PROMISING OPPORTUNITIES IN INSURING RENEWABLE ENERGY

A joint research project between Argo Group and the University of Illinois Urbana-Champaign

PROMISING OPPORTUNITIES IN INSURING RENEWABLE ENERGY

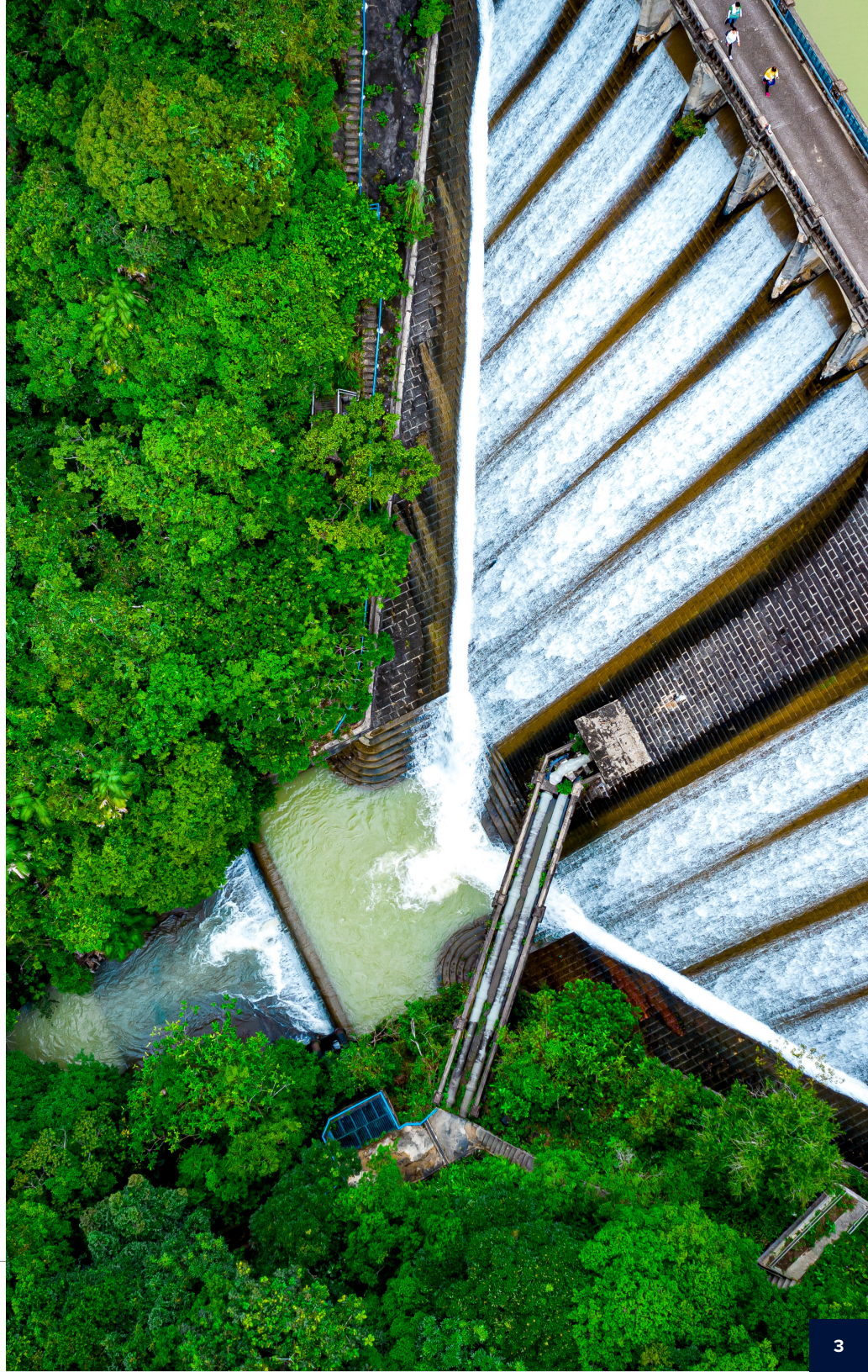
Renewable energy is an emerging area of opportunity for the insurance industry. The most promising opportunities for insurers are in the construction of facilities that produce battery and hydrogen power. These tend to be well-funded, low-risk enterprises with plenty of loss data to analyze. Conversely, other industries present higher risks, less funding and scattershot data.

METHODOLOGY

This study examines renewable energy opportunities and rates each industry's favorability for insurers. It was conducted by Illinois Business Consulting (IBC) and the Office of Risk Management & Insurance Research (ORMIR), both at the University of Illinois, Urbana-Champaign (UIUC), in collaboration with Argo Group (Argo), which also provided funding.

IBC is a student-run consulting group under the Gies College of Business at UIUC. The group includes undergraduate and graduate students who research business issues as part of an experiential learning program.

Argo is a specialty insurance provider with a significant interest in renewable energy.



THE STUDY WAS CARRIED OUT OVER 13 WEEKS AND DIVIDED INTO THREE DISTINCT PHASES.

Understanding Renewable Energy Industries

During this phase, the team researched renewable energy and evaluated market trends in insurance.

Conducting Professional Interviews

The team interviewed experts at insurance companies and in the renewable energy industry to gain unique insights.

Developing Renewable Energy Framework

By evaluating risks, the team was able to rank identified opportunities from most to least attractive.

In order to discover where the strongest insurance opportunities lay, the team looked at factors, including:

- Amount of available loss data
- Amount of government funding
- Risk of each industry
- Insurance products already on the market

The research focused primarily on insurance opportunities in hydrogen electrolysis and lithium-ion batteries, but the team explored opportunities in each of the following renewable energy areas:

Hydrogen from electrolysis

Battery from lithium

Hydroelectric power produced by running water

Nuclear

Wind

Solar

FINDINGS

3 High-Level Findings of the Research

1. **Hydrogen offers highly promising insurance opportunities,** followed closely by batteries.
2. **Government incentives are key** for insurers taking on renewable energy clients.
3. **California presents favorable opportunities** for insurers in the clean energy market.


H2
Danger
Explosive atmosphere
HYDROGEN
H2
ENERGY
STORAGE

HYDROGEN

HYDROGEN: A PROMISING RENEWABLE ENERGY INSURANCE MARKET

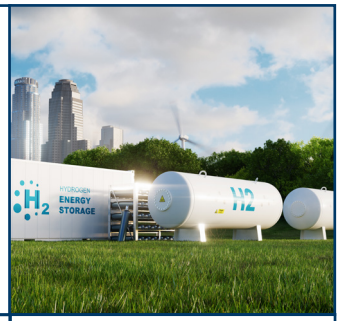
Hydrogen energy is produced by separating hydrogen atoms from larger molecules. There are two main ways of doing this: electrolysis, which produces a carbon-free “green hydrogen” from water molecules, and steam-methane reforming, which produces a “brown hydrogen.”

Production

Electrolytic Processes

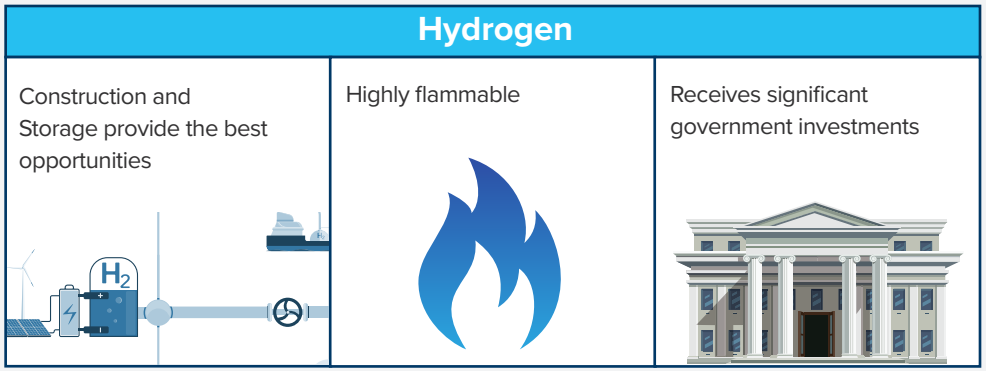
Two of the most popular methods for producing hydrogen energy are alkaline water electrolysis and steam-methane reforming. Each of these processes entail risks that the industry can insure.

Storage



The demand for insuring hydrogen storage will be the greatest for salt caverns and pressurized containers.

Once separated, hydrogen can be converted into usable fuel. Construction of hydrogen-producing facilities and hydrogen storage provide the best opportunities for insurers looking to enter the hydrogen market. The technology is growing and receives significant government investment.



Risks

- **Hydrogen is highly flammable.** Standards have improved in the days since high-profile accidents in the 1930s, but accidents can still happen during production, storage and transportation.
- **Explosions accounted for 84%[1] of recorded hydrogen accidents.** In addition to personal injuries, business interruptions caused by fire and explosions are the biggest risks associated with hydrogen.
- **Other risks include flash fires, jet fires and vapor cloud explosions** during the production phase. There are also risks associated with the difficulty in storing and transporting hydrogen.
- **Flammability risks can be mitigated** by insuring construction of the production and storage facilities themselves. These risks are similar to those encountered during fossil fuel production. Operators need very high safety standards, which insurers can verify through risk engineering surveys.

CURRENT PRODUCTS

Several insurers currently offer products serving the hydrogen energy industry, including:

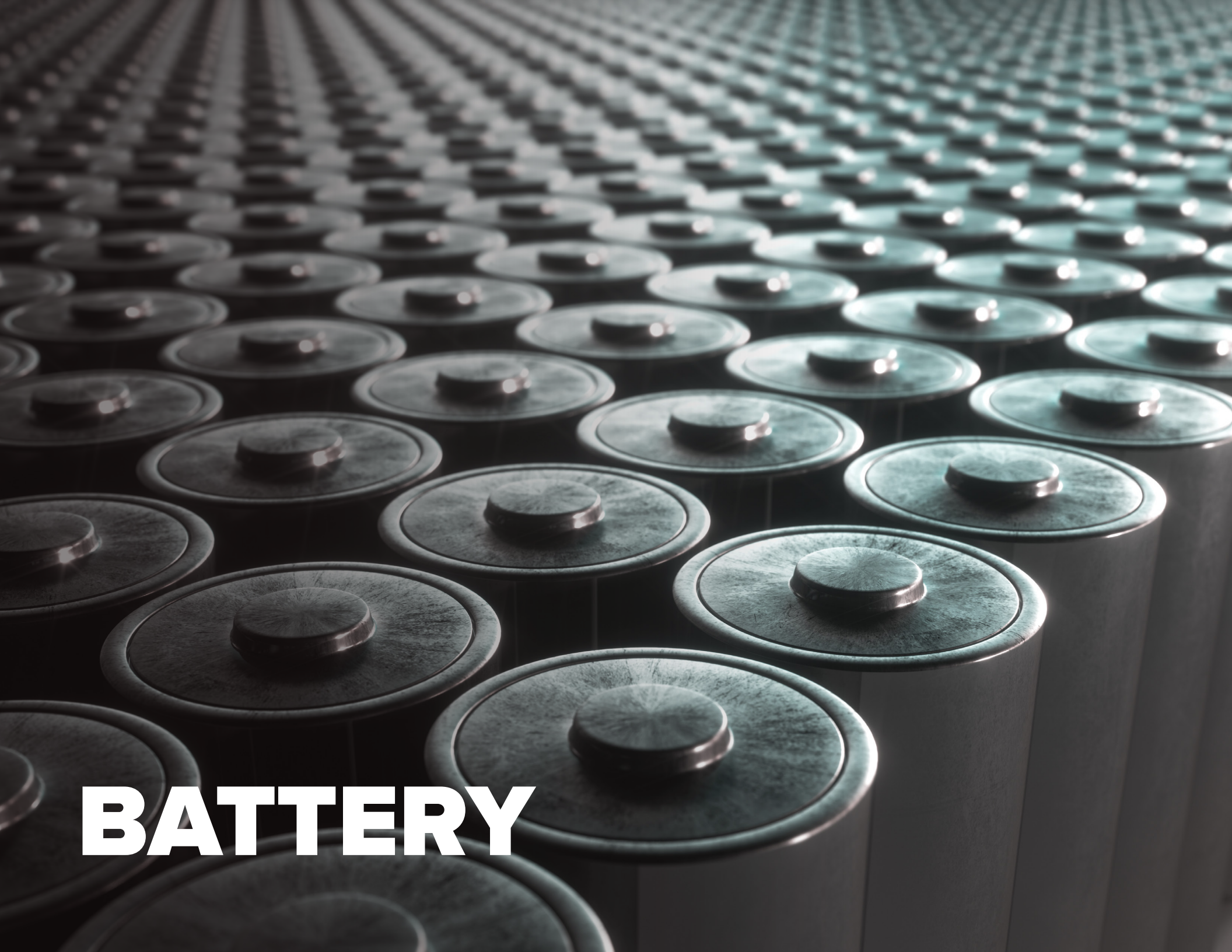
- **Munich Re** – Performance and product warranty for electrolyzer and fuel cell systems.[2]
- **AIG** – Coverage of construction and operation of plants using hydrogen.[3]
- **Lloyd's** – Connects insurance companies to consultants with engineering expertise and distributes risk through reinsurance.[4]

OPPORTUNITIES

Production and storage of hydrogen offers some of the richest renewable energy opportunities for the insurance industry.

Because of the increase in interest and funding, more hydrogen fuel will be produced in the coming years. It's a promising market for insurers with opportunities to take advantage of government incentives.

The 2021 Bipartisan Infrastructure Law allocates $9.5 billion[5] toward expanding the use of hydrogen. Additionally, California's SB 1075 subsidizes hydrogen projects and calls on the California Energy Commission to establish a network of hydrogen fueling stations across the state.


BATTERY

BATTERY: A GROWING INDUSTRY WITH RIPE OPPORTUNITIES

Battery		
Low risk during the production phase	Chief risks are overheating and toxicity of chemicals	Increased funding and demand signals growth in this industry

One of the most popular and fastest-growing types of battery is the lithium-ion battery. Used in electric vehicles, they are lightweight, rechargeable and can carry a lot of energy in a small size.

Risks

- Lithium-ion batteries can heat up to extreme temperatures, potentially causing injury or creating fire hazards. The process known as “thermal runaway” can cause a battery’s temperature to rapidly increase, leading to explosions, injuries, fires and property damage.
- People can be exposed to the toxic chemicals and metals that power batteries during recharging or if the battery is damaged. Damaged batteries can also cause electrical shock.

CURRENT PRODUCTS

Axis Capital covers thermal runaway after confirming that the battery is designed up to a certain standard.[6] Munich Re offers performance-based insurance that covers some battery failures.[7] Marsh has become a leading underwriter of various battery risks.[8]

OPPORTUNITIES

The battery industry is growing. New regulations and increasing demand could lead to long-term projects for the insurance industry.

Battery manufacturing is relatively low-risk. Because batteries have been extensively studied, there is plenty of data available to review. Several studies on lithium-ion batteries show that they rarely perform below standard, meaning insurers could offer performance-based warranties with minimal risk.

There are plenty of government incentives to insure batteries. California's SB700 authorizes $166 million per year[9] in incentives for qualifying, behind-the-meter technologies, including battery.

RISKS IN OTHER RENEWABLES

The team investigated solar, wind, hydropower and nuclear energy but found that the opportunities for the insurance industry were not as enticing.

HAZARDOUS CHEMICALS AND DANGEROUS INSTALLATION MAKE SOLAR RISKY

Solar energy is energy harnessed from sunlight, using cells and panels made of semiconducting material. Some of the challenges include:

- **Solar panels are expensive to install and are vulnerable to damage from extreme weather such as hailstorms.** Because of variability in sunlight, it can be difficult to predict how much energy they will output.

- **Installers, factory workers and electricians are prone to injury.** Injuries can occur during installation or from exposure to hazardous chemicals during solar panel manufacture.

- **Solar panels have been the subject of lawsuits.** California law requires many new homes to install solar panels – and requires that they be installed by certified electricians. The law has been contested in court by the California Storage and Solar Association.

ENGINEERING HAZARDS POSE THE BIGGEST WIND RISKS

Wind power is generated by the motion of a wind turbine. As wind moves the blades of a windmill, they spin around a turbine, which turns a rotor and generates electricity. Wind is a clean energy source, but engineering hazards make it risky for insurers.

Off-shore wind projects have a risky profile, and the industry doesn't yet have a lot of experience underwriting them. In addition to the danger associated with constructing windmills, physical loss or property damage to third parties can result from defective design, faulty parts or poor workmanship. Wind turbines often malfunction within 20 years.

HYDROPOWER HAS A LOW RISK OF HIGH PAYOUTS

One of the oldest energy sources, hydropower is generated by the flow of water which turns turbines that generate electricity. The Hoover Dam is a famous example.

The risk associated with hydroelectric power is very limited. The primary risks are due to human error, and the risk of high payouts is very low.

NUCLEAR ENERGY IS POWERFUL, BUT TOO RISKY FOR MOST INSURERS

Nuclear power is generated by the splitting (fission) or combining (fusion) of atoms, typically uranium atoms. All nuclear energy in the US is generated by fission, which is much easier to perform – but it also carries greater risks.

One byproduct of nuclear fission is radioactive waste, which can be difficult to cleanly dispose of and remains harmful to humans and other life forms for years. Additionally, nuclear power plants can malfunction, leading to catastrophic losses.

Due to the potentially catastrophic risk factors associated with nuclear energy, most insurers are not willing to take on nuclear risk. The U.S. government's Cybersecurity and Infrastructure Security Agency runs a Nuclear Sector Risk Management Agency to mitigate some of the risks.

OPPORTUNITIES IN OTHER RENEWABLES

Solar: The industry could explore insuring engineers for design failures.

Wind: Although offshore wind turbines are risky, the insurance industry may be able to provide important specialty products to cover their construction. The industry can also explore the possibility of insuring against noise pollution caused by windmills.

Hydropower: Because the industry is gaining in popularity and carries minimal risk, there are plenty of opportunities for the insurance industry to get involved. Hydropower has a long lifetime and is the most profitable and economical renewable energy sector.

Nuclear: Currently, nuclear energy provides around 20% of U.S. electricity.[10] Because it is such a widely used source, there could be opportunities for insurance – but the high risk makes it largely unattractive.

CONCLUSIONS

FAVORABLE UNDERWRITING OPPORTUNITIES EXIST IN THE CONSTRUCTION PHASE FOR BATTERY AND GREEN HYDROGEN

4 Most Favorable | 3 Quite Favorable | 2 Not Very Favorable | 1 Unfavorable

	Hydrogen Construction	Battery Construction	Hydrogen General Liability in Production & Storage	Hydrogen Transport (Marine)	Battery E&O	Battery General Liability for Operation	Hydrogen E&O
Risk Frequency	4	4	3	2	4	3	1
Risk Severity	4	4	1	2	2	1[1] 1	1
Market Supply (Competitors)	4	2	4	4	2	2	4
Market Demand	2	4	4	1	2	4	4
Data Availability	4	3	4	4	3	3	2
Average	**3.6**	**3.4**	**3.2**	**2.6**	**2.6**	**2.6**	**2.4**

THREE REASONS HYDROGEN AND BATTERY CONSTRUCTION OFFER THE BEST OPPORTUNITIES FOR INSURERS

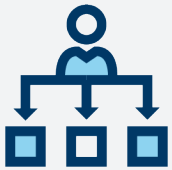
The team examined risk frequency, risk severity, market supply, market demand and data availability across industries. After 13 weeks of research, the team found that the most favorable underwriting opportunities are in insuring construction of hydrogen and battery facilities.

1. **Safe, familiar building materials.** Hydrogen infrastructure mainly uses industrial metals, which are considered safe. Fire prevention technology such as off-gas detectors helps mitigate fire risks in battery plants.
2. **Construction phase avoids many volatilities.** Insuring the construction phase reduces exposure to the risks associated with hydrogen's flammability and the heat and chemical risks of batteries.
3. **Loss data is readily available.** The risks in hydrogen construction are similar to fossil fuels, meaning underwriters have decades of loss data to analyze and inform their judgment. Battery companies keep records on fire losses.

While every energy technology carries unique risks, there are opportunities within each of them for the insurance industry to safely cover risks and provide products.

HOW INSURERS CAN ACT NOW:

Continuing to improve the model. As more information becomes available and more renewable energy products enter the market, the ranking system used to determine favorability can be refined.



Expanding on client needs. Engage with clients, perhaps by generating surveys, and solicit feedback from clients on what insurance products they need the most.

Gathering loss data. Through partnerships or private databases, insurers must continue to model and compile new loss data across emerging industries.

CITATIONS

1. Accidentology Involving Hydrogen, prepared by the Ministry of Ecology, Energy, Sustainable Development and Town and Country Planning, France, 2009, https://www.aria.developpement-durable.gouv.fr/wp-content/files_mf/SY_hydrogen_GB_2009.pdf
2. Hydrogen Performance and Product Warranty Insurance, Munich Re, https://londonmakesitpossible.com/green-product/munich-re-hydrogen-performance-and-product-warranty-insurance/
3. Offering Products with Impact, AIG, https://www.aig.com/esgreports/strategy-and-solutions/general-insurance/offering-products-with-impact
4. A Conversation with Green Hydrogen Systems, Lloyd's, https://www.lloyds.com/news-and-insights/futureset/join-the-reset/greener-energy/green-hydrogen-systems-case-study
5. DOE Establishes Bipartisan Infrastructure Law's $9.5 Billion Clean Hydrogen Initiatives, prepared by the Department of Energy, Washington, D.C., 2022, https://www.energy.gov/articles/doe-establishes-bipartisan-infrastructure-laws-95-billion-clean-hydrogen-initiatives
6. Battery Storage, Axis Capital, https://www.axiscapital.com/londonmarket/insurance/renewable-energy/battery-storage
7. Battery Performance Now Insurable, Munich Re, https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2019/2019-03-07-battery-performance-now-insurable-innovative-munich-re-coverage-paves-the-way-for-renewable-energy.html
8. Transporting lithium-ion batteries: Know your risk, Marsh, https://www.marsh.com/us/industries/cargo/insights/transporting-lithium-ion-batteries-know-your-risk.html
9. Fosterling, Tracy. "SB700 to extend SGIP program through 2025, $800M for Behind-the-Meter Storage," Energy Toolbase, September 27, 2018, https://www.energytoolbase.com/newsroom/blog/sb700-to-extend-sgip-program-through-2025-800m-for-behind-the-meter-storage
10. 5 Fast Facts About Nuclear Energy, Department of Energy, Washington, D.C., 2021, https://www.energy.gov/ne/articles/5-fast-facts-about-nuclear-energy