



# 2019 Global Energy Transformation Conference

**Disrupting business models to drive  
a successful energy transformation**

Conference recap

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# Global Energy Transformation Conference 2019

**In the four years since the signing of the Paris Agreement, the energy landscape continues to shift, and climate change is accelerating. Even as business and world leaders answer some questions and challenges, more arise.**

How do we respond to new public and investor pressures? How do we accelerate the energy transformation? What are the risks and new opportunities coming with this change? Who will lead and who will be left behind?

KPMG invited distinguished guests and speakers to Paris for our annual Global Energy Transformation Conference on November 6, 2019 to take a hard look at these questions. What follows is a summary of our wide range of discussions on decarbonization, business model disruption, sustainable finance, hydrogen, investor and consumer demand, and much more.

This is just a hint of what we might do together to support the global energy transformation. We at KPMG look forward to continuing the conversation with you and your organization.



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## Keynote

# Keynote on the energy transition: Jean Jouzel

**The renowned expert in climate and glaciology presented climate change by the numbers, and explained that actions to date are not enough.**

### How we arrived at this point

While the audience was familiar with the link between the energy industry and climate, Jouzel provided the facts and figures behind the relationship.

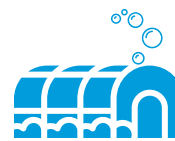


CO2 in the atmosphere has increased by 40 percent over the last 200 years, since the industrial revolution.



80 percent of energy is linked to fossil fuel use worldwide.

Two-thirds of annual greenhouse gas emissions are linked to fossil fuel use.



As a result, overall global temperatures have increased by 1 percent, and the last five years were the warmest on record in 150 years.



90 percent of the additional heat generated by fossil fuel use and the greenhouse effect is trapped by the ocean.



Sea levels are rising at a pace of one centimeter a year, with one millimeter due to thermal expansion and the majority due to ice melt.

## Jean Jouzel

Research Professor Emeritus,  
French Alternative Energies  
and Atomic Energy  
Commission (CEA)

**We can explain that earth is warming by our activities, while natural variation can account only for one tenth of one degree. So we are clearly in a world that we have already modified in terms of climate.**

### Why business as usual can't continue

Current industrial, building, transport, and other activities will likely lead to warming of four to five degrees by the end of the century. This will lead to, among other impacts, sea level rise and acidification, weather extremes, loss of biodiversity, and ecosystem pollution.

Meanwhile, water and food insecurity will likely create climate refugees among low-income populations.

**“The main consequence of a global climate change may be an increase of inequalities.”**

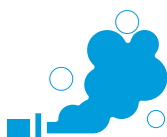
### Keeping the global temperature increase to a minimum

Most countries are not on track to meet commitments to the Paris Agreement and emissions continue to rise.



37 billion tons of CO<sub>2</sub> emissions were from fossil fuels in 2018 and rising toward 65 or 70 billion tonnes.

With the Paris Agreement, emissions would still reach 55 billion tons by 2030.



Even these lower emissions put average global temperature on a trajectory to rise 3 degrees Celsius by the end of the century, compared to an increase of 4 to 5 degrees Celsius with business as usual.



To keep the rise to approximately 2 degrees Celsius, emissions need to stay at 40 tonnes or less for a 1.5 degree Celsius increase between 2020 and 2030.

**“Energy is really at the heart of this possibility of going towards a low-carbon society.”**

This can be achieved by using less than 20 percent of fossil fuel reserves. To get there, the financial sector should invest in industries that operate compatibly with the 2-degree objective; more focus should be placed on energy efficiency; and fossil fuels without carbon capture and storage should be divested, with greater consideration for nuclear and renewable energy.

## Jouzel's credentials

Jouzel, whose primary work has centered on the reconstruction of past climate based on the study of the Antarctic and Greenland ice, has been honored with numerous positions and awards.

- Currently, Research Professor Emeritus, French Alternative Energies and Atomic Energy Commission (CEA).
- Vice-chair of the Scientific Working Group of the Intergovernmental Panel on Climate Change (IPCC), 2002-2015.
- Corecipient of the Nobel Peace Prize, 2007.
- Head of the Institute Pierre Simon Laplace climate science organization, 2001 to 2008.
- Earth science and related awards include the Milankovitch and Revelle medals; the gold medal from the French National Centre for Scientific Research, 2002; and the Vetlesen Prize, 2012.
- Elected as a foreign member of the U.S. National Academy of Sciences in 2016 and as a member of the French Academy of Sciences in 2017.



## Panel 1



### Gardiner Hill

Vice President,  
Carbon Management,  
BP International Ltd

### Moderator

Simon Virley, Partner and KPMG in  
the UK Head of Energy

### Panelists

Gardiner Hill, Vice President,  
Carbon Management, BP  
International Ltd

Andy Kinsella, Chief Executive  
Officer, Mainstream Renewable  
Power Ltd.

Dermot Nolan, Chief Executive  
Officer, OFGEM

Olivia Breese, Head of Market  
Development, Ørsted

Mathieu Hue, Chief Executive  
Officer, EDF Renewables

# Strategies of business transformation across the energy industry

**A diverse cross-section of panelists from business and government discussed how their organizations are approaching the energy transition, and what is still needed in order to meet stretching decarbonization targets.**

#### BP: Industry's role in battling climate change

BP sees a dual challenge for the energy transition. That of reducing emissions while meeting the energy demands of a growing population and an expanding economy that could lift 2.5 billion people out of poverty.

"We believe a rapid transition is really quite important," BP's Hill said. "We think a delay will likely result in a very disruptive transition, which is bad for society, bad for governments, bad for industry."

The company launched its Advancing the Energy Transition framework in 2018, which includes targeted net zero emissions growth through 2015–2025 while expanding business to meet energy demand. It also commits to growing renewable and low-carbon businesses.

For instance, BP is investing heavily in EV charging, including installation of 400 rapid-charging stations in the UK by 2021 and a partnership with DiDi ride-hailing in China to create an EV infrastructure. In fact, most of BP's low-carbon projects are managed through joint ventures.

**Big oil and gas companies like BP need to play a role using their engineering expertise and the strength of their balance sheet to bring cleaner energy to those who really need it.**

—Gardiner Hill  
Vice President, Carbon  
Management, BP International Ltd

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Hill pointed to the potential benefits of a government concept for low-carbon “industrial hubs.” These would allow companies to share infrastructure for carbon capture storage and transportation at lower cost than individual efforts, with the additional impact of helping the UK compete globally for business.

“I think it will take a grand coalition between governments willing to get into action—society willing to buy and use these new low-carbon products, and industry to make them available—in order to meet society and government goals.”

#### **Mainstream Renewable Power: Rapid change in unexpected markets**

“Our cornerstone when we founded the company was that the world is in a once-off transition from fossil fuels to sustainable energy,” Mainstream Renewable Power’s Kinsella said. “Just look what has happened in our industry in 10 years.”

- Peabody Energy was the world’s largest independent coal company and ranked by Fortune as one of America’s most admired companies in 2008; eight years later, the 125-year-old company was bankrupt.
- Approximately 20 percent of countries had renewable energy targets and policies in 2008, up to 90 percent today.
- In 2007, the IEA estimated 180 gigawatts of wind and solar PV worldwide within 14 years, but seven years later capacity had reached 900 gigawatts—five times as much in half the time.
- In 2008, 7 percent of new capital investment was in electricity generation from renewables. By 2019 it was 66 percent, twice the investment in fossil fuels.

Economics are driving the transformation given the “staggering reduction” in the lifecycle cost of energy from wind, solar PV, and on- and offshore wind, now beating out coal, oil, gas and nuclear.

“We don’t need subsidies anywhere in the world at this stage,” Kinsella said. “The discussion about the cost-effectiveness of renewables is over. I think the discussion now is about how to integrate large-scale renewables into our grids and speed up the transition.”

**Even in countries where there’s not a regulatory drive to really push for renewables, communities won’t accept coal. You see people power in places that you wouldn’t expect to see it.**

**— Andy Kinsella**  
*Chief Executive Officer,  
Mainstream Renewable  
Power Ltd.*



(L to R) Gardiner Hill, Vice President Carbon Management, BP International Ltd; Andy Kinsella, Chief Executive Officer, Mainstream Renewable Power; Matthieu Hue, Chief Executive Officer, EDF Energy Renewables; Olivia Breese, Head of Market Development, Orsted; Dermot Nolan, Chief Executive Officer, OFGEM

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## Panel



### Matthieu Hue

Chief Executive Officer,  
EDF Energy Renewables

While many governments and large fossil fuel entities around the world are doing relatively little to make the transition, there are promising markets, such as Chile, where Mainstream is building out wind and solar PV projects approaching 1.8 gigawatts.

Chile's geography creates an "island" without access to natural resources, making renewables a greater necessity. The country's leaders have put forth regulations and policies to support the effort, with technology-neutral auctions that eliminate the need for subsidies.

Other interesting markets include South Africa, which has the largest dependency on coal today but has committed to closing down nearly all of its coal plants by 2045, and Vietnam, which has quickly built significant offshore wind.

#### **EDF Renewables: The need for a regulatory framework**

France-based EDF is the largest producer of low-carbon energy in the world, with plans to double its renewable electricity portfolio to 50 gigawatts by 2030, according to Hue, Chief Executive Officer of its UK business.

In the UK, more than 50 percent of energy is produced from clean energy technology and expected to rise dramatically following the net zero emissions law passed in 2019 targeting 2050 to complete the goal. The UK can achieve net zero even sooner, closer to 2030 or 2035, with significant investment, Hue said.

The UK government's Offshore Wind Sector Deal is a good example of collaboration that can simultaneously support environmental and economic goals, and could be replicated elsewhere.

However, "every country is different, and it's not 'one solution wins it all.' Companies have to understand the local market, establish a presence, and adapt before proposing the right solution," he said. "A combination of technologies can work quite well."

Meanwhile, a lot of attention is being paid to how electric vehicles (EVs) can reduce emissions, but the path forward is less certain.

**We need to work on the regulation framework to accelerate transformation. And there is a lot to be done in the UK to think about how to facilitate investment, because the appetite is there, the technology's there, the solutions are there.**

—**Matthieu Hue**  
*Chief Executive Officer,  
EDF Energy Renewables*

"I would just highlight how important regulatory frameworks are to actual deployment of technology and investment," Hue said. "A lot has to be done on that side if we want to see transport moving into low-carbon emissions as well."

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### Ørsted: Renewables' ability to stand on their own

Ørsted has completely transformed itself over the last 15 years from an oil and gas business (then called DONG Energy) to a global leader within clean energy: the world's leading developer, owner, and operator of offshore wind farms, with a target of 12 gigawatts of operational capacity by 2025 and a global footprint.

Developing close relationships with local stakeholders and customers is essential for bringing energy transition solutions that new markets actually want, Ørsted's Breese said. "It's not enough anymore to show up with a 1.2 gigawatt offshore wind project," customers need targeted energy solutions that address their specific needs.

Competition, which has been introduced by regulators globally, together with scale and industrialization of the offshore wind sector, have driven down costs rapidly since 2012. Now, given the need to meet targets and increasing global energy demand, "there is sufficient opportunity for everybody—strategic developers such as ourselves, oil and gas players and independent developers—to bring their own strengths to the markets to ensure that we all act to accelerate the energy transition and provide value to consumers."

Meanwhile, a grassroots resurgence of interest in clean energy across Europe is pressuring leaders to act now. "What we do need in Europe is a cross-governmental 'coalition of the willing' to support the needed build-out of offshore wind to achieve decarbonization targets by addressing planning and investing hurdles which we currently see in individual member states."

### OFGEM: The changing role of the regulator

A considerable increase in energy prices in the UK over 10 years, combined with its adoption of a net-zero carbon target, has given energy regulators the challenging mandate of facilitating the energy transition at the lowest possible consumer cost, according to Nolan, CEO of Great Britain's government regulator for gas and electricity.

Meanwhile, the collection of entities that require regulation, a homogenous group just five years ago, has radically changed. While the opportunity is enormous over the next 10–15 years, the complexity and sheer number of stakeholders is difficult for a regulator with limited resources to manage, he added.

Considerable progress on reducing carbon emissions in the energy sector has been made, and Nolan suggested coal plants will largely cease to exist in the UK by 2025. But to meet targets, the UK still has to find cost-effective solutions for mobility and heating.

As such, the UK is facing a set of difficult decisions about the future of nuclear energy. While the relative cost of offshore wind at first blush is lower, the scale of investment needed and the demand for carbon-free electricity in the UK going forward is so vast, more than one technology is required.

"It's very difficult to get a level playing field, and perhaps it's a generic concept that doesn't actually exist. But nonetheless, there is a real desire for regulators to say we've got this target, it's the law. We're serious about meeting it and we want to actually facilitate investments that will do that at the lowest possible cost."

Offshore wind is expected to be the fastest-growing renewable energy technology in Europe over the next decade and be cheaper than new-build fossil fuel generation. In order to achieve the decarbonization necessary to keep within 1.5 degrees global warming, European governments must come together in a 'coalition of the willing' to enable offshore wind build-out at even greater speeds and scale. The time has come to stop forcing competition and create an open playing field from a regulatory perspective, allowing everybody to bring their own strengths to the table.

—Olivia Breese  
Head of Market  
Development, Ørsted

It is a complex system, a fragile system. And one of the real tasks for government and the regulators is how to see that system move forward, provide strong investment signals, and yet not frankly muck it up with overly intrusive regulation.

—Dermot Nolan  
Chief Executive Officer,  
OFGEM

## Breakout session



### Cécile Obin

Head of Financing, Neoen

### Moderator

Mike Hayes, Global Renewables  
Leader, KPMG in Ireland

### Panelists

Rob McNabb, Partner,  
Eversheds Sutherland

Cécile Obin, Head of  
Financing, Neoen

Philippe Ducom, President,  
ExxonMobil Europe, ExxonMobil  
Petroleum & Chemical

Helena Anderson, Founder  
and Chief Operating Officer,  
Ikigai Capital

# Developments in sustainable finance— Implications for future capital markets engagement with the energy sector

**Funding the technologies behind  
the energy transition will require a  
combination of new financing sources,  
greater risk appetite, and flexible  
sustainability standards**

### **Project finance has been more impactful than green finance to date**

When it comes to the dual challenge of the energy transition—meeting the world's growing need for affordable, reliable, and secure energy while addressing environmental risk—the ability to finance technologies and bring them to market is key. The International Energy Agency estimates that simultaneously meeting emissions goals and the world's energy demands by 2040 will require substantial investment of approximately \$21 trillion.

Project finance was the biggest lever in getting renewable company Neoen off the ground and operating over the last 10 years, according to Obin, the company's Head of Financing. But the ability to structure deals around project finance has become more difficult as complexity increases and subsidies decrease.

Neoen has pursued several different financing activities including a \$200 million green bond in 2017, but it's limited by a very large number of different standards. The appetite from banks has started to grow over the last 18–24 months, with some interest in green bonds from certain players. However, "there's not really an identified liquidity pool and identified market for this type of product. It's really in its infancy, in my opinion," she said.

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**The market is becoming more complex. The subsidies are getting much less frequent. So we need new financial solutions if we want to keep the prices low.**

—Cécile Obin  
*Head of Financing, Neoen*

Ikigai's Anderson outlined three ESG investment trends she's seen arise over the last few years. First, institutional and private equity investors are becoming more sophisticated about green technology, especially integrated energy solutions.

Second, a "patchwork quilt" of participants is needed to mitigate risk and stabilize cash flows during the energy transition, such as venture capital investors with short time horizons working in partnership with industrial investors who can take a more patient approach.

Finally, asset owners are starting realize "that the stranded asset risk of their portfolios is enormous and doing nothing is not an option," she said, forcing them to review for what will be unsellable in 10 years, where to lower cost of capital, etc.

Given how the consumer is expected to buy, use, and sell electricity in the coming years, a significant potential financing source may come from the tech sector, Evershed's McNabb said. "I think the big technology corporates are going to look to put themselves between the asset owners and the consumer over time. They will obviously bring with them a huge amount of technology experiments, and a huge amount of capital as well."

#### **Lenders' view of risk needs to change**

As the nature of sustainability projects changes quickly and significantly, finance models are challenged to keep up, McNabb said.

For example, private power purchase agreements (PPAs) involving large corporates are easy to finance, but down a tier with a lower credit rating, "there's just a complete lack of access to finance." The ability to use mechanisms like green bonds to hedge and spread risk creates opportunities, but the attitude of lenders and credit committees toward the risk is the key.

## **Breakout session**



### **Rob McNabb**

Partner, Eversheds  
Sutherland

**I do think we need perhaps a bit of a change of attitude amongst the lender group in terms of taking on some risks that traditionally they wouldn't look at in transition projects.**

—Rob McNabb  
*Partner, Eversheds  
Sutherland*

## Breakout session



### Helena Anderson

Founder and Chief  
Operating Officer,  
Ikigai Capital

Anderson agreed. As the renewable sector moves to a subsidy-free environment, it can learn how structure financing products from oil and gas, where merchant risk is a given. Moreover, that risk is being compensated. The ability for renewables to now compete effectively with the alternative also reduces risk from a financing standpoint, ExxonMobil's Ducom added.

On paper, taking the risk can be a tough sell, McNabb said. But the U.S. market has found a way to deal with it, and more models have been developed to address some challenges, such as PPAs with a floor price for the debt period.

**We all got a little bit lazy because we got used to getting government subsidies. For those of us who started our careers in oil and gas, we still remember that there's a thing out there called 'finance with merchant risk,' and it requires a little bit of extra thinking.**

— **Helena Anderson**  
Founder and Chief Operating  
Officer, Ikigai Capital

### **The EU sustainable financing classification needs more “shades of green” to reflect the reality of the energy transition**

The European Commission established a sustainable financing taxonomy, designed to clarify the sustainability profile of activities for investment. The process is still in the works, especially the qualifications around meeting certain technical hurdles, which can be complex, Ducom said.

While a common definition is healthy and will create incentives for companies to develop products that earn the sustainability label, it needs to have “more shades of green” to be flexible enough for transitional solutions, with elements such as technology neutrality and lifecycle analysis to better quantify the contribution of activities. For example, the current taxonomy does not consider replacing coal with gas acceptable.

The system also should continue to offer positive reward, not punishment. “It’s a carrot, not a stick,” he said. The taxonomy does not replace the fact that projects need to be cost-competitive and provide a solid return to shareholders. “The sustainable financing label or a green finance label could help certain projects, but they have to be good to start with.”

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- The EU Sustainability Taxonomy Framework\*
- Climate change mitigation
- Climate change adaptation
- Sustainable use and protection of water and marine resources
- Transition to a circular economy
- Pollution prevention and control

Protection and restoration of biodiversity and ecosystems to qualify as environmentally sustainable investment, a project must:

- Contribute significantly to improve at least one of the six objectives
- Not cause significant harm to any of the other five objectives;
- Comply with minimum social and governance standards;
- Meet certain technical screening criteria

\*As of December 2019

**It's a very deep green taxonomy, which means it's going to help define what perfect looks like. But in the energy transition, we need to find a way to support transitional solutions—I call them 'good,' not necessarily perfect.**

**—Philippe Ducom**  
*President ExxonMobil Europe,  
 ExxonMobil Petroleum & Chemical*

## Breakout session



**Philippe Ducom**  
 President, ExxonMobil  
 Europe, ExxonMobil  
 Petroleum & Chemical

## Breakout session



### Dermot Nolan

Chief Executive Officer,  
OFGEM

### Moderator

Arun Mani, Principal, U.S.  
Power and Utilities Strategy and  
Transformation Leader, KPMG in  
the US

### Panelists

Arnaud de Moissac, Chief  
Financial Officer, DC Brain

Dermot Nolan, CEO, The Office  
of Gas and Electricity Markets  
(OFGEM)

Abhilash Panda, Deputy Chief for  
Europe and Central Asia at the UN  
Office for Disaster Risk Reduction

Vassily Savin, Head of the Power  
and Utilities Group, KPMG in  
Russia

# Building resilience – The art and science of the possible

**Policymakers and company leaders  
discuss what resilience in the energy  
sector means, and the cost and  
standards necessary to develop it**

### Redefining resilience

From tropical storms to wildfires—recent events have demonstrated the increased severity and frequency of climate-related events that have heightened the awareness of the need for greater resilience in global energy systems.

Nolan from the UK regulator OFGEM said that after London experienced its first power cut in August 2019 in over a decade, “It reminded me that whatever happens in energy in terms of prices, carbon, climate change, etc., ensuring that there is a flow of power is probably the single most important issue to consumers.”

But resilience is more than having capacity to meet needs, Nolan added. It’s ensuring that if there’s severe weather, cyberattack, or another shock to the system, it remains stable and can recover quickly in order to maintain public trust and confidence.

**Energy infrastructure is everything  
you don’t think about. The rigs  
and refineries that turn fossil fuel  
into the gas that makes your car  
go. The electricity that powers  
the streetlights and lamps that  
guide your way. This infrastructure  
vanishes into the oblivion of  
normalcy. Until it breaks. Then  
everyone notices.**

—Arun Mani  
*Principal, U.S. Power and Utilities  
Strategy and Transformation  
Leader, KPMG US*

A recent review of multiple blackouts across Europe, Asia, and the U.S. highlighted that issues were in fact occurring in countries with excess power generation capacity, according to KPMG's Savin. These systems have become much more complex and fragile, requiring all-new ideas around power generation and considerations for resilience.

For example, resilience is becoming more of an exercise in predicting behavior and consumption, said de Moissac from DCbrain, which helps network managers automate their systems. Once-static networks can now experience shifts in consumption several times a day and therefore must be designed to manage the dynamic nature of demand going forward.

Panda, from the U.N. Office for Disaster Risk Reduction, views resilience according to his organization's mandate and sees how global decisions are increasingly affecting and creating new vulnerabilities. As such, resilience is no longer just about recovery, but rather transformation in order to ensure minimal disruption and maximum individual accessibility to services.

#### **Challenges of new technologies and expanding number of generators on the grid**

As power generation expands to additional players (i.e., solar-powered generators and energy storage systems) new risks and other challenges are introduced. That's what is happening in the UK, where the retirement of a smaller number of large coal plants is being replaced by a much larger number of sometimes very small generation plants, diminishing the "natural inertia" in the system that once assisted recovery, Nolan said.

Meanwhile, data is necessary for predicting consumption, optimizing networks, and integrating renewables, which all support resilience. But this necessarily requires resilience for the data networks themselves, de Moissac said.

Massive amounts of information must be collected from sensors, scrubbed for accuracy and quality, and then analyzed properly to produce usable insights, he said. This requires huge information technology (IT) infrastructure investment before organizations can begin to apply artificial intelligence and machine learning.

**We don't recommend governments or our stakeholder groups to be only ready to adapt, because adaptation is a human psychology—we will adapt, whatever happens. We are asking them to be transformative—that's where we see future resources and capacity going to.**

**—Abhilash Panda**  
*Deputy Chief for Europe and Central Asia at the UN Office for Disaster Risk Reduction*

## **Breakout session**



### **Abhilash Panda**

Deputy Chief for Europe and Central Asia at the UN Office for Disaster Risk Reduction



## Breakout session



### Vassily Savin

Head of the Power and Utilities Group, KPMG in Russia

### How to value resilience

While it's clear that billions upon billions of investment are required build resilience, the cost of failing to act is underestimated, Panda said. Many interdependencies in the ecosystem are not recognized. "With a direct impact on the infrastructure, you may have the resources or insurance to revamp it. But the dependencies and the domino effect that these are creating are still not being looked at."

**If you want to use data to improve the resilience of your network, you also have to have resilience of your data network. You can't imagine taking strong and really impactful decisions with data without it.**

—Arnaud de Moissac  
Chief Financial Officer, DC Brain

One study underlined that large-scale weather events like floods have a greater impact on small and medium enterprises, which are responsible for most of the job creation in Europe but are more dependent on energy, water, and IT infrastructures than larger, multinational corporations, he said. When an event forces these businesses to stop operating, 40–60% don't return.

The cost and value of building that resilience, including the ability to leverage high-quality data and institute cybersecurity protections, is very difficult to estimate and to describe, Nolan said. Resilience "also doesn't produce any immediate result and therefore is often politically difficult to sustain."



(L to R) Arun Mani, Principal, KPMG U.S.; Dermot Nolan, Chief Executive Officer, OFGEM; Vassily Savin, Head of Power and Utilities, KPMG in Russia; Arnaud de Moissac, Chief Financial Officer, DC Brain; Abhilash Panda, Chief for Europe and Central Asia United Nations Office for Disaster Risk Reduction



Meanwhile, mitigation continues to receive more financial resources because it's measurable, Panda said. "You can count carbon. But resilience and adaptation... You have to wait for a same magnitude of event to happen, and the less number of people dying or less infrastructure damage is then your benchmark. And it takes periods of time."

The ability to leverage data will help keep costs down, de Moissac said. Networks can cost less to build and manage when data and machine learning can help predict peak consumption based on the dynamic profiles from new districts. Machine learning can also help manage the mix of fossil-based and renewable energy by using the latest data to forecast how customers will consume the power.

### Creating standards

"There is far greater recognition today that past conditions can no longer serve as reasonable proxies for the future," Mani said. "Cities are growing faster than ever, even as infrastructure assets are aging and climate change is presenting ever greater risks. These threats are compounded by the fact that rapidly growing urbanization, aging infrastructure, and climate change all amplify each other to create unprecedented risks."

While the costs remain unclear, some governments are making an effort to set reasonable standards, Nolan added. Targets for resiliency can be intrusive and often wrong, so the effort is to think about what new standards might be within the system, such as for the black start process.

These new resilience standards should create new players and new analysis from greater amounts of more reliable data, Savin said. Meanwhile, global risk models are not yet developed enough because uncertainties and assessments are regional, Panda said. Likewise, cost-benefit analyses can't be applied across the board, and events are increasingly large enough in scale to impact across borders, which is affecting how investments will be made in the future.

Climate change readiness is just one of many facets of resilience, he added. Increasingly, the U.N. is urging companies and institutions to consider organizational resilience and "think resilience," the attitude that the effort can't be done alone. This is to counter the narrative that efforts have been more or less divided between mitigation and adaptation, unfortunately leading to politicization that negatively impacts the resilience discussion.

## Breakout session



**Arnaud De Moissac**  
Chief Financial Officer,  
DC Brain

## Moderator

Jean-David Aurange  
Partner, Head of People and  
Change, KPMG in France

## Panelists

Pierre Deheunynck, Executive  
Vice President in charge of ENGIE  
Group Human Resources, ENGIE

Evert Den Boer, Chief Executive  
Officer, Greenchoice

Julien Perez Vice President  
Strategy & Policy, Oil & Gas  
Climate Initiative

**The youth are the  
future employees  
and the future  
customers of  
your business.  
If they are not  
convinced that  
you can play  
a role in the  
transition, you're  
just killing your  
future business  
model.**

—Julien Perez  
*Vice President Strategy  
& Policy, Oil & Gas  
Climate Initiative*

# Redefining leadership, culture and organization— The human side of business transformation

**As energy companies shift their business  
models for a low-carbon future, their  
workforces and culture are challenged to  
change dramatically as well.**

### OGCI: Driving transformation from the top down

The OGCI's combination of 13 national and private companies with differing views from different cultures would typically make it a challenge to find common ground if the company's CEOs themselves weren't leading the initiative, said Perez, who heads up strategy and policy.

"It looks like an impossible equation, but actually having the CEOs involved and really hands on makes the decision process much, much quicker," he said. "They know how to implement from the big picture, and they know the challenge of the low-carbon economy and how to transform that into operational actions at their companies."

Success at the company level requires a change in mind-set, including the need for organizations to inject a "climate culture" into the operational layers of the assets, Perez said. An employee whose performance was judged by the number of barrels produced each day needs to think differently when greenhouse gas emissions are a performance measure as well.

The shift toward new business models also requires companies to strike partnerships with new stakeholders, including those representing younger generations as well as the United Nations, public officials, and others responsible for designing policies that can support business efforts, he said. "Engaging with the governments and showing that the low-carbon economy creates jobs and will rely on the local value chain is one of the key messages that we are trying to push forward."

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Competition between the members of OGCI has become a main impetus for transformation, Perez added. Within just five years of the organization's launch, one of the oil companies that was far behind in its climate change mitigation efforts is now pushing the rest.

"This spirit of 'create and compete' shows that when one company is moving forward with an idea, I'm pretty sure that in the next two to three years you're going to have something like 80 percent of our companies do the same."

#### **ENGIE: The importance of a bold purpose**

When Deheunynck joined ENGIE to head HR four years ago, the company was "upside down," he said. The first new CEO in 20 years, Isabelle Kocher, had launched a multiyear transformation that involved divesting or closing EUR\$15 billion in coal plants, oil production and other assets, and investing EUR\$18 billion in new, nonfossil, fuels-based assets. The decision drastically reduced earnings and revenues—more than \$20 billion between 2011 and 2015—placing obvious stress on employees, leadership, and board directors.

Isabelle Kocher was putting out the strong statement that the world cannot continue the way it is, the company will die if we do not manage a big shift, and we have to change—ourselves."

Stating such a bold purpose was a key ingredient to making the transformation successful, Deheunynck said. The company set a goal to move from being one of the top five CO2 emitters to outside the top 100. Half the existing executive team was replaced with outsiders, and employees were assessed based on their alignment with the vision for a no-carbon future.

**You cannot  
do things for  
achieving  
such a radical  
result without  
being yourself  
radical in your  
management  
and leadership.**

**—Pierre Deheunynck**  
*Executive Vice President  
in charge of ENGIE Group  
Human Resources,  
ENGIE*



(L to R) Jean-David Aurange, Partner, Head of People and Change, KPMG in France; Julien Perez, Vice President, Strategy & Policy, Oil & Gas Climate Initiative; Evert Den Boer, Chief Executive Officer, Greenchoice; Pierre Deheunynck, Executive Vice President in charge of ENGIE Group Human Resources, ENGIE

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## Breakout session



**Evert Den Boer**  
Chief Executive Officer,  
Greenchoice

Other keys to success included involving more employees in decision-making, decentralizing the organization to get closer to customers and regulators, introducing more digital technologies, and developing the renewable energy solutions customers really want. By 2019, the ENGIE was organically growing at 8 percent. Its share price has increased and efforts have opened access to new, significant clients.

The clear sense of purpose, efforts to include more voices in decision-making, and “walking the talk” by instituting its own green policies also are helping ENGIE attract talent, a primary concern among energy companies trying to appeal to younger generations. “They are not going to continue to join companies that are not committed seriously toward zero carbon transition.”

### **Greenchoice: The benefits of being nimble and authentic**

Greenchoice, founded 18 years ago, has been a renewable energy company from the start, CEO de Boer explained. Its customers tend to be early green innovation adapters as well as government organizations with goals for 100 percent renewable energy.

Greenchoice’s model allows customers to participate in generation through crowdfunding or coshareholding, which automatically creates a community, leads to high customer satisfaction, and reduces churn.

While competition is starting to come from the majors, Greenchoice’s strength in decentralized, local energy is hard for the larger companies to replicate. “I see major companies moving from a centralized fossil world to a centralized green world. That’s a big transformation, but it’s still centralized.”

Industry will continue to need centralized energy production and distribution, where offshore wind will play a major role, de Boer said. “But I see a more decentralized world developing where basically people generate their own electricity or together with their neighbors.”

**“If employees are aligned on the purpose and you give them the empowerment, it’s impressive what young people can do.”**

**—Evert Den Boer**  
*Chief Executive Officer, Greenchoice*



Greenchoice has doubled its staff in the last few years to approximately 400 with an average employee age of just 31, creating what de Boer referred to as a “millennial paradise.” Echoing his fellow panelists, de Boer said that the company’s clear stated purpose, so important to younger generations, has helped attract and retain that talent.

Constant discussion between management and staff about how to align strategy and goals to the purpose, as well as empowerment to act on it, also are essential to these employees, he added.

“It’s important that they really feel what the company is about, what we are doing, and that they feel connected with the leadership.”

Externally, authenticity is critical. “Don’t try to convince customers by investing in one solar plant and then putting out a big advertisement about how good you are, because people don’t buy that nowadays. It has to come from the inside. It has to be real.”



(L to R) Jean-David Aurange, Partner, Head of People and Change, KPMG in France; Julien Perez, Vice President, Strategy & Policy, Oil & Gas Climate Initiative; Evert Den Boer, Chief Executive Officer, Greenchoice

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## Panel 2



### Timothy Jarratt

Group Head of Strategy,  
National Grid

### Moderator

Manuel Santillana, Global ENR  
Deal Advisory Sector Lead,  
KPMG in Spain

### Panelists

Tejpreet Chopra, President &  
Chief Executive Officer, Bharat  
Light and Power Pvt. Ltd

Till Schwarzlose, Director,  
New Markets, RWE Climate &  
Renewables

Timothy Jarratt, Group Head of  
Strategy, National Grid

Rupert Shaw, CEO, Pioneer  
Point Partners

# Renewable investments, where next?

## New technologies and markets are catching the eye of energy providers and developers

### National Grid: Expanding in North America from its Midwest base

National Grid is restricted from owning renewables in Europe, according to Jarratt, group head of strategy for the gas and electric transmission operator in Great Britain. So the company, which already operates transmission services in the Northeast U.S., took its first step into renewables in 2019 with the acquisition of Minneapolis-based wind and solar developer Geronimo Energy.

"Making the move into the large-scale end of the energy transition around wind and solar was the right adjacency step," he said. The U.S. market also is "incredibly attractive," having developed significantly over the last 15 years due to state-driven power purchase agreements and corporate interest in green power.

Geronimo has a pipeline of wind projects across the Midwest corridor and stretching south and east, where it also has opportunities for solar. Additionally, the company is considering offshore wind in the Northeast including in New York, which has set aggressive renewable energy goals.

National Grid is interested in expanding partnerships to share ownership once assets emerge from development companies, such as its joint venture with the Washington State Pension Board, Jarratt said.

"We're aware a different financing model is required for renewables, versus owning pipes and wires, which we've traditionally owned 100 percent and owned forever. There needs to be other sources of capital into assets once they've been de-risked and built and into the next wave of the pipeline."

**There's more than enough opportunity  
in North America. We feel very  
comfortable in the U.S. and Canada,  
it's an area we understand, and there's  
sufficient growth that we don't feel  
the need to look elsewhere in the  
world yet.**

— Timothy Jarratt

Group Head of Strategy, National Grid

### The four elements behind accelerating investment in renewables

1. New business models and market participants
2. New sources of production beyond wind and solar
3. Renewables growth that has become global
4. Technology as the critical component, leading to greater efficiencies

*Manuel Santillana, Global ENR Deal Advisory Sector Lead, KPMG in Spain*

### Pioneer Point Partners: Exploring technologies beyond wind and solar

Pioneer Point Partners is focused on early-stage, core energy infrastructure platforms in Western Europe that it can develop and sell to longer-term capital investors, according to Shaw, the company's CEO.

One growth area is green gas. Creating fuel from biodegradable material is of interest in countries with a heavy agricultural focus, including in the Netherlands and Denmark, where Pioneer is invested in the world's largest producer of biomethane from farm and food waste.

Pioneer also is investing in renewable sources for heating, which is responsible for half of the world's energy consumption and 40 percent of its CO2 emissions. The UK and Scotland, for example, are facing a



## Panel



### Rupert Shaw

Partner, Pioneer Point Partners LLP

**We've done a great job putting renewables into the system for power generation, but the greenification of the gas grid has been very poor. I think everyone will hear a lot more about biomethane in the years to come, particularly from the oil majors who have increasing strategic interests there.**

**—Rupert Shaw**  
CEO, Pioneer Point Partners

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## Panel



### Till Schwarzlose

Director, New Markets RWE  
Climate & Renewables

**I think you have to be very self-reflective. You have to on one hand know what you can bring to the table, what you are good at. And**

**“ you also have to be brutally honest with yourself about what you don't have when you go into new markets. ”**

—Till Schwarzlose  
Director, New Markets,  
RWE Climate &  
Renewables

landfill ban on biodegradable municipal waste. Western Europe needs 40 to 50 million tons of new energy-from-waste infrastructure in the next few years, and that could potentially provide nearly 20 percent of the heat in Europe, Shaw said. Poland also holds opportunity should its political environment settle down.

Finally, technology solutions that support flexibility will be key as distributors try to balance their networks with continued intermittency from wind and solar, coal plants going offline across Europe, and nuclear's unclear future. Pioneer is patiently watching Germany, which needs 15 gigawatts of new renewable generation by 2030 due to nuclear phaseouts but is challenged by massive grid congestion and the political environment.

#### **RWE Climate & Renewables: Building scale in carefully vetted markets**

RWE Climate & Renewables was created through deal with E.ON to become one of Europe's largest renewable energy providers, explained Schwarzlose, Director, New Markets. "Scale is becoming a really important factor in renewables to remain a leading player."

The company concluded it needed to expand out of existing European and U.S. markets in order to reach that scale, and following in-depth, on-the-ground research, entered Japan, Australia, Mexico, and Chile. RWE seeks projects where it can still add value, from greenfield to more developed opportunities.

Looking forward, Schwarzlose said Poland and U.S. offshore wind is interesting to the firm, including floating technologies off the West Coast as a longer-term play, and it is taking a look at offshore wind for India and South Korea as well.

As it expands geographically, RWE is open to partnerships with companies offering complementary skills, Schwarzlose said. "I think we always look for partners that bring complementary skills. We will find the financing at the end of the day, but it's bringing together skills to make something new out of two pieces that is more than just the single piece."

#### **Bharat Light & Power:**

Bharat Light & Power largely uses wind and solar to serve customers in India, which is rapidly adding renewables in its energy mix, founder and CEO Chopra said. Prime Minister Modi recently increased the country's target to 450 gigawatts of solar and wind by 2030/2035.

The effort to meet aggressive targets is challenged by a rapid decline in the solar PV tariff from US30 cents per kilowatt hour about eight years ago to 3–5 cents today. "Capital is going to flow where investors get the fair return," he said. "Therefore, unless we find a sustainable way to ensure a fair return, we won't get the kind of capital we need in India."

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The need for countries like India to partner up with new entrants to the renewables industry is creating an interesting dynamic. “In the old days, it was just us guys on the power generation side. Now you have the oil and gas guys, the insurance guys, the sovereign wealth funds. It’s like a mad rush, and the guy who’s going to win is the guy who is able to access the cheapest cost of capital.”

After one of its turbines burned down, Bharat sought greater control over its asset management. The company started collecting data from its wind and solar farms, wrote algorithms for artificial intelligence and machine learning, and applied what it learned to improve machine availability to the very high 90s percentile range. “We saw a huge positive impact in our ability to predict failures and machines, improve generation and get higher returns.”

**The underlying factor, and the enabler across all these technologies, is going to be digitalization—not only for generation, but we are beginning to see huge applications in transmission and distribution as well.**

—**Tejpreet Chopra**  
*President & Chief Executive Officer,  
Bharat Light and Power Pvt. Ltd*

Once Bharat demonstrated improvements in its own assets, other large utilities in Europe expressed interest. The company established a new business incorporating digital technologies to perform monitoring, reporting, and analytics for close to 2000 turbines and a large number of power plants globally, as well as to help manufacturers and other companies increase efficiencies and lower emissions.

## Panel



**Tejpreet Chopra**  
President & Chief  
Executive Officer, Bharat  
Light and Power Pvt. Ltd

## Keynote



**Pierre-Etienne Franc**  
Vice President, Hydrogen  
Energy World Business Unit,  
Air Liquide

**“The intrinsic density and  
properties of hydrogen are  
just magic.”**

# Keynote on hydrogen's role in the energy transition: Pierre-Etienne Franc

## Hydrogen technologies represent a critical solution to reducing carbon emissions more rapidly while still meeting global energy demands

Hydrogen technologies are ready for scale, according to Air Liquide's Franc, secretary of the Hydrogen Council. Volumes will bring costs down, while clear regulatory frameworks will promote even more volume. At the same time, the urgency of the energy transition and interest in the investment potential of hydrogen will help push the necessary regulations.

Why hydrogen? It's light, abundant, easy to store and transport, and versatile.

## Franc's credentials

Pierre-Etienne Franc is Vice President of the Hydrogen Energy World Business Line at Air Liquide Group, responsible for developing H2 activities and supervising the company's venture capital arm, ALIAD.

He also serves as the secretary of the Hydrogen Council and is past chairman of Hydrogen Europe and of the Fuel Cells and Hydrogen Joint Undertaking to accelerate the market introduction of these technologies.

A leading voice in energy innovation and business development, Franc is the author of three books: *Entreprise & Bien Commun: La performance et la vertu*, about the role of businesses in meeting societal challenges; *Hydrogène: la transition énergétique en marche!*; and *La Management du Client*.

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### A sense of urgency

The “Kaya equation” summarizes the challenge of meeting emission goals on an accelerated schedule: CO2 emissions are driven by the carbon content of energy being used, the growth of the economy and its energy efficiency, the economic welfare of the people, and population size.

Hydrogen technologies that reduce the CO2 content of energy can help solve part of that equation. They also are integral to the four major levers for enabling the energy transition:

1. Increased energy efficiency, which will limit the rise of energy consumption
2. Carbon capture storage and utilization technologies to decarbonize fossil fuel use
3. Switching to zero-emission energy, such as electricity or hydrogen
4. Replacing fossil fuels with renewables

**So we’re very happy with the climate agreement but emissions continue to grow, and we are in a very bad situation. We are going directly to the wall if we continue like that.**



(L to R) Ted Surette, Global Head of Power & Utilities and National Industry Leader, Energy & Natural Resources, KPMG Australia; Pierre- Etienne Franc, Vice President, Hydrogen Energy World Business Unit, Air Liquide

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## The seven roles of hydrogen in the energy transition

1. Enable large-scale renewables integration and power generation
2. Distribute energy across sectors and regions
3. Act as a buffer to increase system resilience
4. Decarbonize transportation
5. Decarbonize industry energy use
6. Decarbonize building heating and power
7. Serve as feedstock using captured

### Hydrogen's contribution to the energy transition

Hydrogen can enable and support renewables integration into energy systems throughout the transition.

Massive storage needs can be met with electrolysis, which can store hydrogen long term and in vast quantities. Hydrogen also can add resilience to energy systems by acting as a buffer and serving as fuel to transport other energy sources without producing additional emissions, such as liquefied natural gas via ship. Finally, hydrogen can be used to decarbonize end uses across sectors, from automotive to heavy manufacturing.

In a scenario where all sectors are decarbonized, H2 could meet an

**Whenever you speak about synthesis gases, which is the mantra of the energy transition, or carbon capture, or electrifying massive, heavy duty, high-mileage equipment for transportation—in fact, you're speaking about hydrogen.**

estimated 78 exajoules or 18 percent of global demand by 2050.

### Market dynamics today

- As renewable costs continue to fall, electrolysis-based hydrogen becomes more compelling.
- As renewables become a primary source of energy, hydrogen becomes necessary.
- Carbon emission regulations in the mobility sector are largely focused on heavy transportation, and transport needs can't be met with batteries alone.
- Studies and decarbonization roadmaps from think tanks, governments, and other players increasingly include hydrogen.
- Hydrogen and fuel cell technologies are market ready.
- Not all solutions are cost-competitive yet, but scale will bring costs down.



Air Liquide has been developing hydrogen technologies for more than 40 years, including pipelines and liquid supply chain, production and distribution capabilities, and high-pressure storage. Recently, it started working with the transportation market to develop infrastructure for fuel cells.

The company also is very involved in advocacy and aligning stakeholders through the Hydrogen Council, a CEO-driven organization.

The council identified four key steps for success bringing hydrogen technologies to scale:

1. Shared vision between key countries for hydrogen technology policy
2. Archetype deployments of new technologies along the value chains
3. Clear and standard regulations favoring competitive deployments
4. Supporting schemes to bridge the gap between initial demonstration and market competitiveness



**Pierre- Etienne Franc,**  
Vice President, Hydrogen Energy World  
Business Unit, Air Liquide

**You've got many scaled projects either being executed or contemplated, looking for the right regulations for effective implementation, representing a 90 billion-dollar pipeline of potential investments. So we are all basically ready now to move to the next step.**

## Breakout session



### Jean-Denis Collin

Regional Manager,  
ElectriFI

### Moderator

Mercedes Sanchez Varela, Head  
of EU Office, KPMG in Belgium

### Panelists

Jean-Denis Collin, Regional  
Manager, ElectriFI

Camille Fronville, Senior  
Investment Officer, Infrastructure,  
BIO Belgian Investment Company  
for Developing Countries

Håvard Halland, Senior Economist,  
OECD Development Centre

Patrick Nussbaumer, Industrial  
Development Officer, United  
Nations Industrial Development  
Organization (UNIDO)

# Emerging economies, catalyzer of the clean energy transition?

**Financiers and developers must overcome common barriers to funding renewable energy projects in emerging markets in order to make significant progress toward global climate goals**

### Issues contributing to the financing gap

In most emerging economies, commercial banks are hard to access, and there's a huge need for private capital, according to Collin from ElectriFI, a \$200 million facility set up by the European Union and European development finance institutions (DFIs) to close the funding gap for clean energy and access to electricity in emerging markets, primarily in Africa.

At present, DFIs or multilaterals provide a significant share of the capital, he said. Financing proposals from local banks tend to lack attractivity in terms of required collateral or interest rates, for example. And institutions could do more to help attract international financiers, for instance by improving the quality of power purchase agreements (PPAs).

Fronville described the financing issue as two-fold. Local commercial banks lack expertise to offer financing that's adequate and tailored for the projects, while international banks are unwilling to take on perceived political or regulatory risk in the emerging market.

Fronville's DFI, BIO Invest, steps in where commercial banks won't to finance energy access, value chain, and other projects. "By financing those first projects and showing that there can be success, it will open up the way for international banks or local commercial banks to invest in those projects."

The number-one barrier to address is the lack of bankable projects in the pipeline, said Nussbaumer from UNIDO and PFAN, which has assisted in raising more than US\$1.6 billion for low-carbon, clean energy, and climate-resilient projects in developing countries.

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"We talk to a number of investors, and they tell us they have instruments, they have capital available, but what they are lacking is strong projects that they can invest in."

**The institutions, including DFIs, should do more to improve the bankability of the projects in order to meet the requirements of the financiers.**

—Jean-Denis Collin  
*Regional Manager, ElectriFI*

Early-stage development capital is insufficient, he added. A project's path from idea to market deployment is long, painful and requires resources that few in the private sector are willing to risk. Public institutions or a blended structure could help carry early ideas forward so that the projects can access commercial financing once they become more mature.

**The key is to essentially deploy the little bit of public resources available in such a way that they have a catalyst effect, and bring in the private sector.**

—Patrick Nussbaumer  
*Industrial Development Officer, United Nations Industrial Development Organization (UNIDO); Programme Manager, Private Financing Advisory Network (PFAN)*

#### **The critical role of institutional investors in achieving clean energy adoption on a global scale**

Private capital is necessary if we want a chance of achieving the goals of the Paris Climate Agreement, said Halland from the OECD Development Centre, which focuses on policy.

Official Development Assistance, which is equivalent to between just 5 and 10 percent of the trillions of dollars necessary to meet climate goals in developing countries, can't do it alone, he said. Unfortunately, institutional investors such as pension funds and sovereign wealth funds have allocated just 1 percent of assets to renewables, approximately.

## **Breakout session**



**Patrick Nussbaumer**  
Industrial Development  
Officer, United Nations  
Industrial Development  
Organization (UNIDO)

## Breakout session



**Camille Fronville**  
Senior Investment Officer,  
BIO Invest

“In my view, development finance should in a time of climate change be all about mobilizing capital from institutional investors. That’s the only way to get to scale.”

The key is to break down that need for trillions of dollars into tickets represented by the small and medium enterprises (SMEs) in developing countries who are pursuing more specific projects that contribute to the larger effort, Nussbaumer said. That’s where public resources can come in to create the portfolio, bundle and securitize the assets, and offer the guarantees that institutional investors need to engage at scale.

**There is a lot of money in the market. And, there are projects. The problem is they don’t seem to find a way to work together. We have to find the pragmatic solution. I think it’s all a question of meeting in the middle.**

—**Camille Fronville**  
*Senior Investment Officer, Infrastructure,  
BIO Belgian Investment Company for  
Developing Countries*

While guarantees and improved regulation have been helpful, “if you don’t have the equity investors for the project, you won’t get the banks along,” Halland said.

DFIs need to engage much more at the equity stage, rather than continue to focus overwhelmingly on debt, he added. One solution is for DFIs to set up platforms for project development with local partners, similar to private equity platforms, and take the top risk to help attract institutional investors.

Halland pointed to India’s National Investment and Infrastructure Fund as a significant example. The fund, which is 49 percent owned by the state, recently attracted \$2 billion in commitments from the Ontario Teachers’ Pension Plan and Australian Super, a superannuation fund.

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### Economic incentives for industry to convert to renewable energy

In order to meet climate goals, in emerging countries with high-emitting industries, the focus should be on converting these industries rather than on households, which consume very little energy relative to households in high-income countries, Halland said. For industry, the economics and reliability of renewable energy sources are the incentives to make the shift, Fronville added. "It's not a question of policies anymore."

**To achieve the renewable energy goals in these countries, it's necessary to go to industry and to look at how you can reduce the consumption of fossil fuels in sectors such as mining or cement.**

—**Håvard Halland**  
*Senior Economist, OECD  
Development Centre*

Indeed, a number of industries are "fed up" with trying to operate on an unreliable grid, she added. "To have a sustainable and profitable business, you need energy. If you can't rely on energy 24/7, it can cost you a lot of money."

"We should not underestimate the costs associated with unreliable power generation," Nussbaumer agreed. "The cost of needing a backup diesel is also tremendous and that still doesn't supply all the energy services that an industry needs."

Technology and business model innovation are helping to lower the cost and expand the reach of renewable sources in emerging markets, he added. For example, mobile payment has opened the door to millions of potential energy services customers who just a few years ago could not effectively interact with providers. Meanwhile, artificial intelligence and sensors are reducing the cost of preventative maintenance and increasing efficiencies.

"What I see in the market is a very exciting convergence of innovation that is opening the door to opportunities that were unthinkable only a couple of years ago, and that are making businesses related to clean energy services much more compelling than they were before."

## Breakout session



**Håvard Halland**  
Senior Economist, OECD  
Development Centre

## Breakout session



**Dr. Brian Motherway**  
Head of Energy Efficiency,  
International Energy  
Agency (IEA)

### Moderator

Cassandra Hogan, Australia Power  
& Utilities National Sector Leader,  
KPMG Australia

### Panelists

Eimear Cahalin, CFO and  
Cofounder, Vivid Edge

Laurent Kraif, CEO, Perfesco

Dr. Brian Motherway, Head of  
the Energy Efficiency Division,  
International Energy Agency (IEA)

Bridget Beals, Clean Energy  
Director, KPMG in the UK

# Energy efficiency— Big potential, too little attention?

**Energy efficiency is a key lever in  
reducing energy consumption and  
greenhouse gas emissions, yet too few  
are taking action**

### Government policies could accelerate efficiency gains

Countries with the greatest increase in energy efficiency to date have policy driving the effort, according to Motherway from the IEA. His agency is increasingly focused on helping governments develop efficiency programs as part of their energy transition goals; however, “progress is not what it could be.”

Energy efficiency, as measured by usage per GDP globally is, broadly speaking, improving each year. However, the rate of improvement is slowing down to about 1.2 percent in 2019 over the previous year, compared to 3 percent in 2015. Global investment in energy efficiency has effectively stalled when it needs to double over the next decade, and then double again in order to meet emissions targets.

Governments are typically “supply-side thinkers,” and efficiency is not at the heart of their energy policymaking, Motherway said. And while regulation has had the greatest impact on efficiency globally, in many places voluntary approaches or market-led approaches are preferred. “Sometimes that’s purely just political fashion.”

There’s also a societal dynamic at play in many parts of the world where demand is growing for larger homes and vehicles as wealth increases, canceling some of the technical efficiency gains, he added.

“Efficiency policy, actions, and investments are going to need to work even harder than ever before if we are to revivify our efficiency progress and get back on track.”

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**In the next 20 years, the world could become twice as efficient as it is today if we just deployed the technologies that are already available and cost effective—before we talk about innovation and new, emerging ways of doing things.**

**—Dr. Brian Motherway**  
*Head of the Energy Efficiency Division,  
International Energy Agency*

#### **Corporations want proven reward for investment risk**

Meanwhile, individual company efforts are constrained by capital as well as by concerns about producing results from investment.

Many organizations have already done “low-hanging fruit,” such as LED light installation and fleet management, said Cahalin, whose company, Vivid Edge, helps customers implement efficiency projects by providing capital and other support. Greater impact will come from more significant improvements to industrial processes, such as heat recovery, refrigeration, and rapid cooling, where companies can save as much as 30 to 40 percent of their energy bill without taking technology risk.

**There is a large constellation of small and medium companies for which there is a huge list of things to do... and at the end of the day, the fact is the installation they have is so different that no one has found the magic bullet yet to address them.**

**—Laurent Kraif**  
*CEO, Perfesco*

#### **Breakout session**



**Laurent Kraif**  
CEO, Perfesco

## Breakout session



### Bridget Beals

Clean Energy Director,  
KPMG in the UK

One Vivid Edge customer struggled to convince company leaders to make a significant capital allocation for a large lighting efficiency project. But with an 82 percent reduction in the lighting bill and a healthier working environment, management agreed to pursue other facility upgrades, such as improved boiler and air conditioning efficiency and solar power for data centers.

Kraif from Perfesco said his company uses a technical approach that includes performance and savings guarantees to help companies overcome skepticism and the lack of capital and technical expertise. Projects have included 35 percent savings from improved cooling processes at a cement company, in addition to an LED project that reduced warehouse lighting bills at a major airline by 20 percent.

Often, it's the CFO that has to be convinced, both Cahalin and Kraif said. In other cases, a cost-cutting CFO may lead the charge and need to persuade the engineering team. Purchasing also can put up a fight trying to protect department turf. "Really, where there's the most success is where the silos are broken down," Cahalin said.

#### Accounting and policy issues stand in the way

The crux of the energy efficiency debate is how to get the capital that's available out to the right place in the right funding structure, KPMG's Beals said.

Governments and policymakers need to take the lead to better support investment, she said. For example, the UK has a 10 billion-pound backlog of major energy efficiency infrastructure projects across the National Health Service and other administrators, but the government's capital restrictions won't allow the upgrades despite the potential savings.

The marginal cost of abating one unit of carbon dioxide through efficiency is actually negative, Beals said. The issue is investment horizon, not cost; regulation with a long lead time for implementation would help.

**There is no shortage of opportunity in the energy efficiency space, for all of these funds to fund these capital projects. The issue is actually getting those projects to market.**

—Bridget Beals  
*Clean Energy Director, KPMG  
in the UK*



Meanwhile, new International Financial Reporting Standards around lease accounting, IFRS 16, are having the unintended consequence of pushing a number of operating leases back onto balance sheets, impacting funding for energy efficiency projects, Cahalin explained. She added that she knows three large industrial companies who are challenged in their ability to undertake energy efficiency projects for this reason.

#### **Digitalization will boost efficiencies and create new business models**

Digitalization is fundamentally changing efficiency, Motherway said. Not only will it allow us to optimize individual systems, but how each system contributes to or impacts the entire grid.

Digitalization also enables the data measurement and verification that leads to confident decision-making and supports new business models, he said. Added Beals, digitalization is helping to solve the intermittency challenge of renewable power generation, and new and exciting business models are developing around this need as well.

Subsidies can help bring innovation to market sooner, but they have to be finite, without extensions, Cahalin said. Instead, tax credits are preferred because they encourage companies to take risks and allow them to fail fast and learn.

Finally, we need to raise awareness that the energy transition can't happen if it's not led by energy efficiency, Motherway said. According to IEA's models, 40 percent of the CO2 abatement required to get on track with the Paris Agreement comes from efficiency. "It's the single biggest intervention. And yet, it's receiving a lot less attention and a lot less investment than other sectors."

**You can have policy with one government, and then you have an election and the policy changes. In any market, uncertainty just kills decision-making.**

**—Eimear Cahalin**  
CFO and Co-Founder,  
Vivid Edge



(L to R) Cassandra Hogan, Partner, National Sector Leader, Power & Utilities, KPMG Australia; Laurent Kraif, CEO, Perfesco; Bridget Beals, Clean Energy Director, KPMG in the UK; Dr. Brian Motherway, Head of Energy Efficiency, International Energy Agency (IEA); Eimear Cahalin, CFO and Co-Founder, Vivid Edge

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## Breakout session



**Ole Henrik Hannisdahl**  
CEO, Grønn Kontakt

### Moderator

Ben Foulser, Director,  
Infrastructure Advisory Group,  
KPMG in the UK

### Panelists

Ole Henrik Hannisdahl, CEO,  
Grønn Kontakt

Jean-Philippe Hermine, Vice  
President, Strategic Environmental  
Planning, Groupe Renault

Lydia Ogilvie, Head of UK  
Strategy, National Grid

# Intersecting energy and mobility

## Advances in low-carbon transportation technology and infrastructure require collaboration among all of the players

### Determining the fuel mix

Transport contributed 27 percent of greenhouse gases in the European Union in 2016. The fuel mix solution to lower emissions depends on the expectations and agendas of individual governments in Europe and abroad, said Renault's Hermine.

Regulation can be a lever, either through manufacturing requirements or by influencing total cost of ownership for customers, such as through purchase and use taxes. The technology that ultimately prevails will be cost-efficient relative to internal combustion engines (ICE) while providing the most environmental benefit.

The path is clearer in Europe, where ICE sales must end by 2040 and EVs are widely available. "Climate can't wait 10 more years, so we won't wait for hydrogen distribution to be ready to change our habits. It's going to be electrical cars."

The market will go through an intermediate period where multiple technologies at various maturities will compete until we converge back to sector winners, according to Hannisdahl from Norway-based charging network Grønn Kontakt.

Until then, plug-in hybrids will likely have a much less significant role than previously thought, he said. Hybrids are today's ICE "plus a bunch of things, doomed to be big, heavy, and expensive." Meanwhile, hydrogen infrastructure still doesn't have the scale.

**We need to start with the customer who's going to buy and use this car, make him or her happy, and develop services in line with customer needs and what's also relevant for the grid at that time.**

—Ole Henrik Hannisdahl  
CEO, Grønn Kontakt

EVs, however, have existing infrastructure that can be built upon, Hannisdahl said. “We’re fairly confident that battery electric has a secure and significant place in the long-term market.”

Other solutions might include a mix of power sources in order to increase range, Hermine added, such as vehicles with a small electric battery combined with a hydrogen fuel cell or biogas extender system.

In making projections, it’s important to understand use case and vehicle type, National Grid’s Ogilvie said. Battery EVs make sense for smaller cars and some light freight. But they will especially take off in fleets where utilization is much higher, and range anxiety is less of an issue due to greater control over where and when to charge.

Opportunities to reduce emissions also exist throughout the wider transport ecosystem where raw materials extraction and vehicle production consume significant energy, Hermine said. Battery production drastically increases energy consumption for EV manufacturing compared to ICE. This has implications for the supply chain, given the footprint of a battery manufactured in China or Korea can be 30 percent higher on average than one produced in Europe.

#### **Infrastructure requirements to support mobility**

One of National Grid’s immediate efforts is determining future charging needs at key locations to help consumers overcome range anxiety and support EV take-up, Ogilvie said.

In particular, there is a gap in real thinking around charging en route. Faster charging points are an answer but require far more capacity. “And all it takes is for somebody who’s thinking about buying an EV to drive into a motorway service station, see a huge queue, and say ‘forget it.’”

EV charging is already mass market, the business model is commercially viable and scalable to EV uptake, and it mostly works, Hannisdahl said. The problem for the driver is traffic peaks.

**It’s a very full ecosystem that we have to implement, including charging, of course, but also the infrastructure in the city. And**

**“ we have to find a way to foster that through regulatory and fiscal frameworks.”**

**—Jean-Philippe Hermine**  
*Vice President, Strategic Environmental Planning,  
Groupe Renault*



(L to R) Benn Foulser, Director, KPMG in the UK; Ole Henrik Hannisdahl, CEO, Grønn Kontakt; Lydia Ogilvie, Head of UK Strategy, National Grid; Jean-Philippe Hermine, Vice President, Strategic Environmental Planning, Groupe Renault

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## Breakout session



**Lydia Ogilvie**  
Head of UK Strategy,  
National Grid

It's not profitable for EV charging networks to build for peak hour service alone, an issue that's exaggerated in Norway where the population largely lives on the coast but drives inland to ski, for example. "That's a lot of infrastructure that's going to sit there and not be used for the entire week, to serve a whole bunch of people coming for three hours on Friday afternoon."

While queues will happen, Hannisdahl said his company's role is to make charging as smooth as possible, and provide options in locations where drivers want to shop or dine.

This kind of infrastructure works well for smaller batteries and more local travel, or big batteries that can get to their destination without charging, he added. But there's a huge problem in the middle, where a charge is needed along the way. That's where something like the range extender Hermine discussed makes sense.

### **Wish list: What OEMs, energy providers, and charging networks want from each other**

The power and utility sector seeks collaboration with the other players in order to deliver on a future mobility system, including—as much as possible—an understanding of future requirements, Ogilvie said. "What are the no-regrets things that we can plan for now to make sure that we are a supportive partner in driving this forward?"

OEMs are willing to work with policymakers and others to shape a regulatory and fiscal framework that can support the power and utility sector, as well as to launch pilots to better understand the requirements, Hermine said.

Manufacturers also want charging stations that are not only widely available, but work consistently and are maintained by specialists who understand the technology and customer needs, he added.

"It's actually worse to have a charging point that doesn't work than not having a charging point at all," Hannisdahl agreed.

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## Breakout session

**Our perspective is, how do we make sure that the energy system, and particularly infrastructure, is ready to support EV rollout, and is not going to become a bottleneck? In a world where infrastructure takes longer than markets to evolve, we can't just be in step, we actually have to be one step ahead in understanding what's coming down the line**

—Ole Henrik Hannisdahl  
CEO, Grønn Kontakt

Grønn Kontakt is very focused on the customer experience, so they also want to work with OEMs on a solution that delivers key information to drivers on the road, such as which charging point will likely be available when it's needed. He just doesn't want to give his brand up to the car manufacturer in the process. "That directly contradicts our business model, because we are trying to get people to choose us."

Meanwhile, power providers need to have a solution-oriented mind-set, one that eliminates barriers and issues for the customer, he said. "What I'm looking for is the communication line that's basically, 'Yes we can, we can do this, and we're here to help you.'"

"There is another reason why we should discuss and collaborate," Hermine said. "It's because we have to share the value that is going to be created." Ogilvie added that sharing value extends to the population as well, "making sure that we have that fairness lens so that we're not finding that some consumers are capturing the value, and others are left behind."



**Jean-Philippe Hermine**  
Head of UK Strategy,  
National Grid

## Keynote



### Philippe Dewost

Senior advisor,  
Internet, Tech &  
Digital Transformation;  
Cofounder, Wanadoo

# Keynote on the convergence of energy and technology: Philippe Dewost

## Addressing our greatest challenges requires a new way of thinking

### Powering digital demand

The digital revolution is over, and the energy revolution has begun, according to Dewost.

Today, digital relies on energy to meet the constant need to recharge devices whose batteries are drained by a proliferating number of applications using increasing amounts of data. In fact, the external powerbank market will grow to an estimated \$18 billion dollars by 2024 in the United States alone.

**“The energy revolution is just starting and this is where we are seeing the shift, because we have storage problems. Energy now is part of each of your digital lives. We have been addicted to data for a while. And now we are becoming addicted to power.”**

## Dewost's credentials

Philippe Dewost's vast experience spans digital technologies, internet and mobile strategy, start-up management, and venture capital.

After cofounding Wanadoo, Europe's number-one internet service provider, he has been involved with and advised numerous innovators, including imsense, purchased by Apple. Dewost also led the €4.25 billion Future Investments Program, which inspired La French Tech ecosystem to attract start-ups to France, as well as initiated a joint blockchain R&D effort.

More recently, Dewost deployed Leonard, the VINCI Group's innovation, transformation, and forecasting program exploring autonomous mobility, climate resilience, artificial intelligence, and more.

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Since the introduction of the smartphone, we have made an effort to “master silicon” for faster charging without circuitry damage, a prime example of how technology and energy mingle together to support progress. Unfortunately, we chose not to make the same effort to reduce global CO2 emissions despite knowing the shape of the growth curve.

For better and for worse, the convergence of technology and energy also is accelerating innovation. It feels like change is occurring more quickly because it is.

Mankind used to have generations to absorb disruption, now that time is extremely compressed. Humans also are linear beings getting lost in exponential change that doesn’t match up with our typically straight view the world.

### **Fostering a better customer experience**

What energy means to the consumer, generally, is driven by their interaction with suppliers. And it’s not good.

In contrast to the tech sector, which has focused on producing a fluid customer experience, the energy sector has made it hard to even determine the basic cost of powering a home or the efficiency of an appliance. The consumer electricity sector has to do better if it wants to engage citizens.

**We are told energy is our future, we should save it. But you don’t even know where to start from when it comes to saving energy in your household. I don’t want my kids to have a PhD in electricity bills to be able to save the planet.**



(L to R) Ted Surette, Global Head of Power & Utilities and National Industry Leader, Energy & Natural Resources, KPMG Australia; Philippe Dewost, Senior advisor, Internet, Tech & Digital Transformation. Co-founder, Wanadoo

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**Once you start telling your citizens that they should do some good because you need them to have impact, how do you count, what do you count, how do you make sure that it has not been counted twice? This is where blockchain enters the game.**

**Enable innovation within your companies. The only limit is talent, and the larger your company is, the more likely you have the talent you need, statistically speaking. You need to detect them, you need to nurture them, and you need to keep them. That's a challenge.**

And in the commercial sector, data center efficiency has improved, but on average, facilities still waste half of their electricity. Yet as Facebook has established, there are solutions. The company's Luleå, Sweden data center has a 1.16 power usage effectiveness (PUE), compared to an average of about 2 PUE across Europe.

#### **Supporting the promise of tomorrow**

Recent developments demonstrate the potential for the application of new technologies to energy.

Electric vehicle batteries are becoming more efficient, and start-ups are attracting funding to find new solutions. Others are experimenting with replacements for lithium, such as with much-more ubiquitous sodium.

Meanwhile, blockchain could track and calculate in an auditable way exactly how much energy is saved, and then be used to incentivize citizens to take environmentally friendly action. On a larger scale, an indisputable record of green energy produced by an entire city of citizens could have value in carbon credit markets. Blockchain can even help prove the provenance of renewable energy bought and sold.

Innovators also are trying to tackle two of the most significant problems of the growing global population—insufficient power and food—by using solar panels to protect crops while at the same time producing electricity.

Dewost concluded his address with three takeaways. First, most technology breakthroughs, from operating systems to blockchain, have been made by individuals. Those people may be sitting inside large corporations right now, and it's incumbent on company leaders to find and support them.

Next, education is the key to solving our challenges, but not just any education. We need to return to our focus on the humanities, the combination of mathematics, history, and philosophy that encourages thinking and understanding before action.

Finally, we need to engage the younger generations with a narrative that excites them to contribute to history, instead of simply defending themselves against what we've left for them.

One such narrative where technology and energy converge is the idea to turn moon ice into fuel. Such a development would radically change the energy challenge of space exploration.

**To me, there is lots of hope, especially if we trust the younger generation. And decidedly, there is hope if we cross what's coming from the tech sector and what's coming from the energy sector.**

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## Breakfast



### Harsh Vijay Singh

Project Lead,  
System Initiative on Shaping  
the Future of Energy,  
World Economic Forum

### Moderator

Thekla von Bülow, Manager, Deal  
Advisory M&A, KPMG in Germany

### Panelists

Harsh Vijay Singh, Project Lead,  
System Initiative on Shaping  
the Future of Energy, World  
Economic Forum

Marine Labat, Global Accounts  
Development Manager, Veolia

Famke Krumbmüller, Founder  
and CEO of OpenCitiz,  
Strategist & Entrepreneur

Jonas Risse, Energy Trader,  
ENGIE Global Markets

# Breakfast session: The role of youth in the energy transition

**As younger generations rise through the ranks of companies and governments, their impact on energy policy and climate action will continue to grow**

#### The desire for a faster transition

Reducing global carbon emissions is a top issue among younger generations all around the world, and they don't think it's happening fast enough. Singh, from the World Economic Forum, shared the findings of WEF's survey of people age 20 to 35 from its Global Shapers Community:

- Approximately 70 percent of young people think the global energy transition is stagnant or too slow.
- Ninety percent believe it's important for their own countries to plan for the transition.

However, the younger generation's dissatisfaction with the speed of the energy transition can be leveraged to fully engage them now in order to secure future successes, Singh said.

The breakfast attendees also answered a survey question about which stakeholders have the biggest impact on the energy transition. Most, 43 percent, placed responsibility on policymakers, followed by energy sector companies at 33 percent, and consumers at 16 percent.

Those answers acknowledge the desire for a multistakeholder approach, Singh said. The importance placed on the private sector reflects its technology innovation and investment in cleaner energy, but the results also could indicate that youth expects more from policymakers than they do from corporations, and they aren't seeing enough.

Meanwhile, policymakers and the private sector cannot make the transition on their own, he added. There's a behavioral component when it comes to end use for which consumers are responsible.

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**The effect of most of the investments and policies now will materialize decades into the future when an entirely new crop of leaders will be in charge, and whose voice is not as a representative today as it should be.**

—Harsh Vijay Singh

*Project Lead, System Initiative on Shaping the Future of Energy, World Economic Forum*

#### Corporate and policymaker roles

Risse, an energy trader at ENGIE, agreed that companies are engaging in the transition, adding that it's a core strategy for his company.

The French utility's heritage is in gas, which the company views as complementary to renewables through the transition. But digitalization, blockchain, and other innovations also are changing the energy trading game, he said, allowing for the creation of new ideas and products, and attracting fresh minds.

Veolia, a global environmental services company, has two roles in the energy transition, Labat said. It helps industrial customers improve their energy efficiency, and it produces renewable energy from waste. The company recently decided to transform several coal-firing power plants into power generators from other sources, rather than eliminate the assets.

Regarding the role of policymakers, it's ultimately the citizens who influence the politicians, and not the other way around, according to Krümmüller from political advisory firm OpenCitiz.

The challenge is that the frequency of elections is at odds with the sustained effort required to make the transition over the long term, she said. The questions then become, just how big of a priority is climate change to the electorate, and what are the costs for changing energy policy?

Krümmüller highlighted two examples: the yellow vest protests in France following the introduction of a green tax on top of already high fuel prices meant to incentivize reduced fossil fuel consumption; and the high electricity prices paid by German industry, which are directly impacting on the country's global competitiveness.

## Breakfast



### Jonas Risse

Energy Trader, ENGIE  
Global Markets

**The challenge with the action on climate change and environmental policy is that it doesn't only bring a long-term benefit. From a politician's point of view, it obviously brings very high, short-term political and economic costs.**

—Famke Krümmüller

*Founder and CEO of OpenCitiz, Strategist & Entrepreneur*

## Breakfast



**Marine Labat**  
Global Accounts  
Development Manager, Veolia

**If you find such purpose in your job, I think you're happy and you are good at what you do. And if you are good in the energy sector, you're good for 'the good.'**

—Jonas Risse  
Energy Trader, ENGIE  
Global Markets

### **Making a difference by joining the energy industry**

Attention to climate policy will only continue to grow as youth reaches voting age, and older politicians are replaced by younger ones, the panelists said.

Veolia welcomes the rising voices on climate change, Labat said. Since 2013, the company has promoted the mission of "resourcing the world," to which employees align to three pillars of improving access to, replenishing, and preserving resources.

**We are really happy to see the public awareness is rising around climate concerns, it confirms our company is doing the right job at the right time, that we are giving solutions to today's world challenges.**

—Marine Labat  
*Global Accounts Development Manager, Veolia*

Risse thinks ENGIE's tagline "By people, for people" exemplifies that every household, every utility, and every consumer plays a role in the energy transition. He said he's encouraged by the engagement of young people who want to better understand energy as a commodity. Moreover, he encourages young friends and colleagues to join the sector and participate even more deeply in the energy transition.

We will see more youth choosing employers based on a sense of purpose rather than just following the money, Singh said. More than 70 percent of young people surveyed said that an employer's position on climate is important in their job decisions.

In fact, Labat said she chose to work at Veolia to not only participate in the energy transition, but also for the company's broader sustainability agenda covering environmental, governmental, and social issues.

The energy industry has become a very attractive sector in Europe to those who want to explore a number of topics and cultures in their careers, Risse said. The search for a purpose-driven career is a mega trend that the energy sector will increasingly participate in.

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# GETC by the numbers



246 attendees



157 companies represented



2 General Sessions



27 countries represented



3 keynotes



6 breakout sessions



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A photograph of two men in dark suits and ties standing on a red carpeted floor in a grand hall with large columns. They are engaged in a conversation. In the background, another man is seated at a table with a laptop, and a sign with the text 'Hello Open World' is visible. The right side of the image is a solid blue area containing text.

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