as it uses the Energy Islands as a test site while failing to demonstrate an understanding of what it means when community wind turbines are "knocked off" the stacking system and cannot generate revenue, and the overall effect on islanders' lives.

So, why might the islanders continue to call themselves a "living laboratory," as they are doing? How to counter the colonial tensions that come with this label? An Orkney-based journalist suggested some answers when he wrote in the newspaper, "With a constrained electricity grid, and an excess of renewable energy, Orkney is already attempting to tackle the kind of energy management challenges that the rest of Europe could have to face in the future."

The coming electric world

The challenge of being a living laboratory is being turned into a double advantage. Firstly, the constrained electricity grid is being transformed into a future that "the rest of Europe could have to face" as European electricity networks also move to renewable energy. In this way, the marginalization that the Energy Islands experience on the grid becomes indicative of a coming, constrained electric world.

5. Subsea Power Hub at EMEC. Photo: EC-OG

6. Undersea electricity cable, Hoy, Orkney. Photo: Laura Watts

7. Divers at EMEC test site. Photo: Mike Brookes-Roper, courtesy of EMEC



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Energy Islands, with their local wind turbines and electric cars, are living this future, even if those making it do not realize this, yet. The second advantage is that islands are not separated or isolated by the sea, like a Petri dish, but connected to other maritime locations worldwide.

The Energy Islands work in collaboration with organizations such as the National Taiwan Ocean University and the Ocean Energy Association of Japan, with whom they have been collaborating on marine energy testing. Those maritime places are also experimental, making their own energy futures.

In another example, the SMart IsLand Energy Systems (SMILE) consortium, which is testing microgeneration and smart metering technologies, is being led by three islands: Madeira, Orkney and Samsø. In these experiments, Orkney is not serving some colonial power, but connected undersea with places where they become a living laboratory with different politics. Rather than Orkney being the test site used by other islands, they all become one archipelago of test sites, thinking and working together.

Through brine-transmitted relationships that make an ebbing and flowing 'archipelagraphy' (as Elizabeth DeLoughrey calls it) over the ocean earth—with Madeira, Taiwan, Japan—the Energy Islands create connections for Orkney electrons that do not require grid-limited cables. Orkney electrons are generated as a result of these energy research projects but so, too, are other island electrons. The Energy Islands become a living laboratory in an ocean of living laboratories, each one with unique expertise and learning to be shared. In essence, the question becomes—who is this living laboratory for?

The Energy Islands are a living test site for many sustainable energy futures and have been for fifty or more years, counting back from the Costa Head turbine. With their self-determined, community-led projects, such as hydrogen fuel generation, they are experimenting with their own grid and finding ways to generate income. They are open for business as a living laboratory for those who collaborate with them as an archipelago, not for those who colonize them with their experiments; and they are, of course, a living laboratory for themselves.

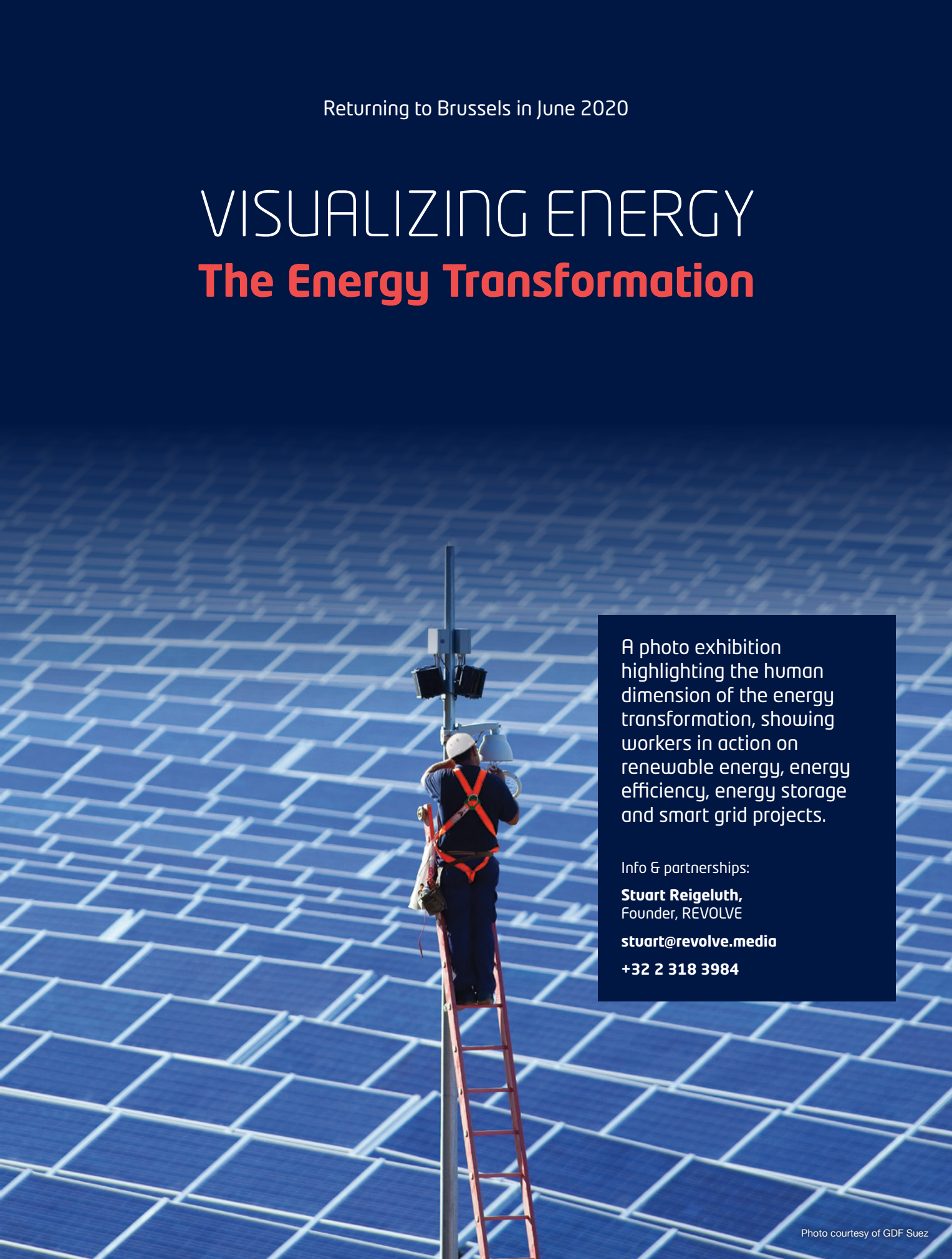
8. Atlantic seas, Orkney. Photo: Laura Watts

9. Orkney Vessel Trials project. Photo: Aquatera

Returning to Brussels in June 2020

VISUALIZING ENERGY

The Energy Transformation



A photo exhibition highlighting the human dimension of the energy transformation, showing workers in action on renewable energy, energy efficiency, energy storage and smart grid projects.

Info & partnerships:

Stuart Reigeluth,
Founder, REVOLVE

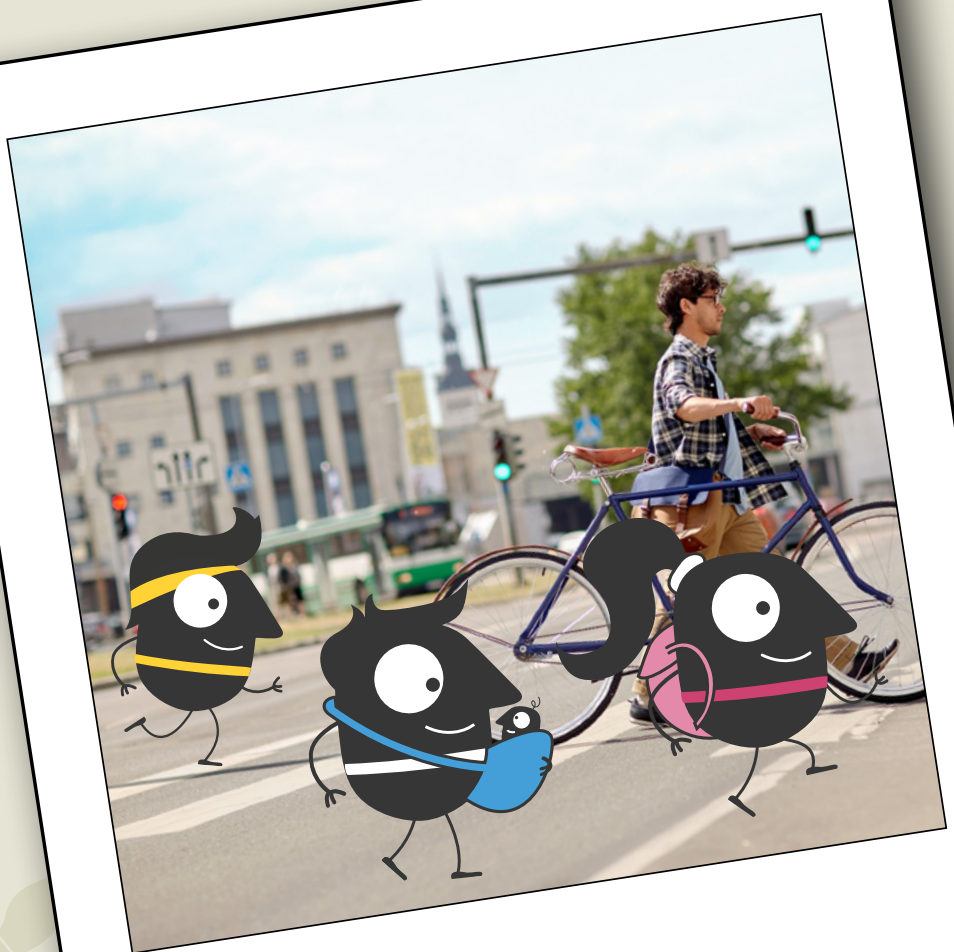
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Photo courtesy of GDF Suez

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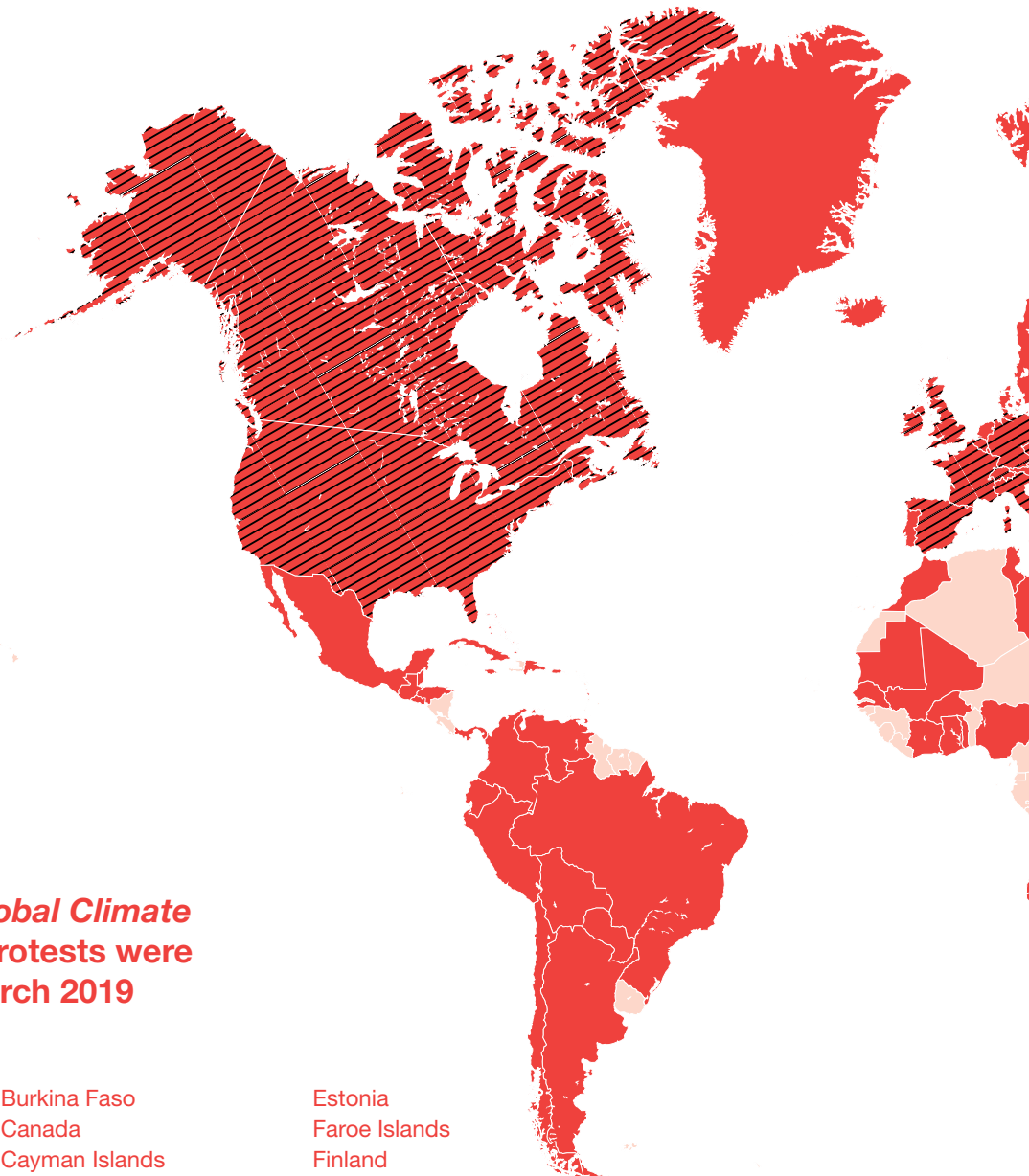
Declare a Climate Emergency Now, 1 May 2019, London, UK. Photo: Anthony Jarman

Taking to the Streets

Redefining climate action and the climate vocabulary - In the past months the Fridays for Future climate marches have seen school children leave their classrooms and take to the streets to make sure that their angst at the inaction of governments is noticed.

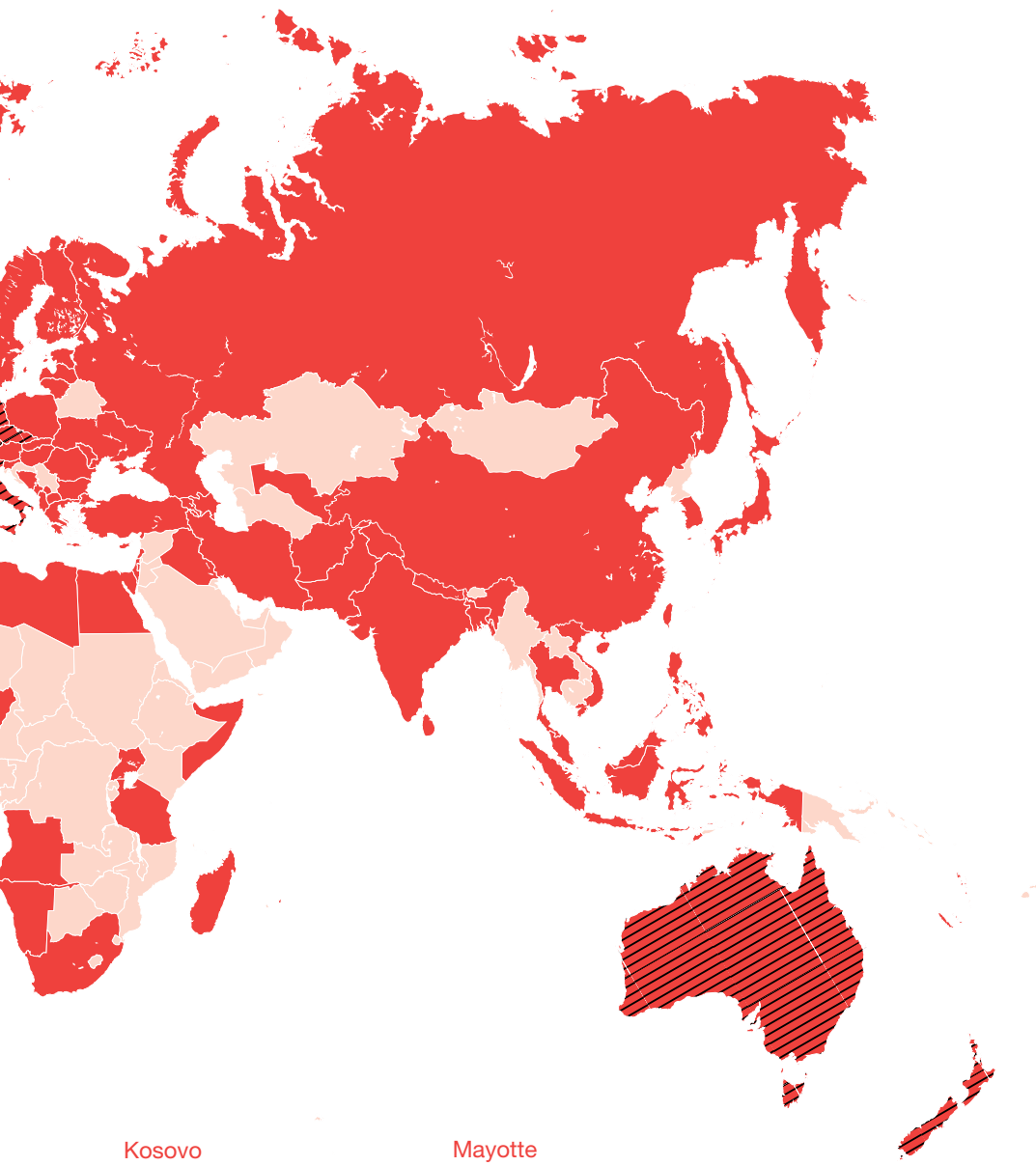
Led by Greta Thunberg from Sweden, a 16-year-old, this plan quickly caught on with strikes in Belgium every Thursday until the European elections, and from there this grew to the Global March for Climate. Terminology among climate activists has also changed, where a 'climate emergency' has been called as something more relevant to describe the state of the world's environment.

The United Kingdom and various jurisdictions in 13 countries have now declared a 'climate emergency', in most cases it is cities or local councils who have taken the initiative with the exception of the UK, whose parliament passed the climate emergency on 13 May 2019.



Countries where *Global Climate Strike For Future!* protests were organized on 15 March 2019

Afghanistan
Albania
Andorra
Angola
Antarctica
Argentina
Armenia
Australia
Austria
Azerbaijan
Bangladesh
Belgium
Belize
Bolivia
Bosnia and Herzegovina
Brazil
Bulgaria
Burkina Faso
Canada
Cayman Islands
Chile
China
Colombia
Costa Rica
Croatia
Cuba
Cyprus
Czechia
Côte d'Ivoire
Denmark
Dominican Republic
Ecuador
Egypt
El Salvador
Estonia
Faroe Islands
Finland
France
Georgia
Germany
Ghana
Gibraltar
Greece
Greenland
Guatemala
Guernsey
Honduras
Hong Kong
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland
Isle of Man
Israel
Italy
Japan
Jersey
Kashmir
Kenya



Kosovo
Kyrgyzstan
Latvia
Lebanon
Libya
Lithuania
Luxembourg
Republic of North Macedonia
Madagascar
Malaysia
Mali
Malta
Martinique
Mauritania
Mauritius
Mayotte
Mexico
Moldova
Montenegro
Morocco
Namibia
Nepal
Netherlands
New Caledonia
New Zealand
Nigeria
Norway
Pakistan
Palestine
Panama
Paraguay
Peru
Philippines
Poland
Portugal
Puerto Rico
Romania
Russia
San Marino
Senegal
Singapore
Slovakia
Slovenia
Somalia
South Africa
South Korea
Spain
Sri Lanka
Svalbard and Jan Mayen
Sweden
Switzerland
Taiwan
Tanzania
Thailand
The Bahamas
Togo
Trinidad and Tobago
Tunisia
Turkey
UK
USA
Uganda
Ukraine
Uruguay
Uzbekistan
Vanuatu
Venezuela
Vietnam
Åland Islands

Countries where local jurisdictions have declared a climate emergency

Australia
Belgium
United Kingdom
Canada
Czech Republic
France
Germany
Ireland
Italy
New Zealand
Spain
Switzerland
USA



Manila

Global Climate Strike, 24 May 2019, Manila, Philippines.
Photo: Leo Sabangan II


350 PILIPINAS
STRIKE FOR CLIMATE
THERE IS NO PLANET B
KEEP IT IN THE
CHINA OUT
WEST PHS
KALIK
WATER IS LI
A
PLANet
TO all NEWLY-ELECTED LEADERS, We are challenging YOU. WE DEMAND CLIMATE JUSTICE NOW!!



London Beehive, baby!, 5 May 2019, Buckingham Palace, London, UK.
Photo: Jeremy Hutchison

Paris Rise for Climate, 8 September 2018, Paris, France.
Photo: Raphael Bodin / Survival Media Agency





Stockholm Rise for Climate, 8 September 2018, Stockholm, Sweden.
Photo: Shubhangi Singh / Survival Media Agency



Kiev Fridays For Future, 15 March 2019, Kiev, Ukraine.
Photo: Olenka Angelova





Canada

Powershift Young & Rising, 26 February 2019, Ottawa, Canada. Photo: Allan Lissner


WE ARE HERE TO
PROTECT
OUR
WATER
GOOD WORK
LIVABLE CLIMATE
INDIGENOUS RIGHTS
EMPLOIS DE QUALITÉ
CLIMAT VIABLE
DROITS AUTOCHTONES
WATER IS LIFE
NO ONE
IS ILLEGAL
PERSONNE N'EST ILLÉGAL
SEPARATE
OIL AND STATE
R, CLIMATE COMMUNITIES
WATER IS LIFE
PROTECT THE
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Nairobi Global School Strike, 15 March 2019, Karura Forest, Nairobi, Kenya. Photo: UNEP

Singapore Global School Strike, 15 March 2019, Singapore, Singapore. Photo: 350.org





Berlin Global School Strike, 15 March 2019, Berlin, Germany.
Photo: 350.org

Brussels Rise for Climate, 8 September 2018, Brussels, Belgium.
Photo: Tim Zijlmans





▲ San Francisco

Rise for Climate, 8 September 2018, San Francisco, USA. Photo: Brooke Anderson / Survival Media Agency


RAÍCES
COMMUNITY
SOLUTIONS
#SOL2SOL



Bangkok Rise for Climate, 8 September 2018, Bangkok, Thailand.
Photo: Pongsit Nopmaneepaisan / Survival Media Agency



Ghana Africa Climate Week, 21 March 2019, Accra, Ghana.
Photo: 350.org



Kiev Fridays For Future, 15 March 2019, Kiev, Ukraine.
Photo: Olenka Angelova

Penang Global School Strike, 15 March 2019, Penang, Malaysia.
Photo: Hoo Salma / Heritage Penang





Brussels

Rise for Climate, 8 September 2018, Brussels, Belgium. Photo: 350.org

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FNR Fachagentur Nachwachsende Rohstoffe e.V.
Greenovate! EUROPE
Imperial College London
Utrecht University

Building the Circular Economy in Brussels

The traditional linear economic model is under pressure. The rapid use of natural resources is producing colossal amounts of waste and is unable to respond to many complex challenges — such as social inequality and climate change. A major solution lies in the circular economy, and the construction sector is building the way there.

The Brussels-Capital Region sees the linear model of resource extraction-production-consumption-waste as unsustainable and considers it has a harmful impact on the environment while making society highly dependent on increasingly scarce raw materials from outside the capital. Brussels also sees an opportunity to evolve towards a circular economy: one of recovering, producing, consuming and reusing. Better management of internal flows of goods will make our capital city much less dependent on external resources. It should also provide sound answers in terms of the environment, local economy and employment.

In the circular model, economic growth is no longer inextricably linked to the depletion of raw materials. It is no longer an end in itself, but a means of improving the quality of life.

The Regional Programme for a Circular Economy (RPCE)

The Brussels-Capital Region aims to be a pioneer in Europe and that is why, three years ago, politicians launched the ambitious RPCE that brings together the different players in the region. The RPCE contains concrete actions that need to be implemented, as well as mechanisms to make it evolve over time. Three ministers and 13 partner boards are managing the plan in close cooperation with the private sector, working both bottom-up and top-down.

Local companies and independent entrepreneurs are also invited to submit 'circular' projects on an annual basis. Under the title **Be circular, be Brussels,** these initiatives count on financial support and guidance. And the results so far are promising: in the construction sector, Brussels' policy-makers see a lot of potential and drive towards the circular economy. Since the start of the RPCE, no less than 21 'circular' construction sites have been launched. Here, materials are reused within the region, site installations and workforces are shared, buildings are preserved as much as possible and local know-how and jobs are created.

From waste to raw materials

One of the ambitions of the RPCE is to move from waste management to raw material management in the construction sector to address the production of no less than 628,000 tonnes of waste per year in Brussels. An estimated 91% of this waste is recycled and is then used, for example, for the groundworks of roads or buildings, but this is **downcycling whereby the materials irreversibly decrease in value.**

Downcycling
Materials are reused but decrease in value.

Upcycling
Materials are recovered and increase in value.

The circular economy strives for a more sustainable alternative – one that maximizes resource efficiency. Improved resource efficiency can be achieved through maintenance, reuse, and remanufacturing, and through **upcycling: materials or products are recovered and transformed into materials or products with a higher quality or value.** A good example is the project Tomato Chili by Dzerostudio Architects that uses formwork wood



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and windows – also simply known as waste from construction and renovation projects in Brussels – to build new greenhouses.

New business models, more sustainable jobs

Companies that aim to extend the life of their products will be able to pick up and overhaul previously sold products, returning the parts to the production cycle and no new raw materials will need to be produced. Companies will be able to provide products as a service, and include extra benefits such as maintenance, repair, leasing and take-back schemes. Or they will share materials, labor and buildings. Two of Brussels' construction projects, Deswaef and Debatty deployed their trainees and site installations optimally and efficiently in this way.

New models for strategic partnership cooperation are emerging in which companies exchange information much better with other players; for example, architects and contractors can work together in so-called building teams from the design phase.

The circular scenario also has positive effects on employment. The construction sector is struggling with high personnel turnover, a shortage of skilled workers and social dumping. In the future, trainees, students and job-seekers will have a much better chance of finding and keeping high-quality jobs. Examples include drawing-up a material inventories prior to demolition, dismantling materials, preparing them for reuse, reversible design processes, and the manufacturing of new products with recovered materials.

1. The project Tomato Chili by Dzerostudio Architects that uses formwork wood and windows to build new greenhouses. Photo: Tomato Chili

2. During the transformation of Brussels' *Tour à Plomb* – a century old abandoned lead shot factory – into a cultural center, nearly 60 m³ of bricks were dismantled and reused. Photo: Bernard Boccara

3. Materials like roof tiles can be dismantled prior to demolition and reused in other construction or repair projects. Photo: Bernard Boccara

Buildings As Material Banks (BAMB)

Read more about BAMB in REVOLVE #28, summer 2018.

The RPCE plan promotes a radically new vision and approach to Brussels' building stock. Rather than demolishing them too quickly, we can see buildings as material banks, or huge material stockpiles. Maintenance and repair, re-use, overhaul and transformation are carried out for as long as possible. Building professionals and policy-makers know at any moment which materials are located where within the Brussels territory. They use inventories and material passports for this purpose. Each design is adaptable and reversible; the materials are easy to dismantle and move. All this keeps construction and demolition waste – and the use of raw materials – to a minimum.

Buildings As Material Banks (BAMB)[4] is a project within the European Horizon 2020 programme, which promoted this new way of thinking and working in the construction sector. Starting in 2015 and ending in February 2019, BAMB was coordinated by Brussels Environment. Six pilot projects tested the materials passports, reversible building design and circular building assessment tools that were developed during BAMB. This generated insights about policies and opportunities for developing new business models. Brussels carried out 2 of the 6 BAMB pilots.

Build Reversible in Conception (BRIC)

The BRIC building is built, deconstructed and reconstructed entirely by young trainees of the EFP Training Center in Brussels. It was designed as a materials bank and will have three different functions in three years' time. The concept is therefore adaptable and reversible; the materials are easy to assemble and disassemble.

The first version, BRIC 1, was a 70m^2 office. More than 180 students participated in setting up and dismantling this module. The rebuilding of BRIC 2 into a 130m2 trading space is under construction and will be finished in June 2019. And in 2020, BRIC will be transformed one last time.



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The circular economy strives to maximize resource efficiency.

4. www.bamb2020.eu

5. Model of the BRIC building. Photo: Karbon'

6. The BRIC building. Photo: EFP

7. Mockup of the Circular Retrofit module. Photo: KADERSTUDIO for Transform (VUB)

8. www.guidebatimentdurable.brussels

9. www.totem-building.be





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The fact that this is a sustainable way of building is now apparent. In the dismantling of BRIC 1, only 3.5m³ of waste was generated, a lot less than what was expected. And there's more good news: if each version of this building were to last 20 years, the greenhouse gas emissions from the reuse of materials could be reduced by 50%.

The Circular Retrofit (CRL)

CRL has 8 student modules on the university campus of the Vrije Universiteit Brussel in Etterbeek. Instead of demolishing the original 1960s buildings as planned, they were renovated. But it wasn't just any renovation: the VUB Architectural Engineering research group tested new circular renovation solutions, together with industrial business partners. For the partitions and façades, for instance, they developed reversible solutions based on existing products.

In terms of costs, reversible construction turned out to involve a higher initial investment. This will however be recovered if you take into account the much longer life cycle of the building and the necessary transformations. In the long-run, reversible construction is therefore cost-efficient.

Tools for professionals

What if construction professionals want to work differently? For them, the Region is developing several tools. The online **Brussels' Sustainable Building Guide**[8] provides tips for dismantling, reuse and recycling of construction materials. Information on Life Cycle Analysis (LCA) and the importance of choosing materials can be found in this guide.

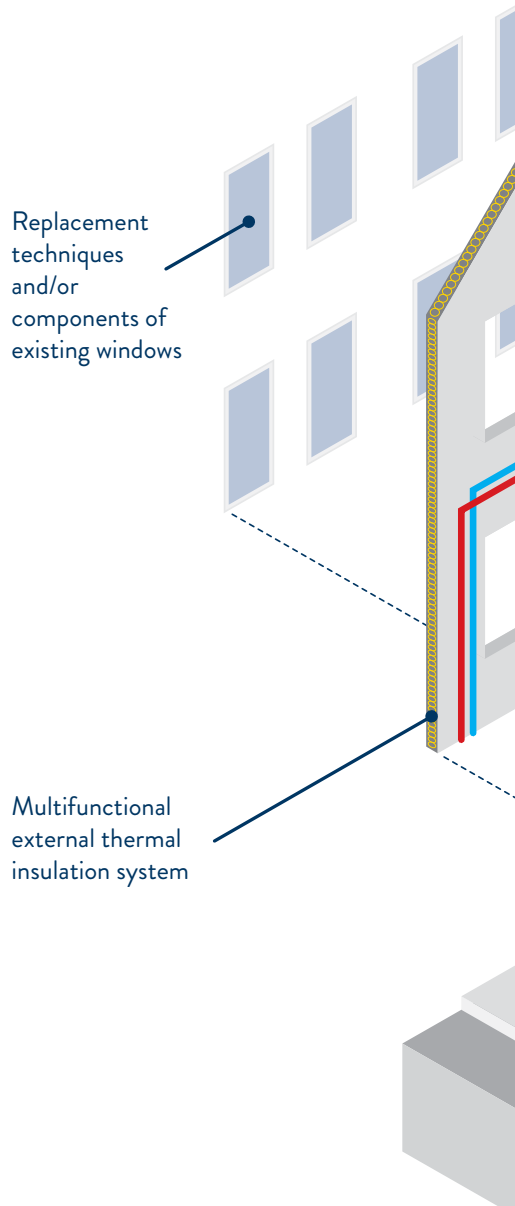
In parallel, the **Tool to Optimise the Total Environmental impact of Materials (TOTEM)**[9] is a free online application – jointly developed by the three Belgian regions – launched at Batibouw in February 2018. TOTEM allows professionals to see the impact of their construction and renovation projects on the environment, and to choose the right materials and techniques to reduce that impact. The goal is to make TOTEM as user-friendly and well-known as possible. Numerous events and meetings have been organized with users of the tool, including manufacturers of materials. To date, more than 1,400 people have used TOTEM and 240 architects have been trained.

These smart sustainability tools, together with the growing number of circular sites and buildings, prove that the new vision is taking a firm foothold in Brussels!

brussels environment .brussels

Could Social Housing Be the First to Decarbonize?

WRITER: **HADIL J.S. AYOUB**

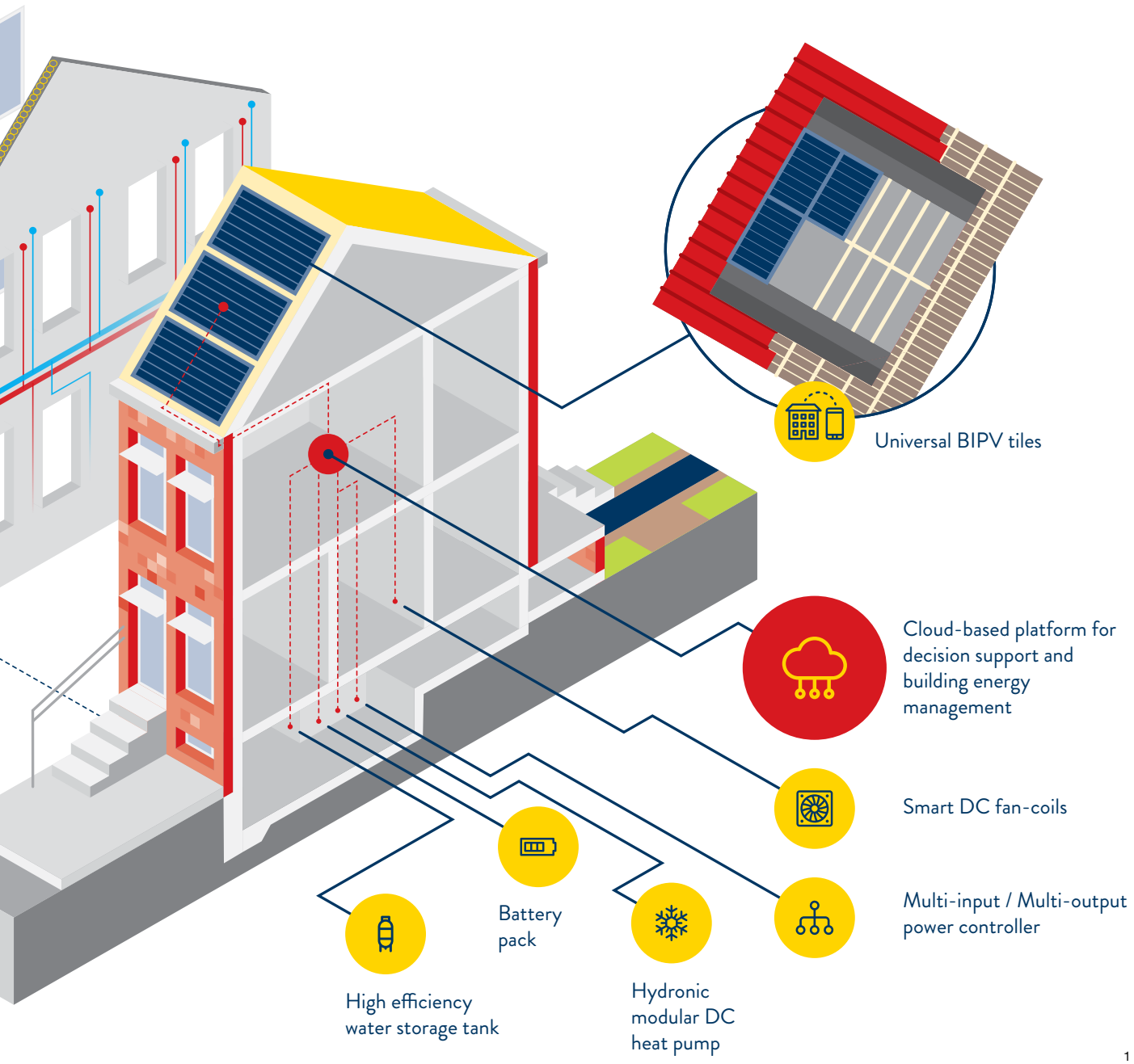


Deep renovation of Europe's building stock is necessary to reach ambitious climate change targets. But the reality is that "business models and solutions are not entirely there yet, in terms of cost and quality," says Sébastien Garnier, innovation and project manager at Housing Europe, a representative network of social and public housing organizations. Housing Europe, along with 15 other partners gathered together in the Horizon 2020-funded HEART project consortium, is aiming to develop a new holistic approach to deep renovation using cloud-based decision support systems. Sounds hi-tech, but Garnier says: "in the end, it's all about the people."

According to European Commission estimates, almost 75% of Europe's building stock is currently energy inefficient, and the renovation rate ranges from just 0.4 to 1.2%, depending on the country. Yet minimizing energy consumption on buildings – and indeed, developing nearly-zero energy buildings (nZEBs) and positive-energy (or 'smart') buildings that can interact with the grid – is central to Europe's climate and energy policy, and essential for meeting ambitious targets for 2030 and beyond.

Housing Europe, a network of social housing organizations whose members manage about 11% of households in Europe, is one of 16 partners in the Holistic Energy and Architectural Retrofit Toolkit (HEART) project aimed at developing a multi-functional retrofit toolkit that can transform buildings into smart, low-energy homes and offices. "Although HEART's holistic approach relies on energy systems automation, algorithms and smart appliances, it is all about the people," says Sébastien Garnier, innovation and project manager at Housing Europe in an interview with REVOLVE.

"In general, what you see in the social housing sector – and also for middle income household renovations – is that the business models and solutions [for deep renovation to nearly-zero energy building level] are not there yet in terms of cost and quality, if we want to reach the ambitious energy efficiency goals in the residential buildings sector. So, this explains why in many cases no action is taken or substandard solutions



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are chosen," explains Garnier. This is especially a critical issue in the social housing sector, which struggles with tight budgets and limited finance.

"There is a huge need to continue to work on innovations in this field if we want to achieve the objectives." To address this, a key innovation of HEART is a cloud-based decision support system that can improve the business case by identifying the optimum combination of low-carbon technologies and operating strategies for a building. "This is a holistic package, that combines all the different elements – photovoltaics, renewables, insulation – for deep renovation, and that can

1. The HEART toolkit utilises components such as ICT, BEMS, HVAC, BIPV, and Envelope Technologies. These cooperate organically to achieve high levels of energy efficiency and allow for an effective interface with the Smart Grid. The system is driven by a cloud-based platform which supports decision-making in the planning/design phase and optimises energy performance in the operational one.

ICT: Information and Communications Technology
BEMS: Building Energy Management Systems
HVAC: Heating, Ventilation and Air Conditioning
BIPV: Building-integrated Photovoltaics

help to choose the most optimal mix and settings. This means that HEART is an excellent example and test case of ways to get the best value, in terms of energy performance and investment costs," says Garnier.

But HEART's functionality goes beyond the design stage. The cloud-based platform uses advanced building energy monitoring systems to optimize energy use when the building is occupied post-renovation. "This is a valuable aspect, that will improve the decision-making process for building owners and managers using the HEART system," notes Garnier. "Also, imagine the potential learning effects if HEART-based cloud systems would connect thousands of these buildings in the future."





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Transforming social housing into low energy buildings

The HEART system will be tested out on four buildings, both of which are managed by social housing providers. One of these buildings is managed by Est Métropole Habitat, a social housing organization managing 16,000 social housing units in eastern Lyon, France.

Another building is owned by ACER (Azienda Casa Emilia-Romagna) Reggio Emilia, a public housing provider in Reggio Emilia, Italy. After the HEART interventions, the buildings will be in line with nZEB (= nearly Zero Energy Building) levels of energy consumption (<50 kWh/m^2/yr) - and should achieve energy savings of 90%.

These test cases for the HEART system are typical of the target market in Central and Southern Europe: medium-size, multi-storey condominium buildings, constructed in the second half of the 20th century and located in moderate climatic zones. It is estimated that there are around 1,005,000 such buildings in Europe.

In terms of the market potential of HEART, much depends on the market segment in question. Garnier is quick to distinguish between different groups with different needs: homeowners of single-family dwellings, homeowners in apartment blocks (gathered in homeowners associations), tenants in dwellings from private landlords, and finally tenants in dwellings managed by professional social, public, cooperative or private housing providers.

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2. HEART combines photovoltaics, renewables and insulation for deep renovation

3. The core of HEART is a cloud-based computing platform developed to address and support specific energy-related needs and choices.

4. Test building in Lyon, France. Photo: HEART

5. Test building in Reggio Emilia, Italy. Photo: HEART



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"These first three groups need much more intensive support in terms of skills and finance to undertake deep renovation," says Garnier. "Here we can see that one-stop-shop service offerings are emerging, and that this is often driven by local authorities." This is as much about social innovation – "basically, organizing and motivating people," says Garnier – as the technical aspects, and incorporating new types of tailor-made financial packages will be key to get the market moving.

In the social and public housing market, the decision to renovate is usually taken by the owner or landlord, "so here you are dealing with professionals who are used to renovation projects like this" Garnier says. "Yet further financial innovation needed for this sector too, as regulation that prevent local authorities from going into debt also prevents them from investing in better buildings. "We need to consider how to tackle the debt issue – one possible option that could be tested is via an ESCO (energy service company) model, whereby the ESCO takes on the debt," says Garnier. Although, this is only a second-best option. It would make more sense to allow public investments for such societal and environmental long-term investments. Especially in those cases where it is clear there is a business case with a financial pay-back (i.e. energy bill savings and health benefits).

European success story

Energiesprong – an innovative approach to renovating social and public housing to nZEB level – has proven to be remarkably successful. Originating in 2013 in the Netherlands as a government-funded innovation program, Energiesprong brokered the "Stroomversnelling" deal between Dutch building contractors and housing associations to refurbish 111,000 homes to nZEB level. Two years later, Stroomversnelling

evolved into a market initiative designed to take NZE (Nearly Zero Energy) to the next level. Currently, Energiesprong teams are active in France, the UK, Germany and New York State.

Garnier is familiar with the Energiesprong initiative through his work at Aedes, the Dutch federation of social housing providers. “Energiesprong became successful, in part because they were able to make deals involving bigger volumes. Social housing providers demonstrated the potential in terms of scale under the right conditions of costs and performance. This motivated the construction sector – in general, showing low productivity growth – to invest in R&D, new technologies and processes to become more competitive and adapt their technical offers and service levels in renovation solutions.”

Most importantly, Energiesprong represents great value for the residents: there is no energy bill anymore and the home has a 30-year performance warranty on both the indoor climate and the energy performance. Thanks to prefab elements and efficient processes, the renovation works take around 7-10 days, sometimes less. Annually, a net-zero energy house generates enough energy to heat the house, provide hot water and power its household appliances. This means that the money that is usually spent on energy bills and maintenance work pays for the upgrade. The whole operation is cost neutral, at worst, for the tenants. The residents get a fully renovated, much better looking, warm and comfortable home at the same (or lower) cost of living. “These are key drivers for tenants to accept the temporary annoyance and go through the whole process.



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6,7,8. Energiesprong refurbishments uses technologies such as prefabricated facades, insulated rooftops with solar panels, and smart heating and cooling installations. From top to bottom, renovation projects in Oud-Vossemeer (NL), Nottingham (UK), Gorredijk (NL).
Photos: Energiesprong

75% of Europe's building stock is energy inefficient with renovation rates ranging from 0.4 to 1.2%, depending on the country.

Source: European Commission



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Again, this does not happen automatically and still requires close personal contacts and thorough preparations (meetings, documentation, helpdesks) from housing professionals."

Interestingly, Energiesprong views the social housing sector in each market as the launch pad for these solutions, with a view to later scaling to the private home-owner market.

People at the HEART of housing

Despite the multiple policy and environmental drivers, "not everyone believes that it will be worthwhile to renovate" notes Garnier. That's why careful consideration of the social aspect, putting people at the center by involving them more closely in tackling challenges such as deep renovations, is of paramount importance to Housing Europe and its members.

As well as HEART, Housing Europe is involved in another Horizon 2020 project Triple A Reno. "We are working on a guide to inform housing providers about the best practices during the different stages of renovation (before, during, after), with pointers for building owners and project managers to show them how to involve residents in the decision-making process and during the whole 'user journey."

This is an eminently practical move, as the tenants' agreement is often required for major renovations. The issue is magnified in the case of mixed tenancy or multi-family home-ownership – "whether these threats are real or perceived, nonetheless, residents fear costs, comfort, intrusion, and other hindrance as a consequence of renovation," says Garnier.

The overarching goal, according to Garnier, is to show that "technical improvements should follow social and human needs - not the other way around." The research underway focuses on the acceptance and satisfaction levels of residents, and initial results from the residents of the HEART test case building in Reggio Emilia have already yielded some interesting points.

Although most residents are over 60, many are keen to improve the energy efficiency of the building and, contrary to popular belief, environmental considerations play a role as well. The residents surveyed reported a strong belief in the ability of new technology to improve comfort and efficiency, although a strong need for user control was noted as well.

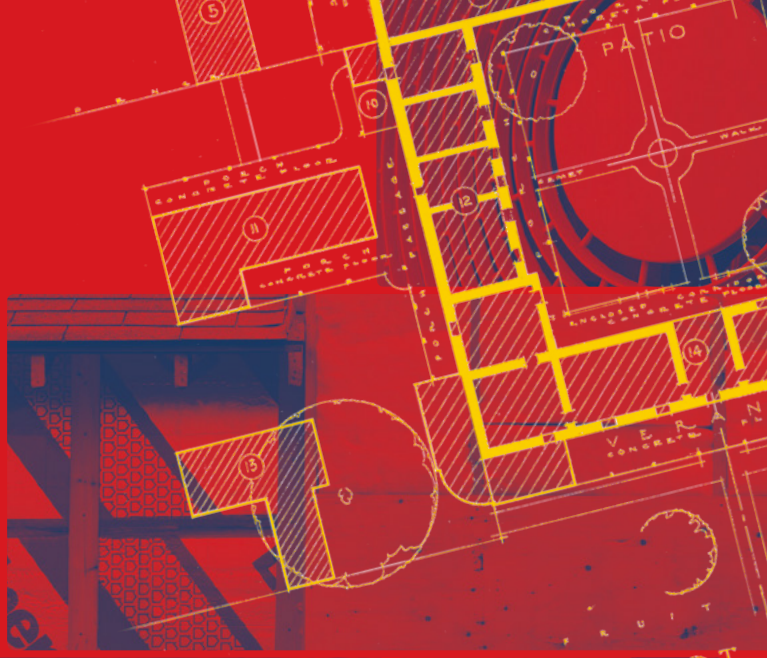
This highlights an interesting contrast, notes Garnier. "This typifies a very interesting discussion in the context of smart homes," he says. "HEART uses very sophisticated systems to regulate energy, track comfort levels, measure humidity and so on. We need to understand how to increase acceptance and satisfaction of residents while taking into account the trade-offs in terms of energy efficiency, health, freedom of choice, empowerment and privacy. This is a difficult exercise with many influencing factors."

The greatest potential of the HEART toolkit, according to Garnier, will be realized if the project achieves a certain scale on the number of buildings throughout Europe using the cloud-based system for ongoing management and optimization of the algorithms controlling the energy systems. In addition, the integration in one single toolkit of the different technologies is an important aspect – "this has the potential for cost efficiencies from packaged systems and in turn this could increase the market share for renewable technologies", he says.

9. HEART uses very sophisticated systems to regulate energy, track comfort levels, measure humidity and so on.

HEART

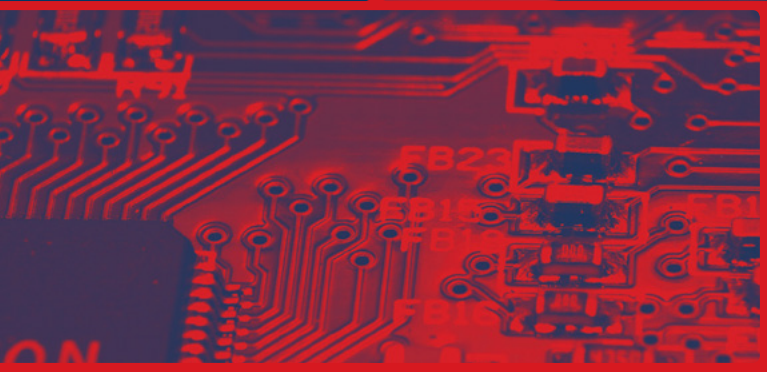
The sum of all things.











HEART is a multifunctional retrofit toolkit transforming an existing building into a smart building.



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This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement N° 768921.





1. Cottage roof reparation, UK.

Health Renovations:

A Sensible Climate Revolution

WRITER: **ADRIAN JOYCE**

The climate case for renovating Europe's energy-inefficient building stock is almost too well known to bear repeating. Responsible for 36% of Europe's carbon dioxide emissions, the sector has been a "low hanging fruit" in the decarbonization debate for almost as long as policy-makers have been jumping at higher-hanging baubles (take a bow Carbon Capture and Storage).

But an increasing body of academic work is revealing just how cost-effective building renovations could be when factoring in the externalities of inadequate housing. The International

Energy Agency, for example, toted the by-products of slashed consumer energy bills, energy imports and alleviated fuel poverty at €500 billion a year in its 2018 outlook report. What reports like this often miss out though, are the cost benefits of improved health, productivity and cognitive performance that building renovations bring in their wake.

Our health and our buildings are intimately linked. Most of the air we breathe over our lifetimes is found indoors and factors such as temperature, light, humidity, draughts and even noise can determine our susceptibility to illness, our moods and general sense of well-being. We actually spend about 90% of our time indoors, imbibing air that is on average between two and five times more toxic than that found outside, according to the U.S. Environmental Protection Agency. Sometimes, it can be 100 times more dangerous. Tragically, the people exposed to the greatest volumes of noxious substances tend to be those already most vulnerable to their effects through age, ill health or poverty – also known as health inequity.

Bad air can come from many sources such as mould, gases, smoke, allergens, and chemicals used in everyday household activities. For example, nearly all the people surveyed in one community of single-family air-tight homes in California had been exposed to excessive levels of formaldehyde.

Some of the deadliest forms of pollution originate from outdoor sources, before becoming trapped inside buildings – particulates, ozone and nitrogen dioxide are good examples of these. Research shows that people living near traffic intersections suffer much higher levels of indoor pollutants. One study last year found that up to 63% of indoor



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2. Bad air can come from many sources, including chemicals used in everyday household activities, like cleaning products. Photo: Crystal de Passille Chabot

3. Particulate matter is broken down into two primary categories, PM10 and PM 2.5. PM 10 refers to particles that are 10 microns in diameter or less. PM2.5, or "fine particles," refers to particles that are 2.5 microns in diameter or less.

4. Research shows that people living near traffic intersections suffer much higher levels of indoor pollutants. San Francisco Civic Center. Photo: Gordon Mak

5. The occupancy density of classrooms, being much higher than in homes or offices, increases the harmful effects of bad air on students' health, attendance, concentration and learning performance. Photo: Neonbrand

6. In hospitals, a healthy interior can make the difference between life and death. Photo: Adhy Savala



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PM2.5 particulates pollution came from outdoor sources, even when windows were closed. After traffic, the greatest cause of this pollution are power plants, and much of their demand is generated by heating and cooling from, yes, poorly designed buildings.

An estimated 4.3 million people die early each year from exposure to indoor air pollutants which manifest as respiratory and cardio-vascular illness, lung cancer or chronic obstructive pulmonary disease. Experts increasingly describe air pollution as a public health crisis on a par with tobacco smoking.

Truly, the statistics, studies and research linking healthy bodies to healthy buildings could fill a city library, but none has been so detailed as a new paper by the Buildings Performance Institute Europe (BPIE), which analyzed and audited the effects of harmful indoor environments in the three most common non-residential building types – schools, hospitals and offices.

Students' health, attendance, concentration and learning performance all suffer from the pernicious effects of inadequate buildings. Children are particularly vulnerable because they breathe more air relative to their developing body size than adults do. The occupancy density of classrooms is also much higher than in homes or offices.

The institute found that healthy school renovations would allow children to attain their current educational levels ten days earlier each year. That would translate to additional teaching, extra-curricular activities or an extra two weeks' holiday for students and teachers each year. In the process, academic performance would be annually improved by between 3-8%.

More precisely, every 1°C reduction in temperature within the 20-32°C range increases students' learning performance by 2.3%. The healthiest building temperatures are 21°C in winter and 26°C in summer. Good daylighting can also increase academic performance by up to 18%, aiding attention spans, concentration and relaxation. Equally, every 100ppm decrease in indoor CO_2 concentrations is associated with a relative fall in absences from school due to illness of between 0.1-1%.

In hospitals, a healthy interior can make the difference between life and death. Good ventilation contains the risk of cross-infection while daylighting and good sound-proofing both accelerate patient recovery times. According to the BPIE, health renovations could cut the length of patient

stays by 11% – about one day – for the average patient. Medication costs and employee turnover could be pushed down by 20%. The cost benefit was tallied at €114 billion a year.

One incredible finding from a 2014 BPIE study found that improved indoor environmental quality would lower mortality rates at a children's hospital by 10% and increase the time doctors can spend with patients by the same amount.

The effect on offices would be no less profound. Around 81 million Europeans – 36% of the workforce – spend eight hours a day or more working in offices. Within their confines, employers also spend around 90% of their operating costs on their employees. Renovating for comfortable, well-lit, healthy and thoughtfully-designed workspaces improves staff morale and performance, while decreasing staff turnover and absenteeism rates.

The healthiest building temperatures are 21°C in winter and 26°C in summer.

Health renovations of this kind could raise worker productivity by up to 12% and save a staggering €500 billion annually, the BPIE say. For every percentile improvement in building performance, the BPIE used a scale that banks €40 billion to the bottom line. Their analysis found that every 1°C reduction in temperature in the 22-32°C temperature range increased a worker's performance by up to 3.3%. And every 100 ppm decrease in CO_2 concentration increases their performance by 4.25%.

In all, the benefits from health renovations would be felt in almost half the continent's non-residential floor space and enjoyed by 260 million people. They would also have a revolutionary effect on Europe's emissions, minimizing energy use and preventing costly power waste we can no longer afford, if our planet is to have a sustainable future.

One of the largest barriers to reaching this point is the burden of upfront investment, which many EU Member States have been keen to deposit on the heads of those least able to make it. A survey in March 2019 found that 60% of tenants were worried about



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higher rents if their landlords renovated their homes, 58% of respondents were anxious about loan repayments and 53% were deterred by the lack of government support for costly building remediation work.

This picture could be shaken up though by a trail-blazing Warmth and Well-Being pilot scheme (WWBS) being rolled out across Ireland. The project, which will produce an interim report later this year, aims to scientifically prove the causal link between cost-effective health benefits and home energy renovations.

It offers 100% grants to 900 homes in five Dublin postcodes that suffer from high levels of deprivation, along with a request for follow up health information.

The awards fund two-week home makeovers which can involve standard attic insulation with appropriate ventilation, wall insulation of the cavity, dry lining or external varieties, boiler replacements and draught proofing.

The first beneficiaries have been most vulnerable residents – such as over-55 years old and under 12, and chronic respiratory disease sufferers. Early results suggest that the project has made a real difference to their lives. One official working on the programme said that of the words they heard the most:

Comfort is often spoken about. A lot of the time, people are living in discomfort to keep the bills down. Two brothers living together became so much more sociable because their health improved after the house was done up. They were so poor that they didn't want to have people visiting them before. That had an impact on mental health as well. They said that the project had opened-up a new phase in their lives.

7. Renovating for comfortable, well-lit, healthy and thoughtfully-designed workspaces improves staff morale and performance. Photo: Austin Distel

8. Derelict buildings in Dublin, Irelands. Photo: Hugues Adamo

9. Draught proofing is is one of the cheapest and most efficient ways to make a building more comfortable and energy efficient. Photo: Courtney Richardson

10. The WWBS project fund two-week home renovation which can involve insulation, boiler replacements, … Photo: Charles Deluvio



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To exploit fully the potential of health renovations – and to do the minimum necessary to keep within the 2°C envelope – would require an overhaul far more radical than yet imagined in Ireland.

The 'Green New Deal' manifesto of Alexandria Ocasio-Cortez and others has electrified American audiences with its promise to "upgrade or replace every building in US for state-of-the-art energy efficiency". In the UK, the opposition Labour party has vowed to slash energy poverty with a mass insulation program for four million homes.

In the ongoing slog of incremental EU battles, it can be easy to forget that the energy efficiency revolution is an idea with history on its side, even if time is not. The small steps being taken in Ireland may one day be retrospectively seen as the bracing position before an almighty jump.

The health benefits and cost savings a renovations wave could bring are more than a tool in the debating armory; they are a reminder of the improved world we collectively stand to gain from a holistic and sensible reappraisal of the spaces and structures in which we live.



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11. Representative Alexandria Ocasio-Cortez speaks on the Green New Deal with Senator Ed Markey in front of the Capitol Building in February 2019.
Photo: Senate Democrats

RENOVATE EUROPE



REDay 2019

10 October 2019
European Parliament, Brussels*

Are you interested in finding out more about the energy renovation of our building stock and the associated benefits? Do you want to know what an energy efficient renovation looks like? Would you like to meet the Champions of our cause in the European Parliament? Then watch out for our REDay2019 events in Brussels on the 10th October and learn more about the benefits of energy renovation for homes, health and our environment.

www.renovate-europe.eu

Renovate Europe is an initiative of EuroACE, the European Alliance of Companies for Energy Efficiency in Buildings, is the only EU-wide campaign that focuses exclusively on ambitious energy renovation of the building stock in the EU and 'bangs the drum' for energy efficient renovations, taking a technology neutral, integrated and holistic approach to energy efficient renovations.

WHY IS ENERGY RENOVATION THE LONG-TERM SOLUTION TO IMPROVED HEALTH?

Buildings impact our health and wellbeing

Energy Poverty & Cold Homes
10.8% of the population are unable to keep their homes warm. Countries with poorest housing status demonstrate highest excess winter mortality –in both warm and cold climates.

Damp Buildings
Over 80 million people live in damp homes, causing respiratory illnesses.

Air Pollution
Leaky buildings with high energy demand and old inefficient boilers are a huge contributor to air pollution and smog in our cities.

Our cherished ones are the most vulnerable

Children
Indoor mould exposure is responsible for 12% of new childhood asthma.

Elderly
75% of the housing stock is not age-friendly. Tomorrow's ageing population needs renovated, warm, accessible buildings.

Renovated buildings will improve our life

At home
A more comfortable living environment providing thermal, visual and acoustic comfort leads to better health and improved quality of life.

At work
An energy efficient office with a healthy indoor climate can lead to 15% increased productivity and reduced absenteeism and sick days among its employees.

At school
Children's learning abilities and emotional wellbeing can rise by up to 15% with good indoor climate.

Potential savings in our healthcare system from energy renovation

€42-88 BILLION PER YEAR*

*Comparatively, the EU wastes €400 billion on energy imports per year.

In 2050 we should aim at a highly energy efficient, healthy and comfortable building stock

90% of the buildings we will be using in 2050 are already built, and 75% is from a time with no or very weak energy performance requirements. We have to bring our buildings up to date and upscale the rate at which buildings are being renovated in order to provide **healthy and comfortable living conditions** for all while at the same time reducing energy demand.

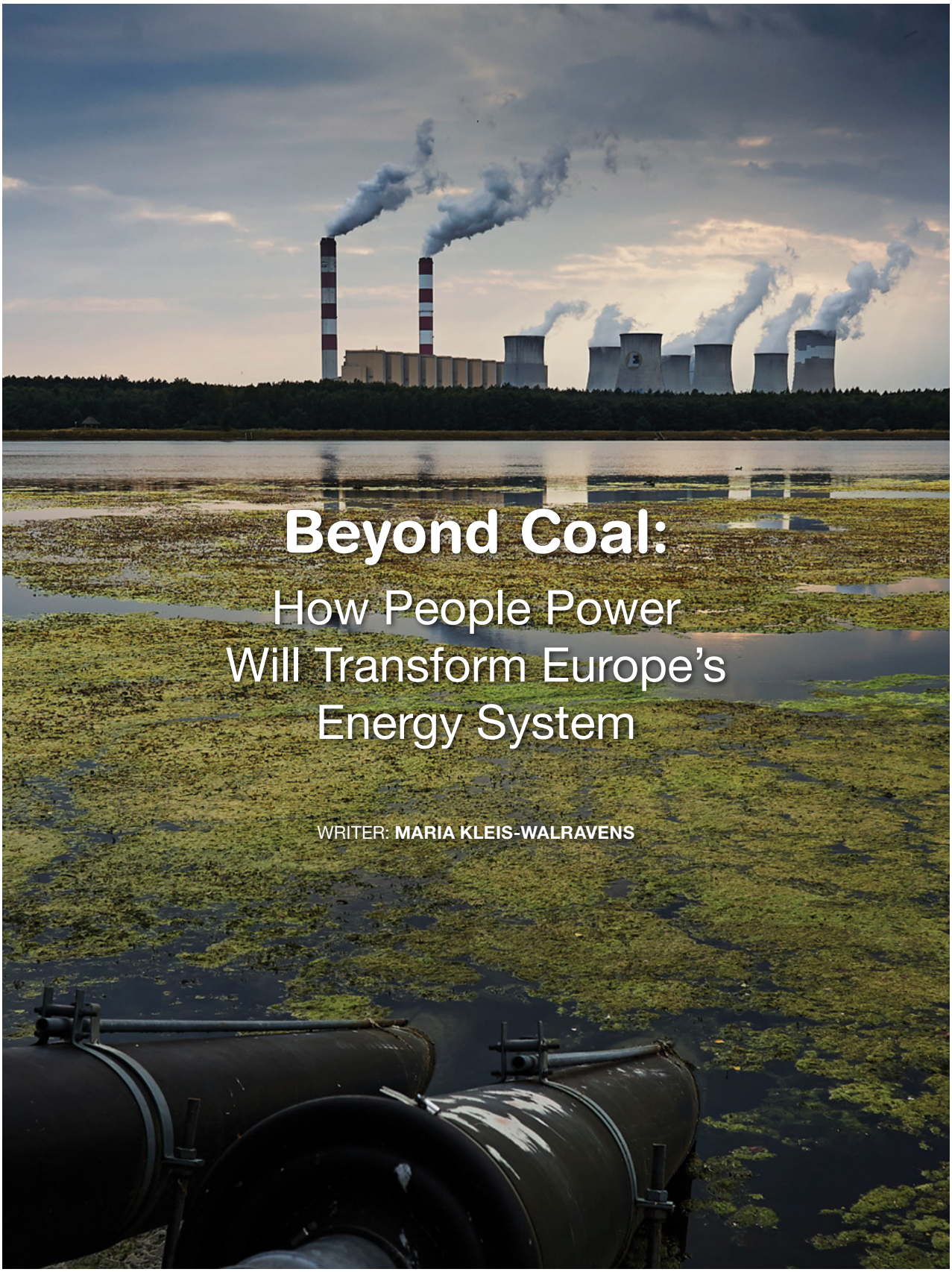
Energy renovation is the best and **long-term sustainable solution** to alleviate energy poverty, to deliver warmer homes for our families, healthier schools for our children and reduced energy bills for our hospitals and businesses, in which we spend 90% of our time.

In 2017 the two major EU buildings-related directives, the EPBD and the EED, are being revised offering the opportunity to enshrine a long-term vision of a highly energy efficient building stock (known as **Nearly Zero Energy Bulding NZEB) by 2050** benefitting all EU citizens.

#NZEB2050

RENOVATE EUROPE

SOURCES: Velux's Health barometer 2016; The Buildings of Tomorrow. Today, Velux Model Home 2020; Indoor Air Quality, Thermal Comfort and Daylight, BPIE (2015); Alleviating Fuel Poverty in the EU, BPIE (2014); Multiple Benefits of investing in energy efficient renvoation of buildings - Impact on Public Finances , Copenhagen Economics (2012); WGBC's Better Places for People Campaign; Infographic European Indoor Environment has Impact on Health and Performance, Franhofer (2016). Icons are from flaticon.com. NOTE: All figures given above refer to the EU



Beyond Coal:

How People Power Will Transform Europe's Energy System

WRITER: **MARIA KLEIS-WALRAVENS**

1

We are facing a climate crisis. Transforming Europe's energy system has never been more urgent, and citizens across the EU are already taking action to end the era of coal to build a cleaner, fairer, more sustainable future. Governments and decision-makers need to back this call for change with legislation and policies that favor renewable technologies and smarter energy solutions to propel Europe's energy market forward, while guaranteeing a just transition that benefits everyone.

How much coal are we burning?

Europe's coal phase-out is gathering pace as renewables continue to grow. In 2018, the European Union's (EU) total coal generation was 30% lower than in 2012. Almost a dozen European countries have already committed to phasing out coal by no later than 2030 .

Yet despite a surge in renewable energy, there are still more than 250 coal power plants in Europe. Coal, including lignite, the most polluting form of coal, still supplies almost a fifth of Europe's energy, with coal power plants responsible for 15% of the EU's carbon dioxide emissions (CO_2) in 2017.

Despite national phase-out commitments and international climate pledges, action to decarbonize our energy system is not happening fast enough – and Europe's citizens are paying the price.

1. Belchatow power plant, Zloczew, Poland.
Photo: Bartek Banaszak/ClientEarth

The cost of coal

Beyond climate targets, phasing out coal in the shortest time possible is crucial to stop the harmful effects mining and burning coal has on the health and well-being of people and the environment.

The array of pollutants released burning coal are linked to respiratory diseases and premature deaths, as well as illnesses including heart problems and bronchitis. The Europe's Dark Cloud report estimates the corresponding health cost to exceed €60 billion per year.

In Zloczew, Poland, 3,000 people are waiting to know if they have to leave their homes as mammoth power plant Belchatow seeks to open a new mine.

Coal mining also has irreversible impacts on the environment. Vast mines are graveyards to biodiversity – meanwhile, ash storage sites pose major threats to local water supplies. The villagers of Akrini, Greece, discovered they were drinking polluted water containing hexavalent chromium, which is known to cause cancer. The contamination was linked to the ash from Agios Dimitrios – Greece's largest power plant.

Coal exploitation has yet another human cost – the displacement of people. Villages are routinely evacuated, demolished and cleared to give way to the world's largest excavators.

This is the situation for the inhabitants of Zloczew, Poland, where 3,000 people are waiting to know if they have to leave their homes as mammoth power plant Belchatow seeks to open a new mine. The Zloczew mine, if it goes ahead, would be the deepest mine ever constructed in Poland. Explosives will blast away millions of tons of rock to access the coal – which will destroy 33 villages and contaminate the surrounding environment with toxic heavy metals.

ClientEarth has launched a legal challenge to block the mine – with its long list of hazards, it should not have been given the green light.

Meanwhile, in Bulgaria, land that has been in farmer Emil Mirchev's family for generations stands to be devoured by an open pit coal mine that would span three villages, destroying kilometers of fertile land and jeopardizing the local water supply. It would also likely mean the end of two popular lakes in the area. The landscape will change forever.

With the support of ClientEarth and coalition Za Zemiata Access to Justice, Emil has taken legal action to fight the mine that would put a stop to the way of life for hundreds of people.

Suffering for too long from the detrimental impacts of coal, Europeans are looking beyond coal towards cleaner alternatives. However, while governments continue to favor coal and gas power plants over low carbon technologies, communities currently reliant on coal lack the social and financial backing from their national



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governments to embrace the transition. They need support and certainty to seize the better jobs and economic alternatives that a coal-free future will bring.

The beginning of a revolution

Even without government support, communities, cities and local authorities are at the vanguard of Europe's energy transition: projects and initiatives are helping people to control and produce their own energy, which is creating a fairer, more decentralized energy market.

Over the past two decades, a growing number of renewable energy companies have entered the market, offering individuals and businesses the opportunity to use renewables to power their homes and businesses. Good Energy in the UK not only allows customers to buy 100% renewable energy, but also pays those who generate their own renewable electricity.

Repowering in the UK and Cap Terre in Belgium install solar panels on social housing, and profits from selling this energy are channeled back into the local communities. These initiatives enable renewables to enter the market in an inclusive way that benefits everyone.

Half of EU citizens - including local communities, schools and hospitals - could be producing their own renewable electricity by 2050, meeting 45% of their energy demand.

Empowering citizens

The law is changing to foster this revolution. Approved in 2018, the EU's Renewable Energy Directive not only set a binding objective for the EU to increase renewables by 32% by 2030, it also establishes an explicit and transformational role for individuals and communities by giving them the right to generate, store, consume and sell their own energy.

In Flanders, Belgium, renewable energy cooperative Ecopower provides





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100% renewable electricity to its 55,500 members at a lower price than its for-profit competitors. Started in 1991, its investments now total €60 million, its capital €50 million. The cooperative has received recognition for having the fairest billing structure of all suppliers in the Flemish region.

What communities can achieve when empowered to play an active role cannot be overstated. A study by CE Delft in 2016 found that half of EU citizens - including local communities, schools and hospitals - could be producing their own renewable electricity by 2050, meeting 45% of their energy demand, and setting a blueprint for energy market transformation.

A transition that puts people and the planet first

To ensure a just transition, governments need to support communities most affected by a move beyond fossil fuels. They must provide training for workers that moves in tandem with the economy's low-carbon transition and support the creation of job opportunities fit for a low carbon future. National policy makers should also use EU legislation to develop renewable energy sources and facilitate an ambitious energy transition. This is crucial not only for the livelihoods of those workers, but also for keeping the social fabric of nations intact and for developing and maintaining political support for a rapid transition.

But while governments must support a just transition for communities that will be most affected, they must not cave to arguments from the coal industry demanding huge compensation sums in return for shutting down – calls the German government is currently dealing with. Plant operators have long known that damage to the climate and human health is caused by their business – and they have been trying to postpone the inevitable day that society requires them to shut down. Their obstinacy in the face of common sense and the public good should not now be rewarded through 'retirement packages' ultimately funded by citizens' taxes and energy bills.

Decision-makers need to choose the right policies and support forward-thinking industries so that communities can build a cleaner, fairer, more efficient energy future, protecting our health, the environment and combating climate change.

Change to our energy system is coming – governments need to recognize it, and back it.

2. Belchatow power plant, Zloczew, Poland.
Photo: Bartek Banaszak/ClientEarth

3. Workers installing rooftop solar panels.
Photo: Justin Lim

4. Greenpeace Bulgaria's 'solar lab' project has taken off at a local secondary school in Bobov Dol, just a few kilometres from its notoriously polluting coal plant. It will offer traineeships in solar installations.
Photo: Greenpeace Bulgaria

Launching the Market for Sustainable Energy Assets

WRITER: **CAROLINE MILNE**

Speeding-up project deployment and unlocking finance at scale, faster and further, is necessary to accelerate the retrofitting of buildings to meet Europe's climate goals.

In Europe, buildings are responsible for the largest share of final energy consumption (40%). Despite buildings presenting significant potential for carbon emission reductions, change is not happening fast enough to meet the EU 2030 climate targets. Building renovation rates must triple, increasing from 1% of GDP per year today to 3%. Investments of an additional €100 bn/year is required annually, cumulatively amounting to over €1 trillion.

Meeting these targets is a substantial undertaking, and project deployment remains slow – too slow considering the existential urgency to decarbonize. Investor/contractor deal closure can easily take up to more than six months, undermining the contractor/end-client sales process (typically a 12-18 month process). This is unacceptable. Closing the investment transaction more quickly is crucial and speeding-up the process is urgently needed to retrofit Europe's building sector at scale.

Process and pipeline matter

A major roadblock to investment is the average size and complexity of Sustainable Energy Assets (SEA) projects themselves. Small-to-Medium Enterprises (SMEs), accounting for more than 80% of necessary renovations and technology upgrades, require an investment of less than €500,000 – an amount far too small to attract investors. Investors, due to the high upfront costs of due diligence and risk assessment, typically seek to invest in project pipelines requiring a minimum of €1 million. Fortunately, understanding the small size of SEA building projects, most investors are willing to aggregate smaller projects into umbrella contracts provided that the total pipeline meets their minimum investment threshold.



However, the fact is that no standardized due diligence or risk assessment process exists that matches real projects, considering their relatively small size and the typical profile of project owners (SMEs and non-profit entities). Moreover, because financial firms tend to perform their own due diligence using their own processes, cross-fertilization of knowledge and best practices for analysing this type of investment are non-existent.

The consequences of this lack of process are significant. While six months of due diligence may be reasonable for a €50 million infrastructure project, it is unacceptable for an energy efficiency retrofit project of €50,000. Many projects fail simply because the financing deal took too long – the clients walks away, perceiving the lag to be a reflection of project credibility (or lack thereof). Moreover, when contractors (who themselves are often SMEs) dedicate so much time to financing one deal, they sacrifice resources that could otherwise be generating more sales pipeline. Thus, a vicious cycle: Slow deal closure requires resources needed to create a sufficient pipeline to attract investment. Discussions drag because of lack of pipeline, and pipeline suffers due to the lengthy discussions.

Slow deal closure and deployment can therefore be attributed both to a lack of process for investment analyses by financial institutions and to a lack of project pipeline for contractors.

Closing the investment transaction more quickly is crucial to retrofit Europe's building sector at scale.

MEDENER

The Mediterranean Association of National Agencies for Energy Management

WRITER: **ROBERTA BONIOTTI**

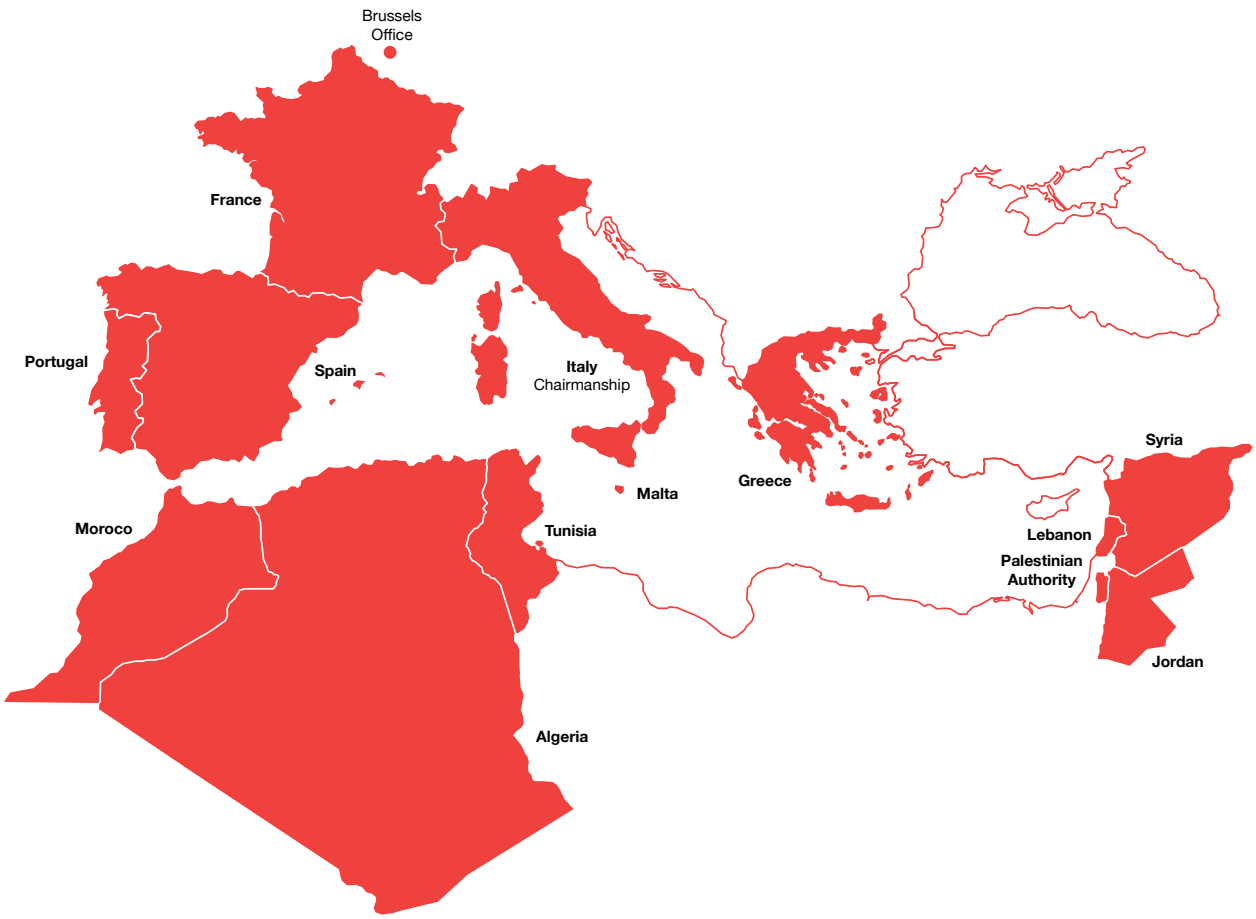
The Mediterranean region is blessed with a wealth of natural resources, including renewable energy sources that are being exploited in sustainable ways for the transition to cleaner economies and more prosperous society on all shores of the sea. MEDENER and their flagship project called meetMED are an example of things to come for a brighter future around the Mediterranean.



MEDENER is the Mediterranean Association of National Agencies for Energy Management. Created in Tunis in 1997 as an international non-profit organisation, MEDENER brings together 13 national energy agencies from the northern and southern shores of the Mediterranean. MEDENER aims to include more countries in the future.

Since 1997, MEDENER has facilitated the sharing of experiences, know-how and best practices among its members and international partners. MEDENER has accelerated the transfer of skills, methodologies and technologies related to energy efficiency and renewable energy sources; and MEDENER has assisted Mediterranean countries with the design and implementation of energy management projects such as **meetMED**, a 2-year EU-funded project that started in May 2018.

Thanks to a constant exchange of best practices, MEDENER members mutually reinforce each other when facing critical climatic and energetic challenges. MEDENER relies on the expertise of a network of more than 1,000 experts in different sectors, working in close cooperation with national central administrations, by providing them expertise to design energy efficiency (EE) and renewable energy (RE) policies and programmes. Internal to MEDENER, national agencies establish synergies among public administrations, private sector, local authorities and financial institutions, that create a stimulating



economic environment for the energy transition around the Mediterranean.

All the initiatives carried out by MEDENER through bilateral or multilateral cooperation in the areas of EE and RE aim to trigger important improvements in the legal and regulatory framework of the southern and eastern Mediterranean countries, including the adoption of national action plans on EE and RE (NEEAP and NREAP) as well as the development of thermal regulations for buildings, EE audits in the industry sector, solar thermal certification and standardisation programmes.

MEDENER activities perfectly fit the guiding principles of the EU foreign policy based on advancing and consolidating strong multilateralism, sustainable security and cooperative autonomy. MEDENER participates in the work on sustainable development performed by the Union for Mediterranean (UfM), inasmuch as the harmonization and strong coordination of the activities among the three UfM Platforms – the Regional Electricity Market Platform, the Renewable Energy and Energy Efficiency Platform and the Gas Platform – have a strong potential to strengthen global energy policy in the Mediterranean region.

Since the climate and energy framework of the 2015 Paris Agreement needs to be enforced and energy poverty is spreading, the transition to an efficient and RES-based energy





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system lies at the core of MEDENER activities. Since 2013, MEDENER has been holding its Annual Conference, focusing each year on a different aspect of energy transition in the Mediterranean area. Both the 6th and the 7th MEDENER International Conference are to be organised as part of the activities of the meetMED project.

In 2018, the 6th MEDENER International Conference was held in Amman, Jordan and provided an insight into one of the most debated topics related to energy efficiency: the linkage between energy prices and energy efficiency measures, particularly with respect to end users and families in some countries of the southern shore of the Mediterranean, where prices are often tariffs and strongly supported by the State. The 6th MEDENER Conference acknowledged the central role of energy prices as the main bottleneck for EE and RE investments wherever electricity prices are very low, and as one of the main prerequisites for energy policy to work effectively.

Regarding energy pricing, support mechanisms to RES could become impracticable, when incentives exceed the costs of the commodity faced by the consumers, while energy efficiency remains difficult to foster as long as end-users have no incentives to invest in EE measures or to change consumption behaviors. To solve this dilemma, MEDENER identified two potential solutions: in the short-term, adapting to the specificities of national energy markets and entrusting the public institutions to lead by example on the benefits of investing in renewables and energy efficiency; and in the medium- and long-term, to strive for a **harmonized Mediterranean energy market** while bearing in mind that energy markets alone will not be able to act alone against the effects of climate change.

The 7th MEDENER Conference will take place on 26 September 2019 in Rhodes, Greece, and will focus on the **role of sustainable energy solutions for islands and remote areas,** as islands in the Mediterranean region are frontrunners in the energy transition and showcase innovative solutions to the lack of adequate energy, water, communication and transport networks. Energy systems in Southern and Eastern Mediterranean Countries (SEMCs) – and in their remote areas – share common constraints with energy systems in islands as both need to tackle without delay the challenges related to energy transition, to improve resilience to climate change and to implement circular economy solutions. Nevertheless, both can immediately benefit from technological innovation. Achieving energy independence in island and remote energy systems will exemplify the clean energy transition around the Mediterranean countries and beyond.

Register for the 7th MEDENER International Conference: www.meetMED.org

1. A solar panel used by Bedouins in the desert of Wadi Rum as an alternative to diesel generators, Jordan. Photo: Wandel Guides

2. The predictable and reliable winds that makes Prasonisi Bay a famous spot for for windsurfing and kitesurfing also make it a smart choice for the placement of wind turbines. Rhodes Island, Greece. Photo: Marco Taliani de Marchio

The meetMED Project

Since May 2018, together with the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), MEDENER is implementing the **Mitigation Enabling Energy Transition in the Mediterranean Region (meetMED)** project – a 2-year EU-funded project supporting the energy transition in 8 beneficiary countries: Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, and Tunisia. meetMED activities contribute to support regional cooperation under the umbrella of the Union for the Mediterranean Renewable Energy and Energy Efficiency Platform (UfM REEE platform).

The Project encourages policy dialogue, capacity-building, investment opportunities, professional training and the exchange of good practices between the Mediterranean countries in order to put EE and RES at the heart of public policy-making both at national and local levels. meetMED events and publications provide technical information and policy guidelines to facilitate decision-making by public authorities, to enhance their expertise and to raise their awareness on investment opportunities in the EE and RE sectors.

www.meetMED.org

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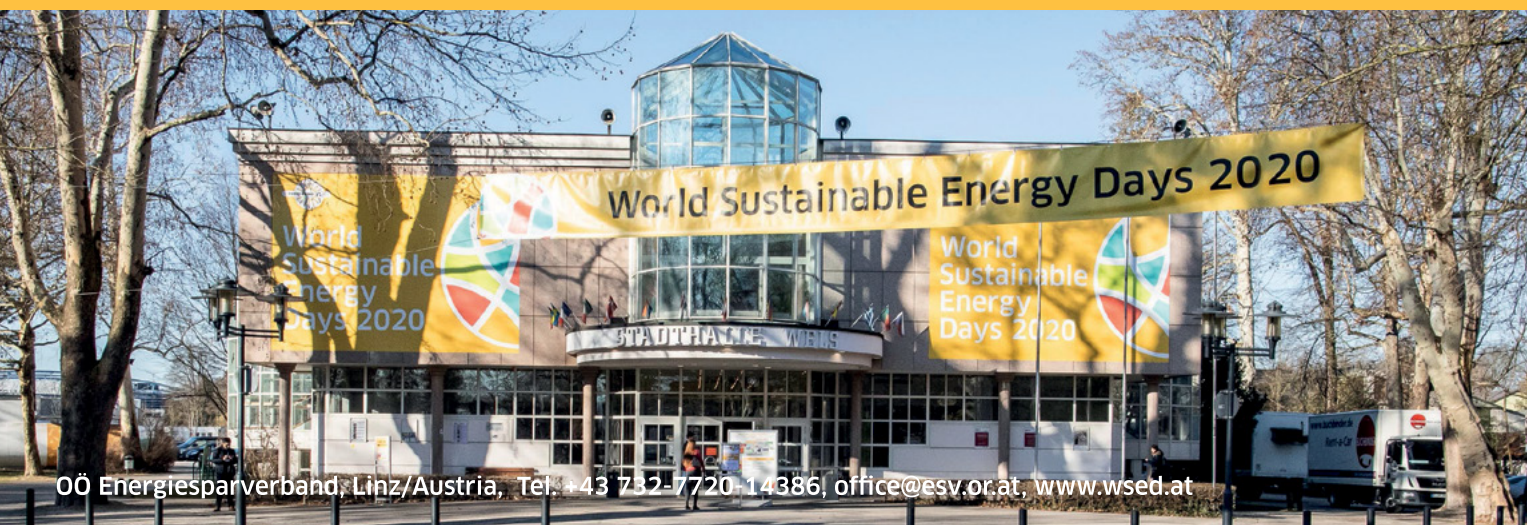
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