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Progress paralysis: accelerating the energy transition

Introduction

First, the good news. Investment in renewable energy rose to $495 billion in 2022, the highest level on record, according to the analyst firm BloombergNEF (BNEF). This was mainly due to a 36% year-on-year increase in solar, now the cheapest form of energy in many parts of the world. Now the bad news: "While these investment figures are the highest ever, they fall short of BNEF estimates of what is needed to be on track for global net-zero carbon emissions by 2050," says the analyst.[i]

Comparing investment in renewables with overall energy demand, the problem highlighted by BNEF is clear. Both are rising in a linear fashion—the expansion of renewables so far has been roughly proportional to the increased consumption of fossil fuels. In other words, renewables growth is helping to meet our growing energy demand, but it is not reducing the amount of fossil fuels we use—a trend which has significant effects on climate and society in the short term, and possibly catastrophic ones in the long term.

Organizations such as the International Energy Agency (IEA) recognize the severity of the situation with projections that forecast emissions reductions based on increasingly desperate cuts to fossil fuel use from the mid-2020s onwards.[ii] The ongoing energy issues in Europe, due to the Ukraine-Russia conflict, have simultaneously reinvigorated the discussion around

fossil fuel use for immediate energy needs while also accelerating the need for energy transition to secure a long-term energy future.

Achieving fossil fuel cuts while maintaining growth in gross domestic product (GDP) will be challenging. "Global fossil fuel use has risen alongside GDP since the start of the Industrial Revolution in the 18th century: putting this rise into reverse while continuing to expand the global economy will be a pivotal moment in energy history," the IEA acknowledges.

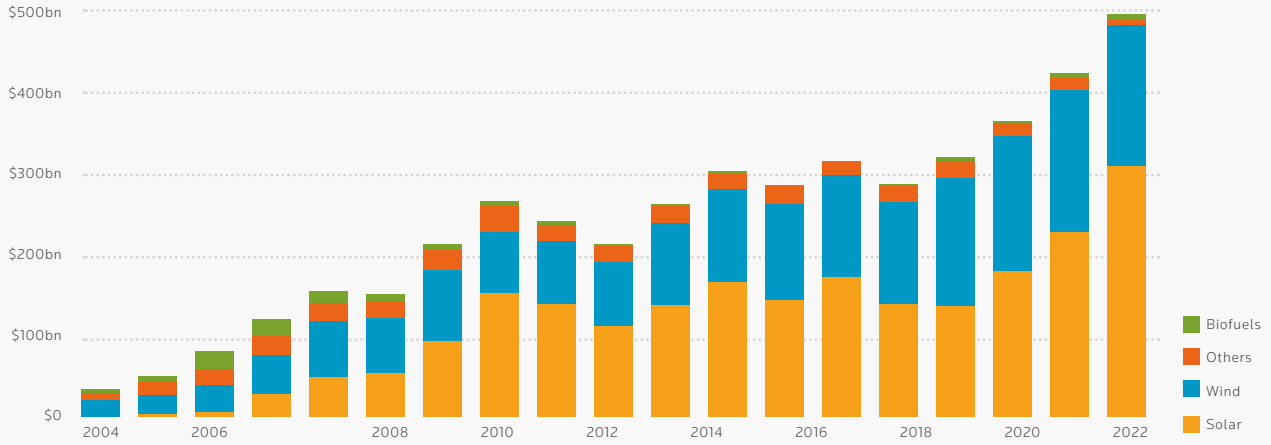
"We know what we need to do, but the means of doing it, the access to all the resources and the will to make it a reality is lacking still," says Tej Gidda, Global Leader of Future Energy at GHD, a leading global professional services company working to accelerate the energy transition.

With leaders evaluating progress towards The Paris Agreement goals as part of a global stocktake concluding at the COP28 United Nations Climate Change Conference at the end of 2023, this paper looks at the causes of this progress paralysis—and ways to overcome it.

More than money

Progress paralysis is not about money, says Gidda. "If we talk to oil and gas companies or private equity firms, the money is there," he states. "But where are the projects that demonstrate an acceptable level of risk for the people who want to place the money, especially for projects that are at scale and involve newer technologies?"

Global investment in renewable energy, by sector.



Source: BNEF.[iii]

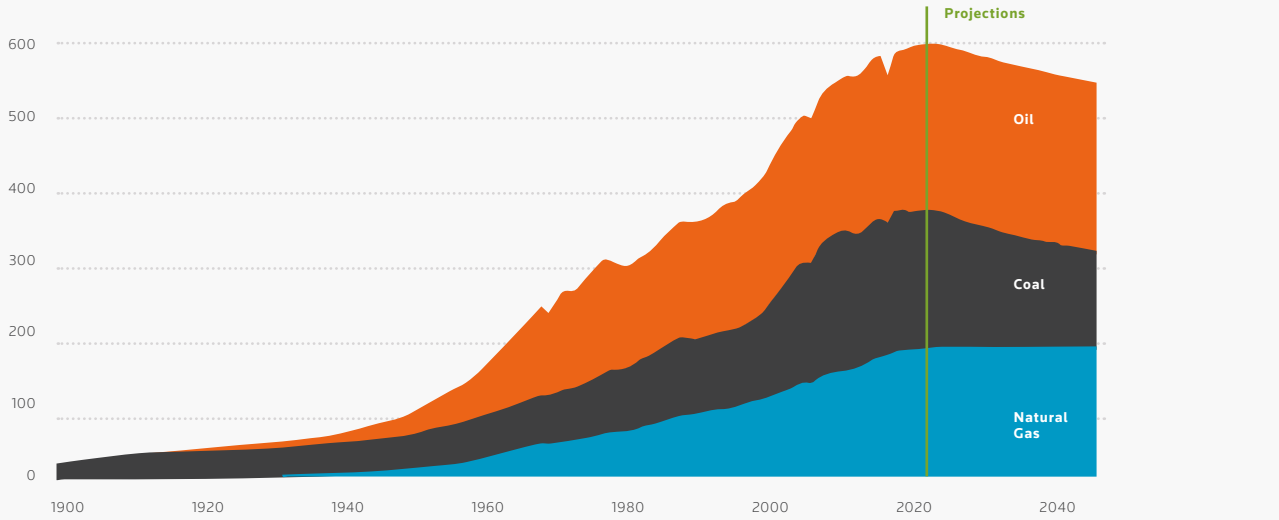
The energy transition comes with technology risks attached to emerging asset classes such as low-carbon hydrogen, which saw a collapse in project announcements in the fourth quarter of 2022.[iv] But investors also see risks in mature asset classes, such as wind and solar energy, often due to government policies. In Europe, for example, price caps and permitting concerns have dampened interest in government auctions.[v]

Meanwhile in the United States, renewables deployment was, until recently, a stop-start affair because of a perceived lack of continuity in tax credit schemes that were key to funding. The U.S. government provided longer-term visibility of tax credits in last year's Inflation Reduction Act (IRA).

"In other markets, lack of regulatory certainty continues to be an issue", says Anna Jakobsen, the Europe and Middle East leader for sustainability, resilience and ESG at GHD. "We're not seeing the scale needed at the moment and governments could be doing more to accelerate planning permission, provide subsidies and offer innovative funding mechanisms to de-risk deployment".

"Access to funding is an issue especially in developing economies," she adds. "Transition is hugely costly. Tax credits provide an attractive incentive, and we're already seeing with the U.S. IRA a shift to focus on projects there, with reduced investment in projects in Europe. However, new types of money and thinking, beyond traditional utility balance sheet or project finance, are also required to unlock and deploy the capital required."

How global fossil fuel reductions will fail to meet net-zero targets under current stated decarbonization policies.



Source: IEA.[vi]

Beyond government-dependent factors, "the absence of high-quality transition plans hinders the ability to make better-informed decisions about how to allocate capital," Jakobsen says. "We are seeing lots of national and regional strategies being developed, but the next stage that outlines the required infrastructure to make the strategy a reality is missing. And this is what the private sector wants and needs to see, so it can decide where investment is needed and what supporting infrastructure is required to drive the market and provide a return on that investment."

In particular, she says, when looking at the energy transitions most companies tend to focus on cost without considering the benefits of moving to new business models.

"Most of all, there is still an insufficient sense of urgency,"

Anna Jakobsen, EMEA Leader - Sustainability, Resilience and ESG, GHD

This likely reflects a lack of awareness in the general public regarding energy transition matters. "We talk about hydrogen and geothermal and all these things on a daily basis, because it's our job," says Tim Mawhood, Executive Director for GHD Advisory in Europe and the Middle East. "But the awareness with 95% of the population, if not 99.9%, is very low."

This means "there's a role here for education that allows people to make choices that are best for the planet," he says.

The experience of companies that have prioritized their energy transition plans shows there could be considerable benefits in accelerating the rate of progress. One example is the Danish multinational power company Ørsted, which started out as a state-owned oil and gas player.

After posting the largest deficit of any Danish company ever in 2015, Ørsted's predecessor pivoted to renewables. Now the company is the world's largest offshore wind farm developer, having seen its share price rise 144% since listing.[viii]

Building a more compelling business case

However, for most companies and communities, "There are limiting factors," says Mawhood. "We've got to find a way of breaking through."

To achieve this, GHD proposes an implementation roadmap to help private and public sector leaders overcome barriers to decarbonization for specific and organization-wide infrastructure projects and to garner greater stakeholder engagement. One way to frame the question is, will the community be better or more resilient by making this decision, and how can we improve economic activity? Also, considering the cost and risk of not implementing the project.

ENERGY TRANSITION IMPLEMENTATION ROADMAP

Private sector	Public sector
Understand your baseline: inventory your scope 1, 2 and 3 emissions.	Set targets, and create strategies and regulatory frameworks that provide certainty to the private sector.
Use science-based targets to establish key objectives for emissions reduction in line with the Paris Agreement goals.	Provide ongoing education for the general public around energy use, carbon-intensive products and the need for rapid, transformative change–plus the opportunities it can bring.
Identify where you can make efficiencies relatively easily with a clearly defined path, for example, through energy efficiency measures and renewable power purchase agreements.	Provide realistic estimates of clean energy infrastructure requirements and the investment potential attached to them.
Understand where large-scale investments will be needed and prioritize them in terms of capital requirements versus carbon savings and other societal benefits.	Define how government will provide regulatory certainty for investors by moving taxation from legacy hydrocarbons to emerging fuels.
Consider where industry coalitions, consortia and public-private partnerships might be well suited for large-scale projects.	Look for synergies with industry and opportunities for improving economic output, employment, communities and the environment.
Implement, track and refine your progress against your emissions reduction path, evaluating opportunities to expand scope.	Create the basis for a circular economy where GDP growth is decoupled from energy use.
Transparently communicate your emissions reduction progress.	Explain to stakeholders how your pathway to net zero is creating community benefit.

Identifying and navigating obstacles

Mawhood says society has to embrace a circular economy model in the medium to long term.

"We can't continue with an exponential growth economy because it is drawing on energy that is pegged to GDP with about a 1% loss. Materials use follows GDP with 100% correlation. This drives resource extraction growth of materials that have been laid down in our earth over millions of years through a process we cannot replicate"

Tim Mawhood, Executive Director Advisory, UK, Europe and Middle East, GHD

Furthermore, "Creating all the new materials to support our growth requires energy to extract, manufacture, assemble, ship, store and distribute," he says. "We need to break this cycle, and that's where we have a problem. We must start to address this now, or we will run into more significant challenges as we reach a limit on the resources the planet provides."

Mature renewable energy technologies such as onshore wind and photovoltaic solar power are seeing mass adoption thanks to their low cost and high bankability. In the U.S., for instance, there is now only one coal plant that can run more cheaply than wind and solar.[ix] While betting on such renewable technologies in principle presents only minimal risk to investors, from an energy security perspective the impact of geopolitical tensions on global supply chains must be considered.

Transmission capacity is another problem that hinders the development of low-carbon projects. Experts believe lawmakers need to take a different approach to transmission regulation and be more speculative in allowing projects to be funded. Since while the cost for getting it wrong is relatively low, the impact of slowing project development is massive.

Navigating existing and new technologies

With newer technologies, one aspect of the energy transition continues to vex leaders: there are many potential pathways to decarbonization, yet little clarity on which ones might be most effective or efficient. Take vehicle fleet decarbonization, which could potentially be achieved through at least three routes: battery electric vehicles, fuel-cell electric vehicles powered by hydrogen, or replacing fossil fuels with renewable natural gas or other drop-in fuels.

A case could be made for any of these options, and they will also most likely all be part of the solution, depending on the market segment. However, there could be significant penalties for betting on ones that fail to gain traction in the market, since the infrastructure to support them might fail to materialize. Such infrastructure challenges are already becoming apparent.

The volume of solar and wind projects in the U.S. has overwhelmed the country's antiquated systems, making it harder to connect new sources of electricity to homes and businesses. On average, it takes roughly four years for developers to get grid connection approval for renewable projects, double the time it took a decade ago.[x] In the UK, the planning system has also slowed in recent years, with the timespan for granting development consent orders increasing by 65% between 2012 and 2021.[xi]

Lack of renewable energy could also risk stalling hydrogen development. In parts of Atlantic Canada, there are incentives to produce green hydrogen and green ammonia, to export to countries such as Germany that desperately need to replace natural gas for industrial applications such as steel manufacturing.

However, there is a lack of required renewable electricity infrastructure needed to produce the low-carbon fuel. Faced with such uncertainties, it is natural to adopt a wait-and-see approach when contemplating uses for green hydrogen, for example—but this only aggravates the likelihood of missing climate targets.

"Already, we're not seeing the rate of adoption needed to achieve our goals," says Kim Domptail, U.S. west regional market lead for future energy at GHD.

One way to overcome this uncertainty for policymakers and business leaders is to look beyond individual technologies in search of industrial synergies that can facilitate adoption and cost reduction.

For example, California's low-carbon-focused regulatory framework can make it attractive for refuse collection fleets to run off renewable natural gas produced from the waste they collect.[xiii]

Similarly, says Domptail, low-carbon hydrogen projects will be more likely—in the early stages at least—to get off the ground when created as part of wider industrial hubs where the gas can be used on location, cutting the need for investments in storage and transport. Without such synergistic approaches, "It's always this chicken-and-egg situation: I'm not going to produce hydrogen because there are no end users," Domptail says. "That is why the hydrogen hub approach used by a number of countries is so promising."

Even when there are industrial clusters that can exploit decarbonization opportunities, it may be hard for them to embrace new technology approaches without some form of incentive. This is why government plays a key role in early adoption, as is the case with the Inflation Reduction Act spurring the industry forward.

Another case in point is the Norwegian government's support for electric vehicles. Thanks to longstanding tax incentives for electric vehicle ownership and investment in the supporting infrastructure, 86% of all new vehicles sold in Norway during 2021 were EVs, compared to 19% in Britain and just 5% in the U.S.[xiv] Similar incentives are needed to stimulate demand for hydrogen fuel cell vehicles, in particular heavy goods vehicles.

"With regards to emerging technologies in the new energy space, we are seeing positive steps from the investor market in the UK and Europe," says Mawhood. "However, greater investor involvement is needed to continue funding the exploration of new technologies to drive the energy transition at the scale we need."

Not just energy: the water issue

Increasing the pace of the energy transition will not only be helped by adopting a more holistic view of technologies and industries, supported by a clearly defined roadmap, but also by being mindful of the material dependencies of the energy system. Just as the fossil fuel economy depends on reserves of coal, gas and oil, the low-carbon energy economy will depend on supplies of raw materials such as polysilicon for solar panels, rare earth metals for wind turbines and electric vehicles, and lithium for batteries.

There is already considerable debate over the stocks, supply chains and social impacts related to many of these materials.

Still, one resource that seems to be largely overlooked in energy transition strategies is fresh water.

Water is vital for powering society, with the U.S. alone using an estimated 58 trillion gallons for primary energy production in 2014.[xv]

Irrigation for ethanol production and evaporation from hydropower reservoirs were the greatest sources of freshwater loss, followed by losses from oil and natural gas. On the other hand, wind and solar require less water than fossil fuels per unit of generation, so, in theory, the energy transition should be good news for the hydrologic cycle.

However, one factor that has been overlooked in older studies on energy-related water loss is the impact of electrolytic or green hydrogen. This emerging low-carbon fuel can be produced from waste, but most will likely be made using renewable energy to power the electrolysis of water, which will be required in large amounts and with high purity.

It takes nine liters of water to produce a kilogram of green hydrogen. Furthermore, additional loads such as

electrolyzer cooling could elevate water requirements to at least 60 liters per kilogram of hydrogen.[xvi] Ensuring water availability can be balanced with energy production will be key to rapid and efficient decarbonization, says Don Holland, Canadian Water Market Leader for water at GHD.

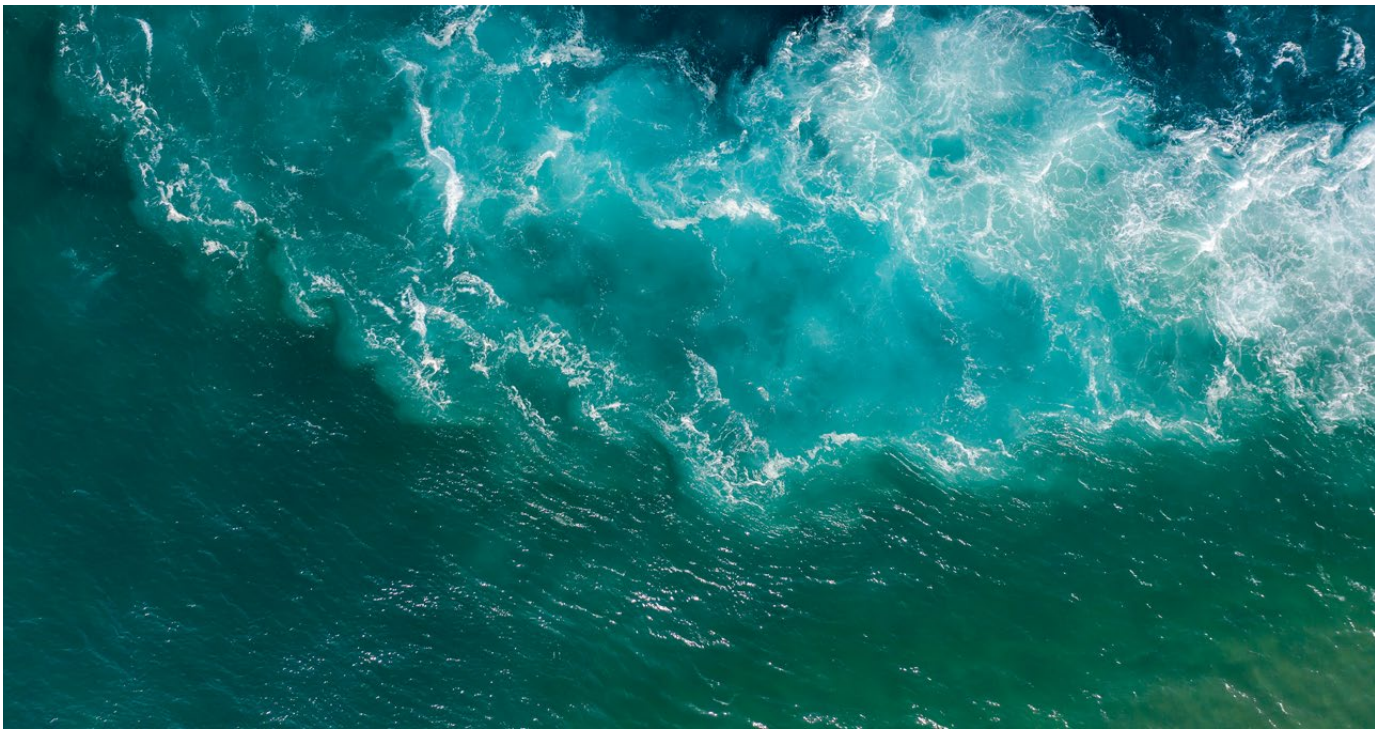
"The biggest challenge we have is that we always focus on the return on investment and what we have really got to look at is the positive impact it has on our communities," he says.

"You can't talk about sustainability without having water involved in the solution, but the challenge of implementing water-based decarbonization in areas where water is already in short supply has yet to be tackled."

Tej Gidda, Vice President and Global Leader – Future Energy, GHD

One way to improve matters is through the integration of water resource recovery facilities into the energy system. It is relatively easy to extract biofuels from waste, and these, in turn, can be used to help power the electric grid. At the same time, surplus energy could be used for water purification, leading to the creation of another valuable resource besides electricity.

"Quite often at wastewater treatment plants we are anaerobically digesting biosolids and you could produce renewable energy, but there's not enough of that being done," says GHD's Tej Gidda. "Many wastewater treatment facilities are flaring biogas. There's so much energy flowing into those facilities, and we spend a lot of energy to destroy it rather than converting it into something useful."



Outlook and conclusions

"The energy transition requires a generational shift in the way we think and act. A guiding principle for planning ahead," says Holland, is the seven-generation stewardship concept attributed to the Iroquois First Nation peoples. This is the idea that the work being carried out today should be guided by the likely needs of people seven generations hence—clearly a recipe for sustainability and resilience.

The big challenge for today's leaders is that these decisions of lasting significance need to be made hastily and on the basis of what we know to be true today. The risk of getting things wrong is high—often leading to paralysis in progress—but increasingly there is an even higher risk from inaction.

As well as following the implementation roadmap outlined above, it is important leaders be guided by the following principles when setting energy transition strategies:

- **Prioritize simple, speedy actions.** Part of today's progress paralysis likely stems from an inability to clearly see the outcome of current strategies. That should not stop leaders from embarking on projects and programs that can have a significant impact in the short term.
- **Turn strategies into realistic, actionable plans.** This will assist the public and private sectors by providing visibility on what is required, in terms of infrastructure, technology and investment, to ensure an accelerated energy transition.
- **Think holistically.** Investments should be considered in the context of their wider social, industrial and environmental benefits to help with popular acceptance and commercial viability. Leaders should also create public awareness of individual and collective energy use and how they can make an impact on the energy transition.

These principles and the preceding roadmap are tools that can and should be applied today. As a leader, it is up to you to ensure you use all the tools at your disposal to overcome the energy transition progress paralysis today. And if you have tools that we are not aware of, we want to hear about them.

Get in touch to learn more

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