

# From breakthrough and bankable:

Scaling high-potential renewable technologies



There is this kind of competition now for new sources of energy - the market is going to select which one has the most efficient, the cheapest, the easiest to execute on.

– **Denis Bensoussan**, Head of Space, Beazley

Hydrogen hubs, next-generation geothermal and space-based solar are redefining what's possible in clean energy. But to move from invention to investment, only technologies that can prove economics, resilience and risk control will earn their place in tomorrow's energy system.

## Green hydrogen

### Lessons learned: The role of hydrogen in driving project economics

The hydrogen story is no longer about whether the technology matters, but where it can be deployed safely, with managed supply-chain exposure and at an affordable cost. Strongest growth potential lies in chemical feedstocks such as ammonia and methanol, alongside applications across oil refining, steel manufacturing, long-duration grid balancing and jet aviation.

But the market is also being shaped by geopolitical pressures which has pushed energy security to the top of the agenda. Green hydrogen, as an energy carrier, could step forward in the energy mix as alternatives and diversification become strategic priorities. India, China, Australia, Oman, Egypt, Saudi Arabia and Morocco are all emerging as important centers of green hydrogen project development.

The current focus is on project feasibility. Renewable energy generation costs (LCOE) are falling, electrolyser efficiency is improving and Chinese manufacturing scale is reducing capital costs, leading to pilot projects advancing for low-carbon steel, shipping and mobility. Though challenges persist, industrial-scale ammonia

cracking is another major step, strengthening the case for hydrogen trade by allowing ammonia to act as a transport vector. Hydrogen fuel cells also represent encouraging innovation by generating electricity through an electrochemical reaction between hydrogen and oxygen. The sector is maturing, but primarily in specific applications where the full value chain can be aligned.



These are not reasons to avoid the technology, but they do require robust risk engineering, stronger global standards, and more mature governance. Insurers and lenders will look for workable project economics, credible evidence of design integrity, maintenance regimes, contractor competence and emergency planning before capital can flow freely



**Francesca Hallam**, Account Executive & Broker, Renewable Energy, Willis Natural Resources

### Risks are impacting viability

For risk managers, project owners and developers, however, both near-term and longer-term challenges remain. Challenges are not only technological:

- Green hydrogen remains significantly more expensive than fossil based hydrogen, limiting investor appetite
- Regulatory uncertainty and inconsistent policy frameworks create difficulty in securing offtake agreements which underpin project economics
- Infrastructure gaps persist across pipelines, storage, ports and refueling networks
- Skills shortages and supply chain constraints for critical components continue to slow deployment
- Safety is a major risk: hydrogen is highly flammable, prone to leakage and can cause material embrittlement in pipelines and storage systems
- Limited operational history and the prototypicality of technologies also creates insurance underwriting and bankability challenges

The commercial viability of green hydrogen at scale will depend on addressing these challenges and managing the contractual framework through smart risk allocation.

## De-risking deployment

Making strides will involve focusing on:

- At the project level, [performance guarantees](#) (which can provide a financial backstop against technology non-performance), can help to build investor confidence as the technology scales up
- OEM partnerships will be critical, alongside sound contingency plans which could involve equipment redundancy pools and other risk mitigation strategies
- Safety management systems that are designed for scale will be imperative, and risk engineering will have a role in assessing the risk controls and identifying exposures, backed by data

Ultimately, the focus is likely to be on deploying green hydrogen to decarbonize existing demand and prioritize hard-to-electrify sectors. Growth depends on sustained cost reductions, clear prioritization of high value applications, and stronger demand side drivers.

Above all, creating bankable demand through structured offtake agreements and shared risk mechanisms will help unlock finance, improve insurability and accelerate commercial deployment at scale.

## Geothermal

Geothermal energy is moving from a niche renewable into a scalable, strategic power source. Next-generation approaches aim to expand the addressable resource base and de-risk key subsurface constraints.

### Innovation is opening doors

Unlike traditional hydrothermal plants that are limited to naturally hot, permeable reservoirs, enhanced geothermal systems (EGS) engineers underground fracture networks to extract heat from hot, dry rock. This breakthrough expands geothermal's geographic reach into regions such as Europe and much of North America, delivering low carbon, dispatchable power where natural geothermal reservoirs previously were not viable.

Meanwhile, closed loop systems are gaining traction. Closed-loop systems function as 'underground radiators', circulating fluid through sealed pipes without relying on natural permeability. This helps to eliminate subsurface uncertainty, providing a more predictable alternative to other geothermal models.

Project cost and scalability are also improving. Processes such as horizontal drilling, hydraulic fracturing, and fiberoptic sensing were pioneered in the traditional oil and gas sector, but these processes are being applied to

geothermal, reducing drilling risk and enabling deeper, more productive wells. It's out with the old and in with the new, as depleted oil and gas wells are showing promise. **"[Converting wells](#) eliminates the need for new drilling... [which] constitute a significant portion (over 50%) of geothermal project expenses. Repurposing existing wells eliminates these costs."**



Drilling accounts for over half of geothermal CAPEX, reusing existing wells and surface infrastructure can materially improve project economics.



**Justin Lewars**, Account Executive & Broker, Renewable Energy, Willis Natural Resources



## Key risks are keeping a rein on rapid deployment

Despite its promise, geothermal can bring complex risks:

- Finding heat in more traditional wells is not guaranteed
- Subsurface uncertainty remains a core challenge, particularly in EGS where fracture behavior and pressure regimes are difficult to predict
- Well-control incidents can occur, including uncontrolled releases of superheated steam or fluids, which are safety and environmental hazards
- High loss severity is a concern for insurers and lenders. Complex failures are likely to require specialist intervention which could increase costs and delays, impacting project feasibility
- Environmental liabilities arise from the potential release of mineralized brines or impacts on groundwater
- Induced seismicity and regulatory shutdown risks can disrupt operations without clear physical damage triggers

While geothermal has learned many valuable lessons from the oil and gas sector, oil and gas risk frameworks don't capture the full scale of the complex and interconnected risk network for renewable energy companies.

## Insurance is a strategic enabler

To unlock geothermal at scale, project developers need to use insurance as a strategic tool, not a late stage requirement.

- **Align risk, design and insurance earlier in the project lifecycle:** Embed insurer and risk engineering input at the planning stage to improve well design, pressure modeling, contingency planning and contractor selection. Early alignment helps reduce loss frequency and severity, while enabling insurance wordings (well control, redrill, mitigation costs) to be structured around the actual geothermal risk profile rather than adapted oil and gas assumptions
- **Improve clarity and consistency in risk transfer frameworks:** Develop more specific geothermal insurance strategies by clarifying policy triggers, addressing gaps (moving away from oil and gas wordings) around subsurface events and induced seismicity, and linking coverage more clearly to prevention and mitigation measures. Greater transparency and consistency in wordings increase insurer confidence, supports capacity deployment and ultimately lowers the cost of risk over time

Geothermal's growth will depend not just on technology and policy, but on how effectively developers de-risk the subsurface through smarter engineering and innovative insurance solutions.

## Space-based solar

“Earth looks like a finite environment where competition is too acute”, says Bensoussan, and in 2026, space-based solar power (SBSP) moved from science fiction to science fact. Social media platform giant, Meta, has reached an agreement with SBSP start-up, Overview Energy, to secure early access to [up to 1 gigawatt \(GW\)](#) of space-based solar capacity with demonstration targeted for 2028 and commercial delivery by 2030. This agreement represents a major step forward for the technology, reframing SBSP as a potential power purchase agreement (PPA)/offtake-backed infrastructure class.

Meta’s deal, plus [Aetherflux’s orbital data-center concept](#), suggest SBSP may initially be pulled by large scale demand for clean power rather than by traditional utility procurement. Power-hungry artificial intelligence and data infrastructure owners are opting for low-emissions sources of electricity to meet company climate goals: data centers will remain at the forefront of deployment for the foreseeable future.

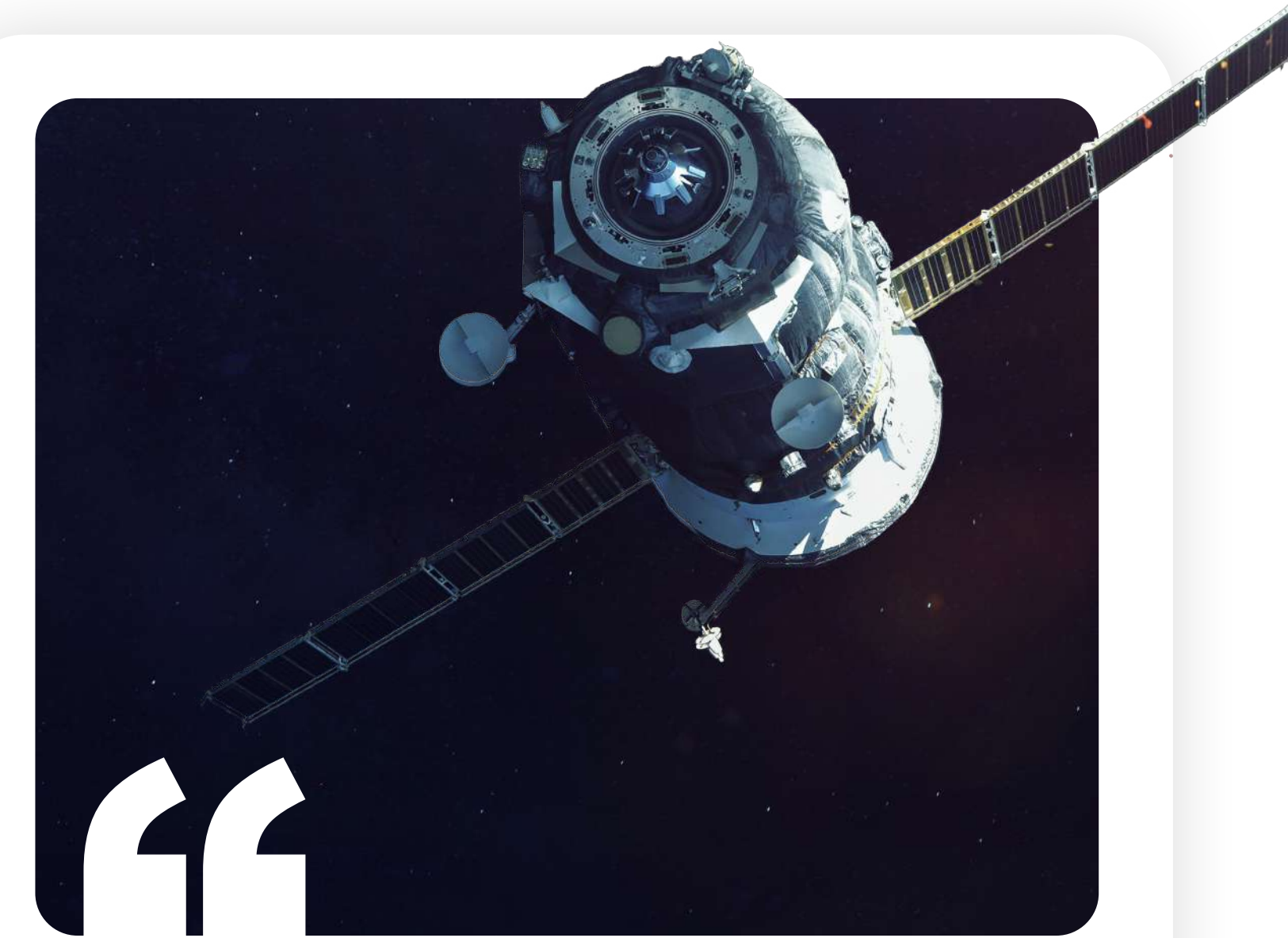
Since SBSP will have access to 24-hour light, SBSP could reduce storage dependence. But this will depend on the probability of the technology. [A 2025 European modelling study](#) suggested SBSP could materially reduce system costs and battery requirements in a decarbonized grid, but the study also flagged key risks.

## Risk follows innovation

SBSP will sit across energy regulation, space licensing, spectrum allocation, aviation safety, environmental permitting, cyber security and national-security scrutiny. For project developers and operators, this creates potential delay-in-start-up, denial-of-access, regulatory change and liability exposures that conventional renewables policies do not properly address.

Wireless power transmission is now the major technology battleground. UK Space Solar’s 360-degree wireless transmission work, and Overview’s moving-platform power-beaming test make beam control, misdirection, atmospheric loss and receiver performance tangible underwriting topics rather than abstract concerns.

As the technology embarks on commercial scale up, launch, deployment, in-orbit assembly, power beaming, ground receiver assets, grid connection, orbital congestion and revenue interruption will all introduce intrinsic risk profiles that may need separate but interlocking covers. This will likely create a need for a multi-disciplined approach from the insurance market and new ways of thinking about the risk. In response, the insurance market conversation is shifting from ‘can this be insured?’ to ‘which phase carries the risk? and ‘how far do existing solutions support this technology?’ According to Denis Bensoussan, “the electrical connection, the pointing and the stability of the platform are going to be key”.



The needle is moving, but the insurance market is being challenged to match the scale and pace of technological innovation.



**Matthew Bailey**, Account Executive & Broker, Renewable Energy, Willis Natural Resources



## Making the leap into scalability

The market should push for staged de-risking before commercial scale. Insurers should require demonstrator data, independent beam-safety validation, debris/collision modeling, cyber resilience, contractual allocation of space and ground liabilities, and clear revenue-loss triggers before treating SBSP as a conventional renewable energy asset.

The path from innovation to infrastructure is rarely linear. It demands clarity, coordination and confidence across the entire value chain. As clean energy technologies move from prototype to portfolio, the role of the insurance broker becomes increasingly pivotal—linking innovation with capital and risk transfer. By bringing together developers, financiers and insurers, brokers help shape solutions that make projects both insurable and investable. With specialist guidance, developers can design risk strategies built for resilience, unlocking the confidence needed to scale.

To find out how specialist risk advisors and brokers can help you build a future-ready risk strategy to scale these technologies, contact:



### Matthew Bailey

Account Executive & Broker, Renewable Energy, Willis Natural Resources

[Matthew.Bailey@wtwco.com](mailto:Matthew.Bailey@wtwco.com)



### Francesca Hallam

Account Executive & Broker, Renewable Energy, Willis Natural Resources

[Francesca.Hallam@wtwco.com](mailto:Francesca.Hallam@wtwco.com)



### Justin Lewars

Account Executive & Broker, Renewable Energy, Willis Natural Resources

[Justin.Lewars@wtwco.com](mailto:Justin.Lewars@wtwco.com)

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