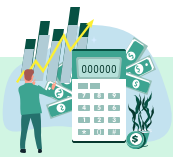
# COP28 MEDIA BRIEF
# ENERGY TRANSITION

There has been global progress across the energy transition landscape – from decarbonizing existing energy supplies to scaling renewables and new technologies like hydrogen or direct air capture – but we're still not moving anywhere near fast enough to meet net-zero goals and stay on track for 1.5 degrees. The green energy transition must happen three times faster than previous fuel transitions. Alongside this, we continue to face challenges with global energy security and growing global demand for energy as economies develop. Meanwhile, there remain challenges around both progress and decisions related to our future energy mix. While the vast majority of countries have potential access to sufficient low-carbon energy, the cost of some solutions is not falling as much or as fast as is needed.

At COP28, negotiations will focus on how to increase finance levels to fund the energy transition and rapidly expand the role of technologies and methods such as renewables, energy efficiency, methane reduction and storage, hydrogen and carbon dioxide removal (CDR) for limiting global warming to 1.5°C.

If you read one report: A Blueprint for Energy Transition (Sep 2023)

## TOP 3 BCG DATA POINTS



Completing the energy transition still has a **$18 trillion finance gap.**

**60%** of energy-related methane emissions are abatable with existing technology.

Solar and wind generation capacity must **increase tenfold.** Global electric grids must expand by **2.5x.** Renewables must rise from **50% to 70% by 2025.**

## BCG POSITION

The transition to a net zero energy future is the most significant and critical transformation of our economy. Currently, we are not on track to meet the objectives of the Paris Accords. To complete this energy transition within the necessary timeframe and avoid significant damage to the planet, humanity, nature, and the economy, we require a much bolder agenda. This agenda should be underpinned by a shared understanding of the necessary actions and should involve an all-of-society approach to pursue them.

## ON THE RECORD

**"We have the tools ready to facilitate the energy transition but at present lack the infrastructure and finance levels to realize it by 2030. Action must be coordinated between public and private sectors to facilitate the scale of investment needed to get back on a 1.5-degree path."**

*- Maurice Berns, chair, BCG's Centre for Energy Impact*

**"With hydrogen, there's a lot of work still to be done to move from hype to reality. Investment decisions are already too late to hit 2030 targets, while optimistic cost projections are simply not coming to fruition. The change has to be led at global policy level with active coordination from the private sector players needed to deliver on our hydrogen potential. Going into COP28, this is not yet happening nearly to the degree needed."**

*- Esben Hegnsholt, Managing Director & Partner*

## BCG TOP 3 TAKEAWAYS:

1 **We have the technology available to get to a net zero energy system.** Through 2030, proven technologies such as energy efficiency, electrification, solar, and wind are mainstays of the transition. In the 2030s, emerging technologies—including grid-scale batteries; new types of nuclear reactors; low-carbon hydrogen and carbon capture, utilization, and storage—will scale, given the right investment and effort.

2 **The transition to net zero energy needs to happen 3x faster than previous transitions.** This is the third major energy transition in the last 150 years. Targets mean that transition to net zero energy supply means that significant renewable shift must take place in just 13-18 years, compared with previous, more stretched out transitions to coal (50 years) and oil (35 years).

3 **A renewed push is needed to close the large funding gap for the energy transition.** Despite a roughly $19 trillion investment globally being made by energy industry players, governments and investments, there remains an $18 trillion shortfall on what is needed.

## WHAT WE ARE ADVISING OUR CLIENTS TO DO:

### Recommendations for policymakers:

1. **Close the cost gap** - while the transition will cost consumers in the short to medium term, it will pay off in the long term.
2. **Get granular** - clear, year-by-year deployment targets are crucial.
3. **Redesign energy markets** - the whole system needs unprecedented levels of low-carbon investment.
4. **Cut planning and permitting times** - Streamline processes to power rapid progress.
5. **Rethink liability frameworks** - New low-carbon technologies are critical but carry risk. Review this to unleash investment.
6. **Ensure a just energy transition** - share the costs and benefits of energy transition equitably.

### Recommendations for energy producers and suppliers:

1. **Secure and affordable energy supply** - Ensure a secure and affordable energy supply during the transition, emphasizing the phasing down of fossil fuels while addressing local energy needs.
2. **Leadership in low-carbon energy** - Producers and suppliers should leverage their expertise and financial strength to lead in low-carbon energy production.
3. **Tailored energy supply portfolios** - Develop roadmaps that reflect regional differences and requirements.
4. **Design the right solutions** - help customers find pathways to effectively transition.
5. **Plan for volatility** - Mitigate increased energy market volatility, ensuring that customers do not bear the full burden of these fluctuations.

### Recommendations for large energy consumers and energy infrastructure providers:

1. **Lock in green energy supply and infrastructure** - Large energy consumers should ensure that they have reliable access to low-carbon energy
2. **Design capital expenditure plans with a long-term** view - Heavy industry players must take capital expenditure decisions that are economic over the long term.
3. **Build and support low-carbon ecosystems** - Major projects and investments carry multiple interdependencies. Collaboration is key.

### Recommendations for manufacturers and low-carbon technology companies:

1. **De-risk and diversify supply chains** - ensure global value chains are robust and do not rely too heavily on suppliers in one country.
2. **Monetize the power of scale** - Drive scale to bring down costs and prices.
3. **Balance innovation and standardization** - Establish standards in emerging and maturing technologies to drive industrialization.

### Recommendations for investors:

1. **Engage with regulators and governments** - With a focus on unlocking unprecedented levels of investment.
2. **Do not lose sight of infrastructure investments** - The success of the energy transition will depend on new networks.
3. **Consistently integrate carbon into decision making and asset valuations** - Encompass carbon costs, alongside value created.
4. **Apply a programmatic approach in financing** - Move beyond financing individual projects.

## ADDITIONAL PROOF POINTS

### ENERGY TRANSITION

**Achieving the Paris Agreement will require significant energy system shifts.**
- Fossil fuels constitute 80% of energy use and 70-75% of global GHG emissions; coal alone contributes over 25%.
- Renewables must rise from 12% of in 2021 to 50% to 70% by 2050.
- The rapid transition to meet Paris goals is increasingly doubtful under current policies, allowing for +2.7°C warming by 2100.

**There is an $18 trillion climate finance gap.**
- By 2030, the energy transition will require at least $18 trillion in additional capital.
- 90% of the capital gap is in the end use and electricity categories.
- A $9.3 trillion capital gap includes consumer and industrial spending to reduce energy demand and emissions.
- The electricity category's $7.8 trillion capital gap consists primarily of investments in renewable power.
- Energy market volatility threatens the transition, but market redesign efforts are underway in the UK and EU.

**Selective investments in oil and gas remain necessary while being phased down.**
- Net-zero scenarios target 50-80% of 2021 oil and gas supply by 2030 and 15-30% by 2050.
- Companies must meet emission reduction targets, including methane removal, during these investments.

**Key challenges in energy efficiency, transport costs, storage, and markets.**
- In 2021, the US wasted two-thirds of primary energy due to inefficiencies and conversion.
- Current electricity storage covers only one to two hours of average consumption in Europe and the US, compared to over 1,000 hours for oil and gas.
- The cost of long-distance energy transport, especially in the form of H2, is 10-30 times more expensive than oil over a 1,000-mile pipeline.

### RENEWABLES

**There are diverging investment signals within renewables.**
- The investment picture across renewable power is not uniform.
- Negative signals, such as in offshore wind, deter capital deployment, while solar and other sectors see improving conditions.

Renewable investments are stalling.
- Some renewables projects have stalled as inflation has taken hold, raising costs, weakening returns, and leading to high-profile offshore wind project cancellations in the US and the UK.
- Some recent large-scale renewables projects have cited cost inflation of 10% to 30%; others have faced 40% higher costs.

**Renewables are central to the energy transition investment gap.**
A substantial portion (90%) of the $18 trillion capital gap is linked to electricity (primarily renewable power investments) and end use (consumer and industrial spending for emission reduction).

**Renewables are part of a solution that must be coupled with decarbonization.**
- Scaling up green technologies worldwide has the potential to cut 23 gigatons of CO2e annually, representing 45% of the current 51 gigatons released into the atmosphere.
- Achieving net-zero goals requires addressing the remaining 28 gigatons of CO2e yearly, necessitating changes in both energy consumption and production.

# ADDITIONAL PROOF POINTS

## HYDROGEN

**The optimistic cost projections for low carbon hydrogen are not materializing.**

- Past expectations of green hydrogen production costs below €3/kg have proven unrealistic due to a deteriorated macroeconomic context, higher energy market prices, and supply chain challenges.
- Real hydrogen asset projects indicate green hydrogen production costs in central Europe will likely range from €5-8/kg in 2030.
- Even at the lower end of these costs, green hydrogen struggles to compete with alternative decarbonization technologies.

**Very few green hydrogen customers commit to long-term offtake contracts.**

- Under Europe's current regulatory environment, domestic green hydrogen will remain the fuel of the future.
- European regulations should aim to bring green hydrogen costs below €5/kg to maintain competitiveness, especially in key industries like chemicals and steel.
- Policymakers need to provide infrastructure clarity, favorable investment conditions, and transport and storage infrastructure to support the hydrogen value chain.
- Ambitious national implementation of EU regulation is necessary.

**The cost of delivered green electricity still remains the largest factor determining overall green hydrogen economics.**

- As a result of a higher cost of capital and structural supply chain challenges of wind power system manufacturers, the levelized cost of power has significantly risen in recent years.
- High electrolyzer utilization can be a major lever for decreasing hydrogen production costs—but will come at a trade-off with green power costs in most locations.
- Optimizing electrolyzer efficiency can reduce hydrogen production costs.

**The absence of decisive regulation should not prevent hydrogen players from taking action.**

- Market players should embrace risk-taking and prioritize the development of hydrogen projects.
- The cost of green hydrogen must decrease faster, encouraging streamlined project development and collaborations with electrolyzer manufacturers.
- The emerging regulatory environment is reshaping Europe's demand market, and informed advocacy is essential for scaling hydrogen in challenging applications.
- Collaboration is key. Governments ,must collaborate with OEMs, tech providers, offtakers, and companies to accelerate hydrogen trade infrastructure development, including networks, storage, and terminals.

## CARBON DIOXIDE REMOVAL (CDR)

**We need to move much faster when it comes to implementing carbon dioxide removal (CDR) methods. The longer we wait, the more carbon we will need to remove from the atmosphere.**

- To limit global warming to 1.5°C/2°C, we need to remove 5-16 Gt CO2 of removals p.a. by 2050.
- Direct air capture (DAC) has significant advantages for CDR in terms of scalability, permanence, and verifiability.
    - DAC is over 100 times more land-efficient than reforestation, making it a more scalable solution.
- DAC technology adoption requires reducing end-to-end CO2 removal costs, from $600-1,000 per ton today to under $200 and ideally closer to $100 by 2050.

**We won't reap the benefits of CDR unless more policy support goes towards reducing the costs for carbon dioxide removal (CDR) methods.**

- Governments should secure investments for CDR, similar to efforts in renewable energy technologies.
- A good example of government support for carbon removal is the $180 tax credit for every ton of permanently stored CO2 in the US Inflation Reduction Act.
- Changing carbon accounting rules to count carbon removal toward emissions targets will encourage investments.
- Estimated demand for CDR methods is significant, with 40-200 Mt CO2 in 2030, growing to 80-900 Mt CO2 in 2040.
- This demand represents a market opportunity of $10 billion-$40 billion in 2030.

## RELATED BCG REPORTS

ENERGY:

- Energy Transition Investment

HYDROGEN:

- Turning the European Green Hydrogen Dream into Reality: A Call to Action
- Fast-Tracking Green Tech: It Takes an Ecosystem

CARBON DIRECT REMOVALS:

- Shifting the Direct Air Capture Paradigm
- Climate Needs and Market Demand Drive Future for Durable CDR

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