

Driving the Future of Energy: Insights on Hydrogen, Carbon Capture, and the Evolving Energy Market

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insights from industry

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Explore the future of renewable energy with insights on hydrogen, carbon capture, and evolving market dynamics with Christophe Valdenaire.

Could you please introduce yourself and your role at Omniseal Solutions and share a bit about your background in the energy sector?

My name is Christophe Valdenaire, Senior Business Development Manager for Alternative Energy. My professional focus centers on expanding our supply of solution to the energy markets, focusing on clean energy solutions including hydrogen and carbon capture utilization and storage (CCUS) technologies.

With a long pedigree in Oil & Gas and Power Generation, our experience has enabled us to develop advanced seal designs. These designs are capable of withstanding extreme conditions, such as the high pressures and cryogenic temperatures found in hydrogen refueling stations. Additionally, we have developed new proprietary material formulations to address specific needs. These include enhanced creep behavior and KOH (potassium hydroxide) compatibility in Alkaline Electrolyzers.

Our engineered sealing solutions are specifically designed to meet the unique demands of the energy sector as well as the renewable energy challenges.

Our customers rely on our relentless innovation and technical expertise to overcome their

toughest sealing challenges. For a comprehensive overview of our technical capabilities, engineered solutions, and resources, please refer to our [Energy Carbon Free Homepage](#).

How is the current energy market evolving with respect to hydrogen and CCUS technologies? What are the major drivers behind this shift?

The energy market is rapidly transitioning toward carbon-free energy sources, with hydrogen and CCUS at the forefront.

Hydrogen is becoming central to decarbonization efforts, especially in hard-to-abate industrial sectors such as steel, cement, petrochemicals, heavy-duty trucking, and maritime. This shift is driven by increasing global pressure to reduce carbon emissions and the rising demand for renewable energy solutions.

At Omniseal Solutions, we recognized this trend and initiated identifying critical applications in hydrogen and CCUS ecosystems. We've developed specialized sealing solutions - including carbon-neutral and fluoropolymer seals - that support critical hydrogen infrastructure such as refueling stations and electrolyzers. Our technical approach focuses on providing reliable, precise engineering solutions that enable the clean energy transition.

To explore the broader hydrogen value chain and the pivotal role of sealing solutions, you can read our blog, ["Value of Seals & Materials in the Hydrogen Value Chain."](#)

The landscape of hydrogen and CCUS technologies is rapidly evolving. What are the most significant technological advancements or breakthroughs you have observed recently in these fields?

We are seeing advancements at different Technology Readiness Levels (TRLs) that are shaping the future of hydrogen and CCUS. For hydrogen, breakthroughs in electrolyzer efficiency and storage methods have been crucial. Sealing technology plays a critical role in ensuring the safety, efficiency, and durability. You can explore this topic further in our blog, ["Why Sealing is Essential in Hydrogen Electrolysis"](#) which delves into how advanced sealing solutions are key to supporting this pivotal process.

Similarly, for CCUS, progress in capturing and storing CO₂ more effectively is helping reduce the costs associated with these technologies.

The rapid evolution of these technologies points to a future where hydrogen can be used more broadly, from power generation to transportation. As we look ahead to the next decade, we believe the industry will continue to make significant strides in scaling up these technologies. At Omniseal Solutions, we are well-positioned to contribute through our materials expertise and sealing solutions that meet the demanding requirements of these emerging applications.

Can you elaborate on how Omniseal Solutions tackles the needs and pain points identified in the Hydrogen and CCUS applications?

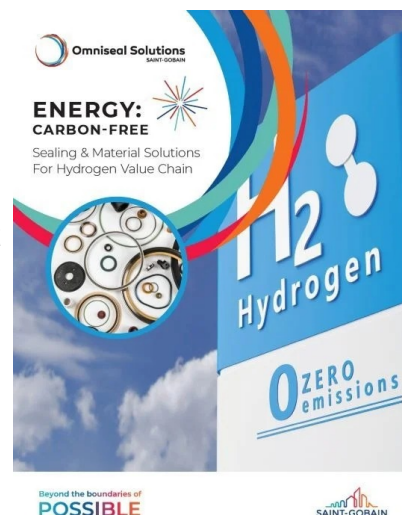
We have developed a specialized hydrogen technical platform that directly tackles some of the industry's most pressing challenges, such as material compatibility, leakage control, and maintaining efficiency in high-pressure and cryogenic environments. As part of this effort, we have conducted an extensive material testing campaign to ensure that our sealing solutions can endure the extreme conditions associated with hydrogen storage, transportation, and utilization.

For CCUS applications, we focus on providing high-performance solutions that operate reliably. By leveraging advanced material engineering, our seals offer chemical resistance to CO₂ impurities and mechanical strength, which are crucial for ensuring durability and reducing operational risks. These tailored solutions allow our clients to confidently implement hydrogen and CCUS technologies, knowing that their systems are optimized for safety and longevity.

For a closer look at our precision-engineered sealing solutions across the hydrogen value

chain, explore our [Hydrogen Industry Handbook](#).

This handbook provides an overview of our experience in developing seals for critical hydrogen applications such as electrolysis, storage, refueling, and transportation. The content includes detailed information on our fluoropolymer and thermoplastic materials, which have been carefully engineered and tested for properties like permeability, rapid gas decompression (RGD), and thermal resilience.



How are policy frameworks and governmental incentives shaping the development and deployment of hydrogen and CCUS technologies? Are there any specific policies that you believe are particularly impactful?

Policies play a crucial role in accelerating the adoption of these technologies. A competitive landscape is emerging, particularly between China and the US/Europe. Both regions are pursuing initiatives to enhance their domestic capabilities, which we believe will further stimulate innovation.

Additionally, we are actively contributing to international standards through our involvement with ISO and API technical committees for hydrogen valves. Standardization will help create a more harmonized global market, making it easier for companies to scale hydrogen and CCUS technologies worldwide.

As Omniseal Solutions looks ahead, what role do you see the company playing in the future of energy?

At Omniseal Solutions, we are committed to being at the forefront of the energy transition. As hydrogen and CCUS technologies mature, our aim is to remain an integral part of these ecosystems, providing high-performance sealing solutions like our carbon-neutral friendly seals that support the development of next-generation energy infrastructure.

Our focus on sustainability and problem-solving teams ensures that we address the complex challenges faced by the industry. With our technical advantage and extensive experience in the energy sector, we will continue to drive innovation and contribute to a more sustainable energy future.

About Christophe Valdenaire

Christophe Valdenaire, Senior Business Development Manager for Alternative Energies at Omniseal Solutions, brings over 23 years of expertise in the energy sector. He has extensive knowledge of high-value applications in Oil & Gas, Power Generation, and emerging fields such as Hydrogen, Carbon Capture, Utilization, and Storage (CCUS), and Concentrated Solar Power (CSP). Leveraging his strong commercial and technical background, Christophe leads strategic initiatives that support Omniseal Solutions' mission to advance alternative energy technologies.



This information has been sourced, reviewed, and adapted from materials provided by Omniseal Solutions.

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Omniseal Solutions is an engineering leader with over 65 years of global history and longevity, relentlessly dedicated to the design and manufacture of precision sealing and wear control solutions that protect critical applications in space, aviation, hydrogen, nuclear, life science and industrial extreme environments.

We are passionately driven to push *Beyond the Boundaries of Possible*; going beyond is what our team is known for! Customers trust Omniseal Solutions to swiftly resolve seemingly insoluble engineering and technology challenges that are extremely difficult, rapidly changing, unpredictable or not the norm.

With 17 manufacturing sites in 10 countries, we are not only global but also local to provide rapid response to customers and the communities they serve. We focus on collaboration to make positive changes - sharing experience and ideas to build unique solutions - to go beyond together.

BEYOND

the boundaries of possible