

Future Cleantech Architects



Annual Report 2023

Future Cleantech Architects



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Future Cleantech Architects

We are a climate innovation think tank. We exist to close the remaining innovation gaps to reach net-zero emissions by 2050.



A letter from our Founder & CEO

In 2023, we were able to take a couple of crucial steps toward developing our organization and further scaling our impact. By expanding our team and establishing a new office space, we further increased our analytical capacity and multiplied our options to perform independent and science-based advocacy. These advocacy efforts have already allowed us to shape the future of new technologies within European legislative frameworks through bi- and multilateral consultations with policymakers and by completing policy briefings on critical topics such as innovative power generation technologies, zero-carbon fuels, cement, and long-duration energy storage.

In addition to teaming up with intergovernmental organizations and other players in the research community, we have also intensified our collaborations with national and international media to increase the visibility of cleantech innovation for a broader audience. Our publications, including factsheets on overlooked technological domains and in-depth studies on green public procurement and green hydrogen industry clusters, have provided easy-to-access insights and knowledge to our stakeholders. Our flagship events, the Future Cleantech Festival and the kick-off of our technical briefing series for Brussels policymakers "Coffee & Cleantech" brought together key changemakers to discuss methods for driving cleantech innovation.

Our dedication to research and development remains at the heart of our mission. In 2023, we actively participated in research consortia, focusing on agile organizational structures and pioneering innovations in cement manufacturing processes. These efforts are critical in advancing our understanding and capabilities in cleantech, ensuring that we remain at the forefront of industry developments with our "boots on the ground".

I would like to express my gratitude to our team, strategic partners, and stakeholders for their continuous support and collaboration. Our collective efforts have laid a strong foundation to continue driving cleantech innovation - together.

Dr. Peter Schniering
Founder and CEO
Future Cleantech Architects





About us

Future Cleantech Architects is a non-profit climate innovation think tank situated in Remscheid, Germany. We exist to close the remaining innovation gaps to reach net-zero emissions by 2050. To reach this objective, we accelerate innovation in critical industries – such as cement, aviation, or shipping – where sustainable solutions are still in very early stages. We urge policy-makers to intensify and better prioritize their R&D activities. Moreover, we initiate and actively drive high-level research consortia on critical technologies for these neglected technological sectors. For example, we are part of CemSol, a research project aims to show that a solar-heated calcination unit is technically feasible on an industrial scale and can be operated economically. See our explainer video [here](#). We combine this active "boots-on-the-ground" R&D work with industry collaboration to do effective advocacy.

Non-profit.
Independent.
Science-based.

Our ambitious, multinational team translates into FCA presence in nine cities in six European countries:

- ▶ Amsterdam
- ▶ Barcelona
- ▶ Berlin
- ▶ Brussels
- ▶ Cambridge
- ▶ Cologne
- ▶ Munich
- ▶ Paris
- ▶ Remscheid

"What is special about Future Cleantech Architects' approach is that the organization not only takes on the advocacy for these [neglected] technologies at the political level but is also itself part of research consortia for the development of these technologies."

– *Effektiv Spenden*

Future Cleantech Topics 2023

At Future Cleantech Architects, we focus exclusively on hard-to-abate sectors in which the share of emissions is high and technological solutions are still in very early TRLs (technology readiness levels). In 2023, we dove deeper into our work on Cement and added Long Duration Energy Storage (LDES) and Aviation to our portfolio. You can find an overview below.

Cement

The state of the sector today: not on track for net zero.

Between growing demand, stagnating emissions intensity, and a conservative industry that isn't given strong incentives to decarbonize, construction is not on track for net zero and relatively neglected by public policy (which focuses much more on operational emissions, i.e. energy consumption during the usage phase of infrastructure).

To understand the challenge of decarbonizing cement production (the main source of emissions in concrete production), it is important to consider that about 30% of the emissions come from energy use (high-temperature heat), while 60% come from the core chemical reaction of turning limestone into cement (so-called process emissions).

Aviation

Aviation is responsible for 2-3% of global annual CO₂-emissions and is the fastest growing emitter in the transport sector. However, CO₂ represents only 1/3 of the sector's emissions, with 2/3 coming from non-CO₂ effects: The largest contributor to aviation's warming impact on the planet are contrails (>50%).

Airplanes are built to last; the average lifespan of an aircraft is over 25 years. Therefore, what is happening in the industry today has far-reaching implications when looking towards a net-zero 2050.

Additionally, safety, testing, and verification are lengthy procedures. Such procedures need to be sped up and simplified to accelerate the entry of new technology onto the market, from new aircraft designs to new engine technologies, and help the sector decarbonize.

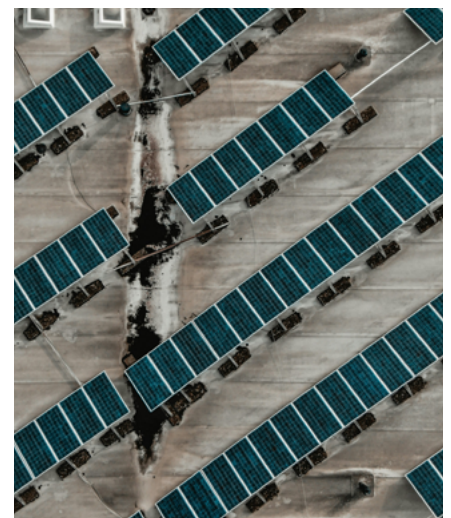
Long Duration Energy Storage (LDES)

Electricity generation is responsible for over 25% of global greenhouse gas emissions, the vast majority of which come from coal and gas-fired power plants.

Decarbonizing electricity will require large amounts of solar and wind energy. Solar and wind are already the cheapest and fastest-growing energy sources globally. However, they fluctuate over time.

LDES enables the integration of large shares of solar and wind into the power grid, storing clean electricity when there is a surplus and supplying it back when needed.

There are a diverse range of LDES technologies, divided into four families: electrochemical, thermal, mechanical, and chemical. Together, they can provide energy security from daily up to seasonal timescales.



Future Cleantech Highlight

Future Cleantech Festival The ARC23

Europe's most ambitious Cleantech Innovation Festival

In June 2023, we were once again able to organize our [Future Cleantech Festival](#) The ARC23, together with UNIDO ITPO Germany, United Nations Climate Change, and EIT InnoEnergy.

With over 250 experts from politics, industry, and the innovation scene, we discussed challenges in the hardest-to-decarbonize industries, such as cement, aviation, and Long duration energy storage. Our Future Cleantech Festival aimed to identify specific steps that will remove roadblocks and bridge the innovation gaps to reach net zero by 2050. See the key takeaways [here](#).

"At The ARC, cleantech stakeholders from all over the world came together to discuss solutions for a sustainable future. Many solutions are already technically and scientifically available – but the political framework is still lacking. That's why it was so important that FCA brought us together at this festival"

- Yazgüli Zeybeck (State Chairwoman NRW | Bündnis 90/Die Grünen)



Europe's most ambitious
cleantech innovation festival will
be back next year!

Future Cleantech Highlight

Coffee & Cleantech

In 2023, we were able to expand our team, both in the areas of impact and cleantech analysis as well as expanding on our policy work by hiring an EU Policy Manager.

This has enabled us to further expand our network in Brussels and discuss specific legislative proposals or funding instruments for the expansion of climate protection technologies with political players from all key political groups. Our work in Brussels is focused on positioning industries and innovations that are difficult to decarbonize more prominently on the EU agenda.

In October 2023, we were delighted to host the first [Coffee & Cleantech](#) in Brussels, a 45-minute technical briefing for EU policymakers and advisors. The Briefing was headed by our CEO, Peter Schniering, our Cleantech Analyst, Antoine Koen, and our EU Policy Manager, Marlène Siméon.

FCA welcomed representatives from the European Parliament, the CINEA (European Climate, Infrastructure and Environment Executive Agency), the European Innovation Council and SMEs Executive Agency (EISMEA), and the Korean Mission to the EU at the Permanent Representation of North Rhine Westphalia to exchange on long duration energy storage for electricity and for heat.



Future Cleantech Highlight

FCA highlighted by Vox as a Top Organizations to Support for a Second Year!

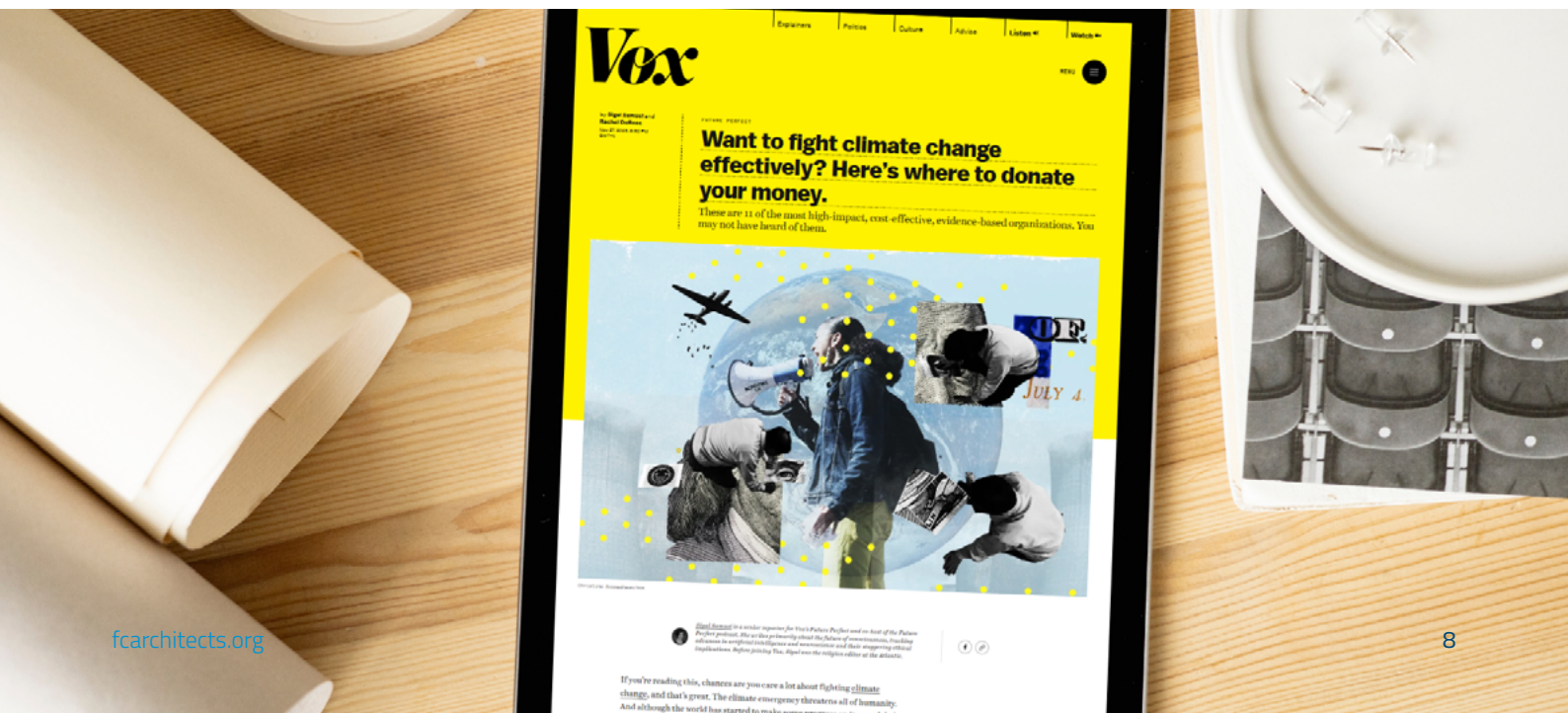
In 2023, Future Cleantech Architects was proud to be recommended by U.S. independent journalism portal Vox as one of the top climate organizations to support. Every year, Vox highlights a handful of environmental organizations whose approaches they believe are effectively contributing to fighting climate change. As a donation-based non-profit, we are especially thankful to have been named alongside such impactful organizations for the second year in a row.

Future Cleantech Architects is mentioned as one "of the most high-impact, cost-effective, and evidence-based organizations", where donations are "likely to have an exceptionally positive impact". Moreover, we were honored by the following passage:

"According to Founders Pledge, [Future Cleantech Architect has] already exceeded expectations at improving the European climate policy response. Most notably, it has helped shape key legislation at the EU level and advised policymakers on how to get the most bang for their buck when supporting research and development for clean energy tech."

– U.S journalism platform [VOX](#)

You can find Vox's full article [here!](#)



Future Cleantech Highlight

Future Cleantech Architects at COP28 in Dubai

The 28th Conference of the Parties (COP28) took place in Dubai, UAE, from the 30th of November until the 13th of December 2023. As in the past years, Future Cleantech Architects attended the conference, co-hosting two sessions on Innovative Renewables for Energy Security and on Future RD&D Needs, producing an Aviation short film, and actively participating in several interviews, events, and panels with the goal to push cleantech innovation harder. You can find a compilation of the results [here](#).

Future Needs in RD&D: Perspectives on Key Global Technology Development Needs

The session focused on the key takeaways and results of the survey and the ways in which we

can use these findings to better support and accelerate RD&D in the most urgent sectors. Special attention was paid to the different results from developed and developing economies as well as those stakeholders that have been identified as most effective in supporting these endeavours. The session began with an overview of the survey and its results, followed by a short panel discussion on lessons learned and next steps.

Innovative Renewables for Energy Security: Alternative Sources of Flexible Low-Carbon Energy to Meet Global Electricity Demand

This session focused on the technological innovation landscape in renewable energy production. The session centered on the increasing demand for electricity and the need for more flexible energy sources next to conventional solutions, such as solar and wind, and the key challenges and roadblocks faced by innovators globally. The panel also discussed the relevance of these technologies for global and regional electricity generation.

Short film on Aviation: Future Cleantech Film on Aviation

As part of our COP28 UAE endeavors, Future Cleantech Architects (FCA) produced [a short film](#) anchored by our CEO Peter Schniering, Eleanor Webster (Mission Innovation), Ingrid El Helou (FCA), and Marlène Siméon (FCA). They discuss the challenges of bringing aviation on to a more sustainable path and the elements needed for a holistic transformation of the sector that takes into account both CO2 and non-CO2 effects.



Future Cleantech Publications

Joint Article Series with Handelsblatt



“Green ideas that could change the world”

In collaboration with Handelsblatt, the largest and most-cited German-language business and financial newspaper with more than 500,000 readers per issue, 6.1 million readers in total, and more than 90,000 subscribers to the online version, Future Cleantech Architects highlights cleantech innovations into two areas: neglected sectors with high emissions and technologies that could have a groundbreaking impact.

Titled “Green ideas that could change the world”, the articles provide a concise overview of such technologies, highlighting their potential and the biggest hurdles on the road to climate regulation. From space-based solar energy and the potential of decommissioned coal-fired power plants to green ammonia and heat storage.

So far, ten articles have been published in the series, reaching almost seven million readers, on the following topics:

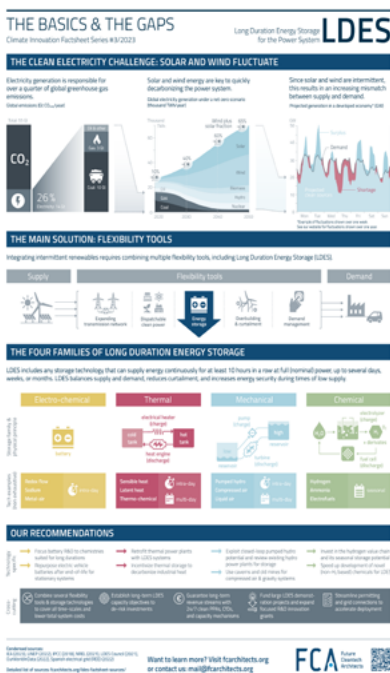
- ▶ Geothermal energy
- ▶ Thermal Energy Storage (TES)
- ▶ Green ammonia
- ▶ Solar radiation management
- ▶ Lithium alternatives
- ▶ Airborne wind energy
- ▶ Repurposing old coal power plants for LDES
- ▶ Wave energy
- ▶ Green cement
- ▶ Distributed ledger Technologies
- ▶ Space-based solar power

All articles are available on our [website](#).

Our collaboration with
Handelsblatt will continue in
2024!



Factsheet on Long Duration Energy Storage (LDES)



The Basics & The Gaps is the Future Cleantech Architects flagship series of factsheets and animations which aims to summarise the key facts and figures on some of the most challenging issues and technological innovations needed to reach net-zero.

Long duration energy storage is a crucial flexibility tool for the electrical power system. Flexibility is needed at different times to smooth out supply and demand curves that change throughout the day and during different seasons. While gas peaker plants are a common tool used to fill in supply gaps in many countries, many low-carbon alternatives, such as grid interconnection, clean dispatchable sources, renewable overcapacity, demand response, and long duration energy storage (LDES), already exist.

LDES is one of the most crucial pieces of the energy flexibility puzzle, especially for countries reaching high shares of wind and solar power. By incorporating LDES into the grid, utilities can better manage the balance between supply and demand, improve energy security, and reduce curtailment (waste of excess production) of renewable sources.

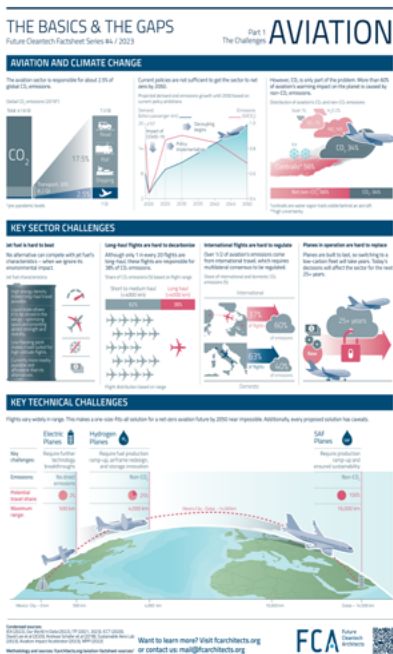
Download our factsheet on LDES [here](#).



Long duration energy storage is a crucial flexibility tool for the electrical power system

By incorporating LDES into the grid, utilities can better manage the balance between supply and demand, improve energy security, and reduce curtailment (waste of excess production) of renewable sources.

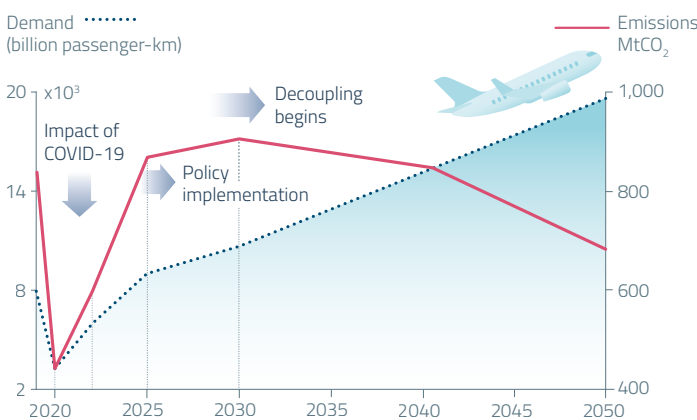
Factsheet on Aviation



Aviation accounts for 2-3% of all global CO₂ emissions and is the fastest growing emitter in the transport sector. However, this does not give the full picture of aviation's impact on the climate. Taking into account aviation's non-CO₂ effects, the industry accounts for 3.5% of global effective radiative forcing, i.e. 3.5% of global warming, with the largest contributor to its warming effect being contrails.

To help the industry overcome its reliance on conventional jet fuel, both alternative fuels and revolutionary aircraft designs are necessary. Additionally, to further help minimize the sector's warming impact on the planet, technological innovation should extend beyond the aircraft itself to encompass airport operations as well as flight path optimization and rerouting for contrail avoidance. Therefore, to be able to fly more sustainably, we require a holistic transformation of the sector that takes into account both CO₂ and non-CO₂ effects.

Why is it so hard to get the aviation sector on a more sustainable path? What technological alternatives are available? What would a holistic solution pathway look like? For more information on the aviation sector's challenges and a holistic solution pathway, download our fact-sheet [here](#).



Airtravel demand is expected to double by 2050 compared to 2019 levels.

Current policy ambitions are not enough to get the industry to net zero by 2050. Projected demand (billion passenger-km) and emissions (MtCO₂) growth to 2050 based on current implemented ambitions

Participation in External Events and Panels

FCA at Bonn Negotiations (SB58)

Our team was invited to brief an international audience on [key takeaways from our Future Cleantech Festival](#) alongside the Bonn negotiations. Results focused on specific steps to accelerate the development of climate-friendly technologies in aviation, cement, long duration energy storage, and more generally on fostering structural innovation for policy-makers.

We were pleased to be joined by several experts from UN Climate Change's Technology Executive Committee, a couple of other UN departments, and by additional stakeholders to the cleantech innovation process. Members from other research and policy organizations completed the line-up. The event was facilitated by our partners from UN Climate Change Global Innovation Hub (UGIH).



FCA at UNIDO's Climate and Energy Forum

Peter Schniering joined the session "Connecting the dots to empower cleantech solutions and climate innovations: Cleantech Days Knowledge". This session was organized under UNIDO's flagship initiative Cleantech Days 2023, as part of the Global Cleantech Innovation Programme (GCIP). It aimed to bring together key experts from 16 countries working to accelerate cleantech innovation.

In the afternoon, Peter Schniering moderated a fireside session on Hydrogen during UNIDO's Green Hydrogen Industrial Cluster model networking event, which aimed to discuss the interest of governments and the private sector in applications for green hydrogen.

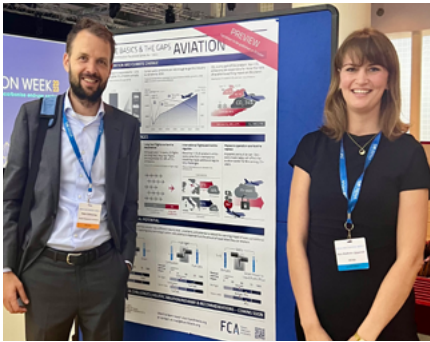


Participation in External Events and Panels

FCA at IRENA's Innovation Week 2023

Intensifying our collaboration with International Renewable Energy Agency (IRENA), it was our pleasure to support their [flagship event IRENA's Innovation Week 2023](#).

[Our main focus](#) centered around our core areas in the hard-to-abate sectors. Our factsheet series – The Basics & The Gaps – was displayed in the gallery of the main conference venue Bundeskunsthalle in Bonn and our founder, Peter Schniering, was honored to join Roland Roesch (IRENA) and Eleanor Webster (Mission Innovation) on stage to wrap up the results and key findings from the first two days.



FCA at NRW IHK Annual Gathering

Future Cleantech Architects was invited to give a [keynote presentation](#) at our home region's industry and trade chamber's annual gathering. Peter Schniering addressed regional policy-makers, representatives from financial institutes, and, predominantly, representatives of the region's mainly family-owned industrial companies.

Metalworking, an emissions-intensive industry in Germany's Western state North Rhine-Westphalia, has significant potential to attract bright innovators and investments for cleantech solutions, given that a lot of the important infrastructure for producing such cleantech is already in place. However, it will take a consistent and highly ambitious approach, combined with a strategy embracing international experts, to transform the industry.



Participation in External Events and Panels

FCA at Global Renewable Energy Forum (GREF)

Peter Schniering moderated a session on “Advancing Policy for Hydrogen Economy”, where Eunji Park (UNIDO), Magnolia Tovar (Clean Air Task Force), and Dr. Jiyoung An (Korea Energy Economics Institute) delved into the policies and regulations shaping the renewable energy and hydrogen sectors to gain insights into the future of sustainable energy governance.

We were pleased to once more participate [in this yearly event](#) co-hosted by the Embassy of the Republic of Korea and the International Renewable Energy Agency (IRENA).



Other Events and Panels

- ▶ NRW Mobility Day 2023: Peter Schniering was invited to a panel discussing "[Mobility with Hydrogen – New Drive for Climate Protection](#)", where he emphasized the need to prioritize green hydrogen use only for those sectors which cannot be electrified - unlike road transportation.
- ▶ [LDES Workshops](#): FCA co-hosted a workshop on LDES market design for innovators together with Breakthrough Energy and The European Association for Storage of Energy (EASE).
- ▶ [CDI Innovation Summit](#): as part of the Cluster Dekarbonisierung der Industrie (CDI)'s Innovation Summit, Peter Schniering held a presentation on the potential of long duration energy storage (LDES) for heat and the power system.
- ▶ [b°future festival](#) in Bonn: as part of the Bonn Institute's Festival for Journalism and Constructive Dialogue, Peter Schniering was part of an expert panel discussing Climate Journalism, particularly focusing on effective engagement with cleantech innovation topics.
- ▶ Mission Innovation Member Insights Report Launch at COP28 UAE: Peter Schniering moderated the session "Advancing Clean Energy and Climate Goals through Collaboration," on the occasion of the report's release.
- ▶ Clean Air Task Force's event "[Getting real on hydrogen](#)" at COP28 UAE: Peter Schniering joined CATF's session and zoomed in on key priorities for governments and the numerous regret applications of hydrogen that should better be avoided.

Media Coverage and External Publications

External Publications

- ▶ [UNIDO report on Green Hydrogen Industrial Clusters](#): a result of collaborative efforts between UNIDO, German Energy Agency (dena), New Energy Coalition, GreenLab, Impact Hydrogen, and Future Cleantech Architects.
- ▶ [Open letter](#): Letter ahead of the European Council's extraordinary meeting on the Green Deal Industrial Plan (GDIP) on 9-10 February.
- ▶ [Open letter](#): Europe's Industrial Transformation at Risk: EIB's Guarantee Facility is the Key to a Sustainable Future.
- ▶ Peter Schniering interviewed at COP28 UAE for German news [WDR's TV news segment, Lokalzeit](#).
- ▶ Peter Schniering's [Op-ed in Tagesspiegel Background](#) on the role of public servants.
- ▶ Aviation and Future Cleantech Festival The ARC23 on TV during prime time in NTV Nachrichten's evening [special on decarbonizing aviation](#). The report was also broadcast later that night on RTL Germany.
- ▶ UK magazine Energy Monitor report on [decarbonizing the cement industry](#) featuring interviews with Future Cleantech Architects' experts Peter Schniering and Ingrid El Helou.
- ▶ BloombergNEF Article on our Future Cleantech Festival The ARC23 "[Clean-Tech Innovation Is a Marathon Not a Sprint at ARC2023](#)".
- ▶ Tagesspiegel Background Energie & Klima reports on FCA's work on [climate-neutral public procurement](#).
- ▶ [Peter Schniering's portrait](#) by German newspaper Tagesspiegel, in the section Energy and Climate.
- ▶ Peter Schniering at [N-TV Klima-Labor podcast](#) about cement decarbonization.
- ▶ FCA was quoted on "[Leschs Kosmos](#)", a popular German television program in which astrophysicist Prof. Harald Lesch explains complex scientific concepts. This episode was on Thermal Energy Storage and retrofitting coalplants for energy storage.

Media Coverage

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