

Uncomfortable truths about the energy transformation

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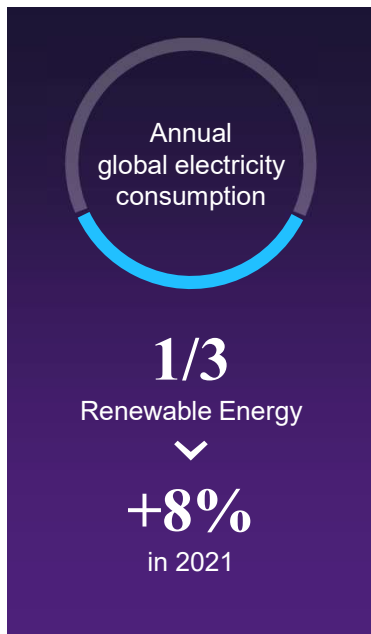


A large industrial turbine component, likely a compressor or turbine section, is being assembled in a factory. The component is massive, with many blades, and is being held by a yellow crane. A worker in a red shirt and yellow hard hat stands in the foreground, looking up at the component. The background shows the factory floor with various equipment and structures.

#1

Fossil fuels are
an answer

#1 Fossil fuels are an answer



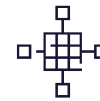
Wind and solar energy are intermittent.

→ Currently no ability to effectively store surplus electricity from these sources for distribution on overcast and windless days.



Power grids were designed for a steady supply of electricity to avoid power blackouts.

→ Natural gas is an important part of the solution as a reliable complement to renewable energy.



Expansion of renewables is not possible without using bridge technologies, e.g., hydrogen-capable gas turbines.

→ Possibility of cutting CO₂ emissions in half by immediately switching every coal plant to natural gas.

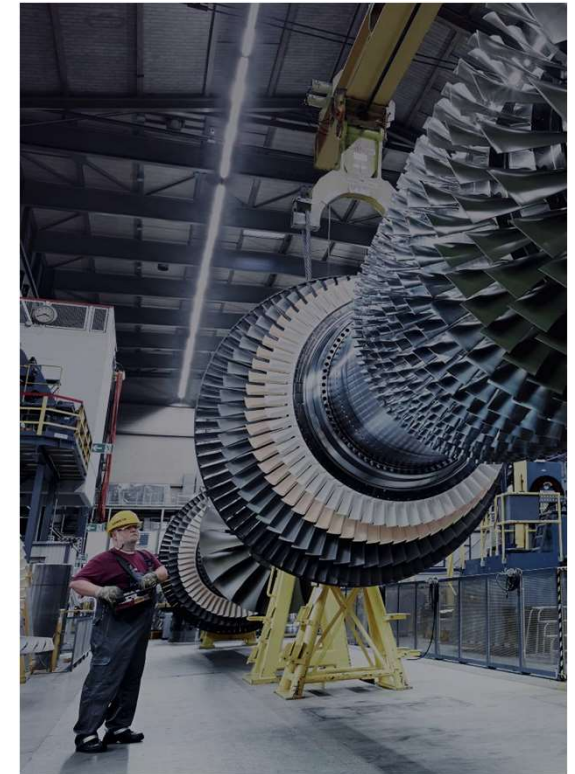


Siemens Energy gas turbines are already capable of running on 75% green hydrogen when the infrastructure for climate-neutral fuels eventually prevails.

→ Siemens Energy gas turbines will be 100% hydrogen ready by 2030.



Every step toward being “greener” is better than not taking any steps, and better than waiting for perfect solutions.





#2

Renewables don't come for free

2022-07-20

Unrestricted © Siemens Energy, 2022

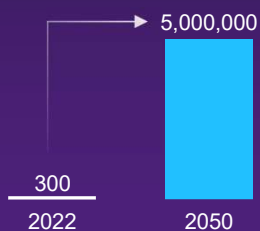
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#2 Renewables don't come for free

Using wind and solar as source of energy on a bigger scale to replace the old energy system will be quite expensive.

For example:
Scenarios limiting global warming to 1.5° C

Demand for electrolyzers in megawatts



Massive investments are needed.

→ EU is already investing €150 billion to accelerate the green transition and develop green hydrogen production in Africa. But shifting the global economy to net-zero will cost around €54 trillion by 2050.



Shifting towards renewable energies and green hydrogen will have a profound impact on the geopolitical landscape.

→ Especially on the oil and gas-producing countries of the world.



According to the 2021 Political Risk Outlook, countries most dependent on oil exports also have the highest risk of political instability.

→ These countries will need to adapt to avoid serious economic consequences.



Procurement of raw materials for sustainable energy systems is also fractious.

→ E.g., Iridium (chemical component of hydrogen electrolysis) is mostly found in South Africa. A switch to green hydrogen in 2040 will require five times as much iridium as we use today.



All these changes will create costs of which we're only just beginning to come to terms with.



A welder wearing a blue protective suit and a black welding mask is working on a metal plate in a factory setting. The welder is holding a welding torch and a metal rod, and a bright blue light is visible at the point of contact. The background is dark and industrial.

#3

Technology is not the issue

#3 Technology is not the issue



There are still innovations necessary to commercialize and make it affordable, but we have the technology to create energy with a much lower greenhouse gas footprint.

The issue:

How can we become sustainable w/o leaving

millions of people behind?

In Europe the net-zero transition will create around eleven million jobs while eliminating six million.¹

- Similar gains and losses will be seen around the world, and regions whose economies have been tied to coal will be particularly effected and will likely bear the worst impact from decarbonization.
- This massive shift will require retraining and support for millions of workers to avoid leaving large swaths of the population behind and underemployed.



Electricity consumption is also expected to double by 2040

- Especially in developing economies where populations are growing, electricity access remains incomplete and investments in clean energy are lacking. Progress should benefit everyone, and these issues need to be tackled sooner than later.



All of this will require a just energy transition with equitable distribution of the costs and benefits of climate change, along with new arrangements for social and economic growth.



¹ Source: McKinsey

Fair distribution of climate change's costs and benefits as well as new arrangements for social and economic growth must be addressed.



The background image is a composite. The left side shows a vast ocean with several offshore wind turbines under a blue sky with light clouds. A small boat is visible in the distance. The right side shows a close-up, high-angle view of a yellow industrial structure, likely an oil or gas platform, with complex scaffolding and a curved staircase leading down. The text is overlaid on the left side of the image.

#4

Infrastructure is an issue

#4 Infrastructure is an issue

Adding renewable energy to the electrical grid will not solve the climate crisis on its own.

The biggest part of greenhouse gas emissions:



Heating and cooling



Industry



Transportation

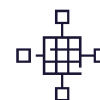
Without coupling these sectors to the power industry, we won't achieve our climate goals.

- In 2019, the combined emissions from industry totaled 36 gigatons – that's nearly a quarter of global CO₂ emissions.
- To stay on track to meet our climate targets, industry alone must save over five gigatons of CO₂ per year.



The technology for sector coupling is here, but the development of its infrastructure continues to lag behind. Additionally, a changing energy mix will also have an impact on grid stability.

- Grids are currently unequipped to handle an influx of distributed energy generation, and sector coupling will not succeed until grids are expanded and upgraded. This is the only way to ensure that the electricity generated from renewables reaches the consumer regions with low losses along the way.



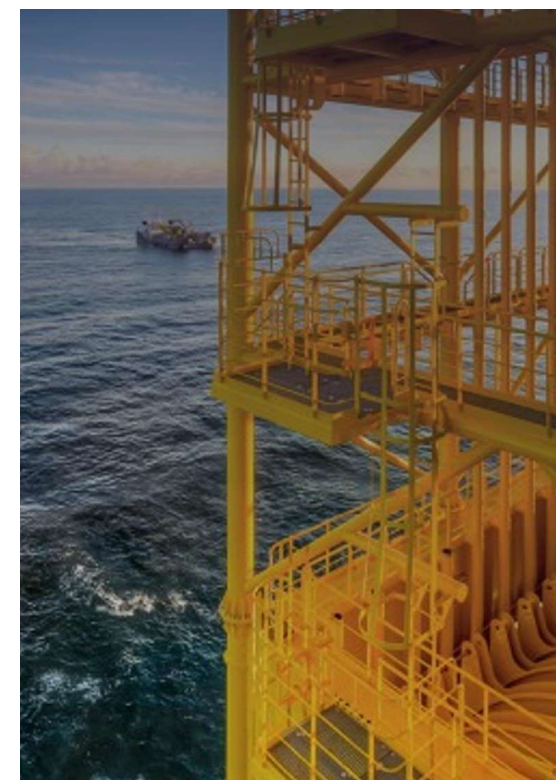
The magnitude of the work needed is immense.

- More than 7,500 kilometers of grid will need to be upgraded or added¹ in Germany. In Brazil, estimates run to around 35,000 kilometers of new transmission. In the U.S., it will be more than one million kilometers.



¹ Source: Federal Ministry for Economic Affairs and Climate Action

Bringing new lines into service takes more than 10 years and requires a dramatic increase in capital spendings.





#5

**We can't do
this alone**

#5 We can't do this alone



The U.S. is committed to halving emissions by 2030.



Germany is phasing out coal by 2038.



China has set a target to become climate neutral by 2060.



And the EU wants to achieve net-zero emissions by 2050.

>130 countries have set or are developing net-zero targets. But making these transitions is an immense task & everyone needs to pitch in:

- Business, politics and society. It starts with being transparent about climate contributions, which creates accountability and helps us make informed decisions.



Businesses need to keep innovating clean technologies and develop new models for facilitating & trading clean energy, while politics needs to work on local and global international levels to deliver the appropriate frameworks for making those technologies feasible and viable.

- Carbon pricing would offer companies an incentive to incorporate climate risks into the cost of doing business. And reforming fossil fuel subsidies would allow clean energy to compete on a level playing field.



The path to net-zero will involve higher prices and society will have to face new paradigms with more conscious consumption.

- We may not be able to solve climate change as individuals, but the choices we make do matter.



The solution is to stop working and thinking in silos.

- Politics and business must work together to address the demands of society, while consumers need to understand the cost we will all have to pay for a greener future – and a healthier planet.



A true solution to climate change requires the cooperation of governments, businesses, and consumers.

