

TRANSITION FASTER TOGETHER

Setting the scene: Solutions, strategies and policies
for a clean energy future

SAFER, SMARTER, GREENER



DITLEV ENGEL

CEO, DNV GL - ENERGY

“Global warming will have catastrophic consequences for humanity - this is why we signed the Paris Agreement in 2015. Now five years on, we have not made the progress required to deliver on this. To avoid irreversible climate change we must all deliver on the commitments, which aims to limit the global temperature increase to 1.5°C. Currently we forecast a 2.4°C increase by 2050, despite an expected massive build out of renewables in the years to come - but it is far from enough.

Technology, policy and societal change have the power to close the emissions gap and create a clean energy future. The outlook for the required technology is very positive in our opinion. But time and the speed of implementation is against us. All nations and industries must do their part now. The energy industry needs to lead from the front by promoting ideas, sharing innovation and finding ways to work together with other sectors to transition much faster. We need to set measurable key performance indicators for implementation of all contributing decarbonization activities that can make a difference now. We need to use the technology more forcefully. Let's therefore transition faster together.”

A handwritten signature in black ink, appearing to read 'Ditlev Engel', written in a cursive style.

Ditlev Engel





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THE TRANSITION CHALLENGE - FAST BUT NOT FAST ENOUGH

The 2020s is a decade that is being called the 'exponential decade', or the 'decade of transformation'. This is the decade when our food and health systems will change immensely and when the digital technologies underpinning industry 4.0 will mature from experimentation into large-scale application. For most of us the first half of 2020 has brought a new understanding and appreciation of our health and food systems, as the world tackles the coronavirus crisis with the help of the best experts.

As we get used to living with the restrictions that will help save lives, for many of us it may feel as if time is currently standing still, but during all this unprecedented change, the energy transition marches on. This is the decade when the pace of the energy transition will be set; when humanity succeeds or fails to deliver on the Sustainable Development Goals; and when the world either does or does not take extraordinary steps to meet the Paris Agreement.

On April 2 2020, it was announced that COP26, the most important climate negotiations since the Paris Agreement in 2015, was pushed back to 2021 as a result of fighting the unprecedented global challenge and health crisis, COVID-19. However, we can't get complacent. Christiana Figueres, the former Executive Secretary, United Nations Framework Convention on

Climate Change (UNFCCC), who oversaw the 2015 Paris summit was quoted saying: "Emissions must peak this year if we want to limit warming to 1.5°C and the Paris Agreement set the COP26 summit as the moment when all countries would ramp up their targets in line with the steep emissions decline we need to see in this decisive next decade."

With lockdowns in many countries worldwide, some airports closed and restrictions in place in others, as well as less office work, changed commuting habits, lessened demand for manufacturing goods and iron and steel globally, nature is being given a temporary breather from carbon emissions. We don't yet know the full implications of the COVID-19 global shutdown on emission levels, but we know it will be a temporary dip and not a structural change.

As reported by Forbes, "while the decrease in pollution is definitely good news, it doesn't mean that climate change is backing down. Concentrations of carbon dioxide, the gas that's most responsible for trapping heat in the Earth's atmosphere, are up from 413 part per million (ppm) this time last year to 416 ppm now. That's because on average, a carbon dioxide molecule will remain in the atmosphere for about four years. Then, when they leave the atmosphere the carbon dioxide



molecules simply swap places with carbon dioxide in the ocean, which means that the extra carbon dioxide we've added to our atmosphere from burning fossil fuels for decades will remain in our environment for centuries. So, the current decrease in carbon pollution is a mere blip in the overall picture and the climate crisis will still be with us for a very long time."

However, when it comes to tackling the climate emergency, things are heading in the right direction. According to the 2019 edition of our Energy Transition Outlook, renewable energy will provide almost 80% of the world's electricity by 2050 and an electric vehicle revolution will see 50% of all new cars sold in 2032 being electric. The report also forecasts that the energy transition is affordable with the world set to spend an ever-smaller share of GDP on energy, falling from 3.6% of GDP to 1.9% by 2050, driven by the plunging costs of renewables and other efficiencies, allowing for greater investment to accelerate the transition.

Despite this rapid pace, the energy transition is not fast enough. Our forecast indicates that, alarmingly, for a 1.5°C warming limit, the remaining carbon budget will be exhausted as early as 2028, with an overshoot of 770 Gt CO₂ in 2050. Our modelling predicts that the average global temperature is most likely to be 2.4°C above pre-industrial levels by the end of the century. This is based on current

knowledge and trends, combined with projections of key drivers such as population, economic growth and technological advances.

This level of warming is associated with "very high risks of severe impacts" according to the Intergovernmental Panel on Climate Change (IPCC) and the scientific community. But what can be done to close the gap between our most likely forecast of 2.4°C down to the widely acknowledged maximum of 1.5°C?

A faster transition will require high levels of investment, including the implementation of new technology and business models, as well as favourable policy and regulation frameworks. Societal and political thinking and responses to climate change will consequently have a significant impact on how the power sector develops. But that doesn't mean that businesses and scientists on the frontline of the energy transition can't play a vital role and find ways to speed up the transition.

By coming together as a collective of experts from industry, science and governments to identify and champion the solutions that could speed up the transition, we can play a positive role to fight the climate emergency.

NO SILVER BULLET - OUR 10 MEASURES

What can be done to close the gap between our most likely forecast of 2.4°C down to 1.5 °C? There is no silver bullet. As outlined in the 2019 edition of our Energy Transition Outlook, we do believe however, that a combination of measures can get us there. One such combination includes:

- 1 Ten-fold growth in solar power increasing to 5 terawatts (TW) and a five-fold increase in wind power to 3TW by 2030, which would meet 50% of the global electricity use per year.
- 2 Fifty-fold increase in production of batteries for the 50 million electric vehicles needed per year by 2030, alongside investments in new technology to store excess electric energy and solutions that allow our electricity grids to cope with the growing influx of solar and wind power.
- 3 New infrastructure for charging electric vehicles on a large scale.
- 4 More than \$1.5trn of annual investment needed for the expansion and reinforcement of power grids by 2030, including ultra-high-voltage transmission networks and extensive demand-response solutions to balance variable wind and solar power.
- 5 Improvements in global energy intensity (the energy used per unit of output) need to increase by 3.5% per year within the next decade.
- 6 Green hydrogen to heat buildings and industry, fuel transport and make use of excess renewable energy in the power grid.
- 7 For the heavy industry sector: increased electrification of manufacturing processes, including electrical heating. Onsite renewable sources combined with storage solutions.
- 8 Heat-pump technologies and improved insulation.
- 9 Massive rail expansion both for city commuting and long-distance passenger and cargo transport.
- 10 Rapid and wide deployment of carbon capture, utilization and storage installations.

This means we must tackle at least three fronts simultaneously: we need to adopt renewables at scale and at speed; we need to invest in our power grids ensuring they are fit for the future; and we need to boost the adoption of energy efficiency.

THREE VITAL AREAS:

RENEWABLES; POWER GRIDS AND ENERGY USE AND EFFICIENCY

More renewables, strengthened power grids and increased energy efficiency are vital to accelerating the energy transition. But a faster transition will require high levels of investment in these three areas, including the implementation of new technology and business models, as well as favourable policy and regulation frameworks. We've asked our experts and industry professionals for their views on what they predict in the coming years and what is needed to help accelerate the energy transition at a faster pace than is occurring today.

1. Renewables

Government policies are already shifting incentives away from fossil fuels to low-carbon generation. As renewable technologies advance, they will keep getting better and cheaper, leading to a reduced levelized cost of energy (LCOE). Put simply, this is the cost of producing the electricity, averaged over the lifetime of the generation plant. Ensuring that electricity can be produced cheaply will mean that developers won't need to rely on government subsidies, which will be a tipping point for accelerated growth of renewables. Increased installation of variable renewables will bring an associated rise in the application of flexibility options over the coming years. These options will include using excess renewables to produce green hydrogen, demand-side response; storage; and, potentially, curtailment of solar PV and wind output. As costs of solar PV and battery storage continue to fall, they will be increasingly installed together. This may prove a very effective solution to managing daily fluctuations in solar generation for more rural areas.

We call for 10 times more solar power and five times more wind power, as well as a 50-fold increase in battery production for the 50 million electric vehicles needed every year for the next 10 years. But what does it take to achieve these measures? Our upcoming report will draw on expert insight both from DNV GL and the wider industry to explore which technologies we'll need to implement to achieve these targets and which policies are needed to encourage faster adoption of wind and solar power.

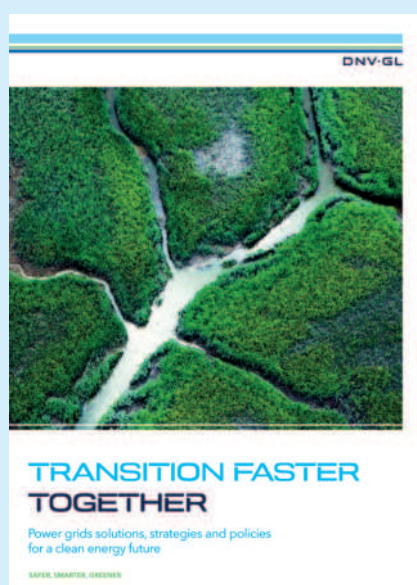


2. Power grids

As more renewable energy is produced our power infrastructure will need to be ready to support it. System operators, utilities and electricity markets must be ready to integrate increased volumes of renewable energy efficiently, while maintaining high levels of grid reliability for consumers. With an increasing share of renewables, operation of the power system will become more and more complex. New technology, including the digitalization of existing systems will need to be considered to future-proof our grids. Some of these investments will include high voltage direct current (HVDC) power transmission systems integrated in the existing alternating current (AC) power system, creating (AC/DC) hybrid grids, more sophisticated Supervisory Control and Data Acquisition (SCADA) systems and data analytics, to enable the ongoing decentralization of generation.

We estimated that more than \$1.5trn of annual investment is needed for the expansion and reinforcement of power grids by 2030, including ultra-high-voltage transmission networks and extensive demand-response solutions to balance variable wind and solar power. How can this be realized? What will it take?

Discover ideas, solutions, strategies and policies to make this possible in our forthcoming report.



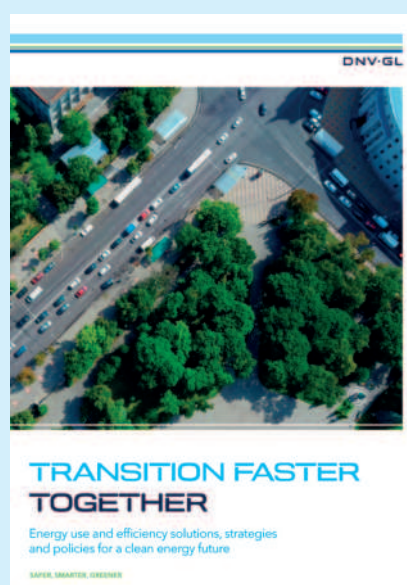
3. Energy use and efficiency

An area of the energy transition which has a large role to play, but is often overlooked, is the way we manage energy. Energy efficiency is a low-cost, readily available way to cut carbon emissions, but is implemented far less frequently than available financial returns merit.

There are key areas which could contribute to improving overall energy efficiency. Energy consumption in buildings could be reduced by 30%-40% if major economies apply already proven technologies to boost energy efficiency, such as electrification of cooking and heating/cooling; greater use of LEDs and smarter controls.

In the next five years, there will be significant acceleration in the electrification of transport, in particular light vehicles and city buses. Rapid EV adoption and better battery technologies will drive CO2 and energy demand reduction and help accelerate the transition, when supported by stronger policies. Transport hubs should not be overlooked; the decarbonization of ports can also play an important role in the energy transition. As the targets imposed on road vehicles result in lower emissions, the relative contribution of emissions from water transport will increase. Understanding the decarbonization potential of port sites will ensure we can bring emissions down across all areas of transport.

In our list of 10 measures to reduce the emissions gap we identify several actions needed to boost energy efficiency in buildings, heating, manufacturing and transportation. What are the drivers and barriers in realizing such measures? What solutions exist today to help us boost energy efficiency? Which technologies and business models, policy and regulation and investment are needed? Explore our findings in our forthcoming report.



THE TRANSITION FASTER HUB: AN INDUSTRY INFORMATION SOURCE

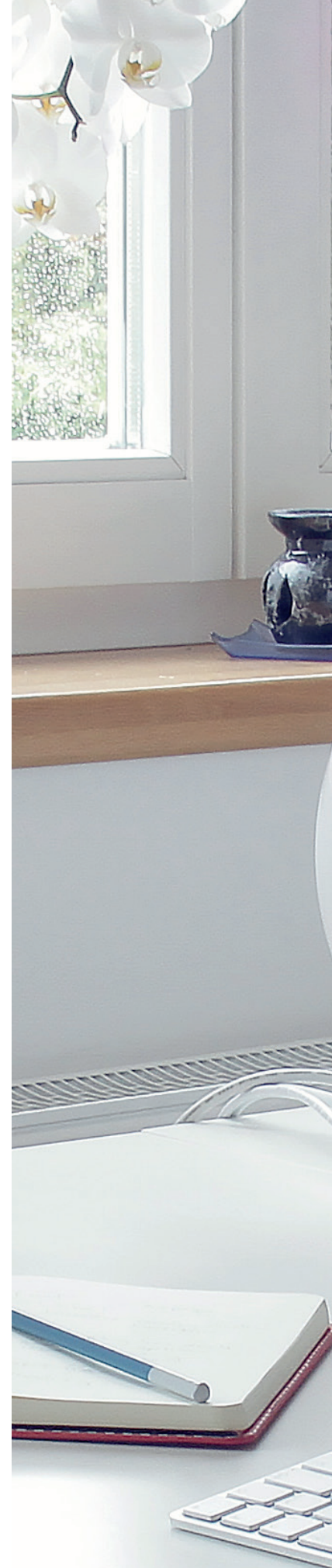
We want to change the forecast. To do so, we need to transition to a clean energy future... faster. We need extraordinary policies, along with solutions, strategies and ideas across the three vital areas of more renewables, future-proofed power grids and more energy efficiency.

The industry needs fast thinkers, new ideas and proven solutions to help accelerate the energy transition. To inspire and inform we've launched an industry information source, the 'Transition Faster Hub'.

The hub is a community where the energy industry can learn from each other through thought leadership reports, podcasts, videos, blogs, and the latest industry news. The hub will showcase best-in-class projects, technology, innovation and solutions that contribute to accelerating the transition.

Subscribe to receive Transition Faster updates and to pre-order your copy of our forthcoming reports, visit the hub at: dnvgl.com/transition-faster

The race against 2°C is on, we still have time, but the clock is ticking. Despite the postponement of COP26 and the pressures placed on us all by the coronavirus crisis, climate change cannot be put on the back burner. The energy industry needs to come together, now more than ever, to share ideas, promote innovation and champion change. We can make a real impact if we transition faster together.



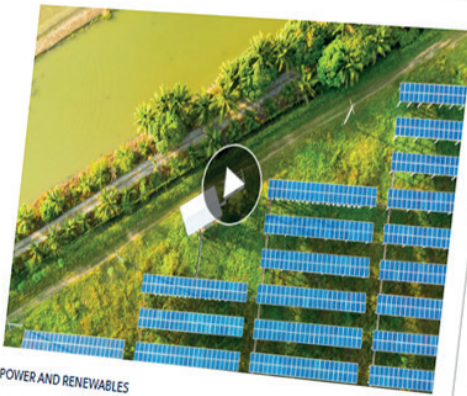
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TRANSITION FASTER TOGETHER

An industry information source of solutions and ideas to help us accelerate the energy transition



POWER AND RENEWABLES

Watch: Transition Faster Together

Video duration: 1min 17sec

Transition Faster Report Series



POWER AND RENEWABLES

Transition Faster Together: Setting the scene

Download our report with solutions, strategies and policies



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We are the independent expert in risk management and quality assurance. Driven by our purpose, to safeguard life, property and the environment, we empower our customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. As a trusted voice for many of the world's most successful organizations, we use our knowledge to advance safety and performance, set industry benchmarks, and inspire and invent solutions to tackle global transformations.

DNV GL delivers advisory, certification and testing services to stakeholders in the energy value chain. Our expertise spans energy markets and regulations, onshore and offshore wind and solar power generation, power transmission and distribution grids, energy storage and sustainable energy use. Our experts support customers around the globe in delivering a safe, reliable, efficient, and sustainable energy supply.