ATLANTIC
FINANCIAL GROUP

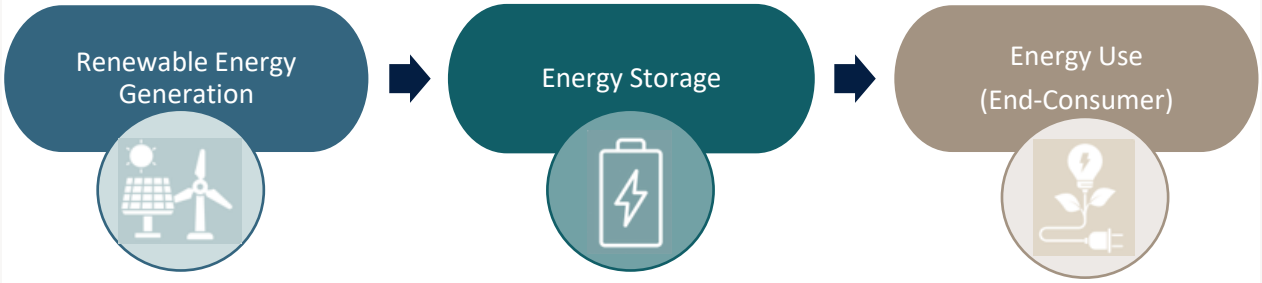
Weekly Investment Focus

6 March 2023

"NO RENEWABLE ENERGY WITHOUT STORAGE"

- What are the energy storage technologies?
- Why do they go hand in hand with renewable energy?
- Innovation reduces costs and dependence on raw materials
- Political support is becoming more concrete

CHART OF THE WEEK: "The renewable energy value chain"



Source: Atlantic Financial Group

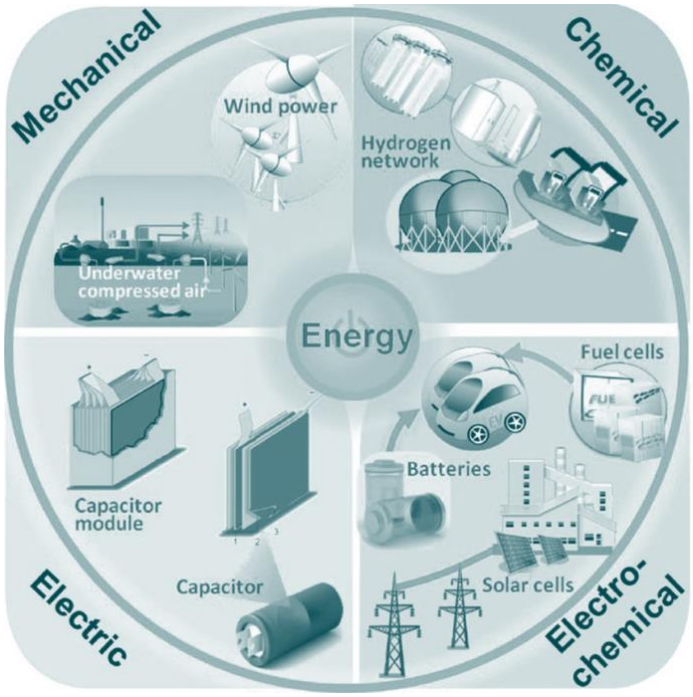
FINANCIAL MARKET ANALYSIS

Energy storage plays a central role in the decarbonisation of our economies and in our ability to provide for our future energy needs. Wind and solar power generators, which do not emit carbon dioxide, have seen their costs fall dramatically. Deployed on a large scale around the world, these energies have the potential to provide a large share of global energy production. Electricity storage can play a key role in balancing electricity supply and demand and can help decarbonise energy systems making them more reliable and cost-effective (see Chart of the week).

♦ What are the energy storage technologies?

There are currently four types of energy storage at different levels of technological advancement: **(1) mechanical, (2) chemical, (3) thermal and (4) electrochemical** (see Fig. 2).

Fig. 2 - The different types of energy storage



Source:, Atlantic Financial Group

Some of these technologies, such as lithium-ion batteries, pumped hydro and some thermal storage options, are proven and available for commercial deployment. Others require more research and development and may not be available until 2030 or 2040.

Electrical energy can be converted into **various forms of mechanical energy such as gravitational energy and kinetic energy.** Electrical energy can also be used to compress a gas such as air.

Some of these forms of mechanical energy are well-suited for large-scale, long-term energy storage. Mechanical energy storage systems tend to have a large footprint and are therefore not suitable for small-scale installations.

Pumped hydro (PH) stores energy in the potential energy of water pumped upstream. Compressed air energy storage systems (CAES) store air under pressure in underground cavities or surface reservoirs. Some systems also store the heat generated by the compression of the compressed air.

The role of hydrogen as a form of **chemical energy storage** for the electricity sector is likely to depend on the extent to which hydrogen is used in the economy. This in turn will depend on the future costs of producing, transporting and storing hydrogen, as well as the pace of innovation in the end use of hydrogen.

Of the **electro-chemical energy storage** options, the development of electric vehicle batteries has greatly improved the possibilities for short-term electricity storage. Long-term storage technologies (>12 hours) have not been as popular. However, these technologies become more attractive when decarbonisation requirements are introduced by governments or when dependence on renewable energy increases.

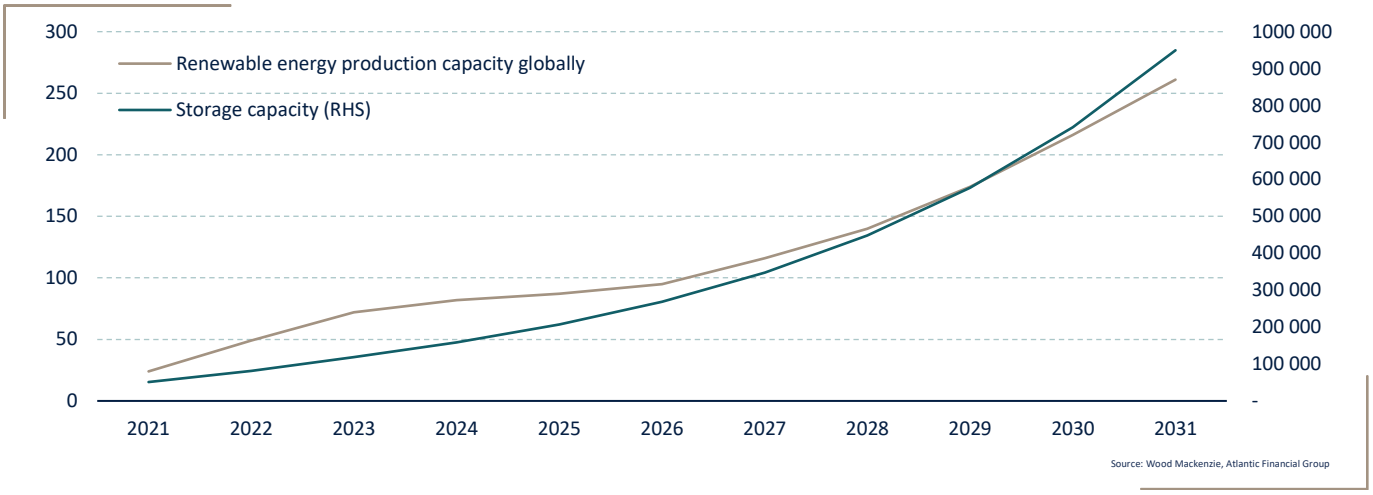
Thermal energy storage (TES) has attributes suitable for long-term storage, including the ability to store heat efficiently in materials.

♦ Why do they go hand in hand with renewable energy?

The main function of the various storage technologies is to return renewable energy, generated during periods of abundance, to the electricity grid at times when its production is scarce and prices are relatively high. Variable renewables (VRE) or intermittent renewables (IRES) are not reliably dispatchable due to their fluctuating nature (e.g. wind and solar) as opposed to controllable renewables (e.g. dammed hydro or biomass) or relatively constant sources (e.g. geothermal).

Options for absorbing large shares of variable energy into the grid include the use of storage, improved interconnection between different variable sources to smooth supply, the use of dispatchable energy sources and overcapacity, so that sufficient energy is produced even in less favourable weather. Energy storage capacities follow the expansion of renewable energy production capacities (see Fig. 3).

Fig. 3 - Expansion of energy storage depends on renewable energy deployment (GWh)



Many companies in a wide range of sectors are investing in energy storage. **Tesla** is one of the best examples of this, as the company **markets energy storage solutions for large-scale projects such as power plants with the "Megapack", or solutions for private individuals with the "PowerWall".**

NextEra, a renewable electricity provider, is also investing heavily in energy storage. **NextEra Energy has more energy storage capacity (>180MW) than any other company in the US.**

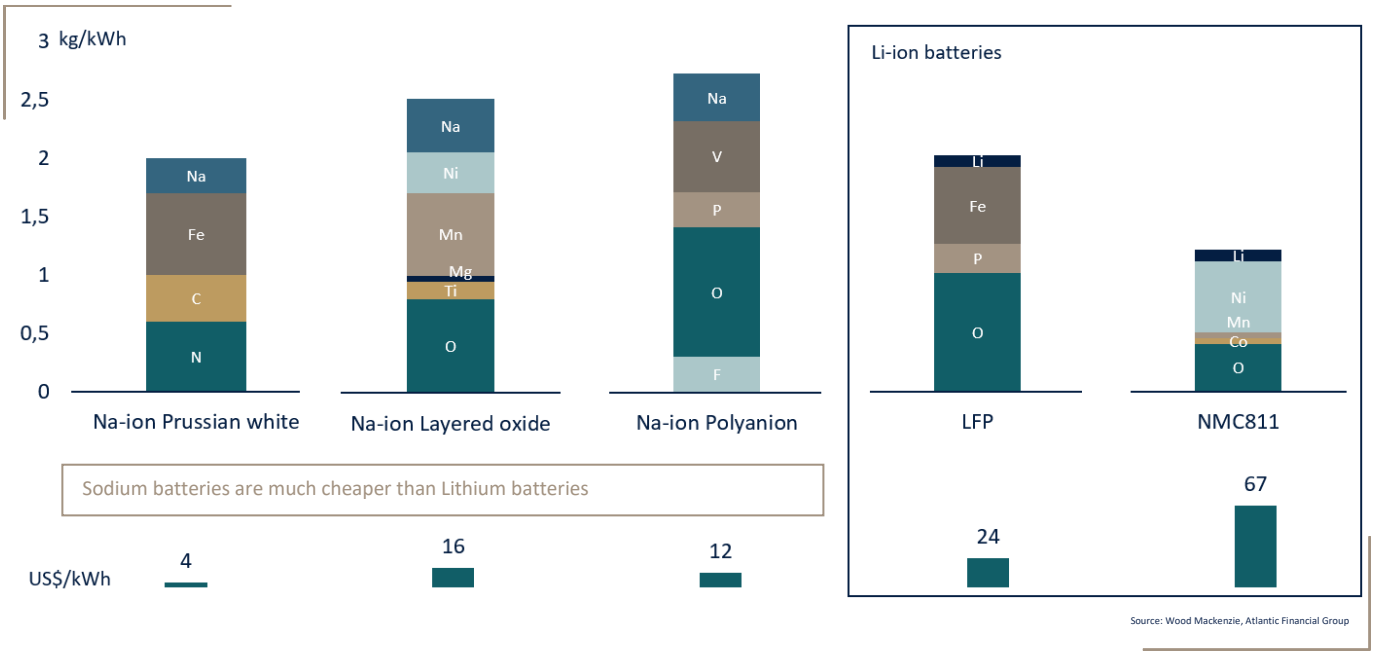
Finally, some market leaders are forming alliances. For example, **Samsung SDI has signed a memorandum of understanding with ABB, one of the world's leading power and automation technology companies, for the joint development and sale of Energy Storage System (ESS) solutions for microgrids.** The aim is to develop and sell an optimised ESS solution using Samsung SDI's lithium-ion battery technology and ABB's electrical component technology, such as PCS, EMS, etc.

♦ Innovation reduces costs and dependence on raw materials

Among the energy storage solutions, batteries for electric vehicles are benefiting from constant innovation. Indeed, **car manufacturers are aware that the race for market share requires a reduction in the price of batteries.**

Today **lithium-ion batteries dominate this market but competing technologies are emerging** that could reduce dependence on lithium, whose price has soared. Sodium-ion batteries could help reduce the price of batteries significantly (see Fig. 4).

Fig. 4 - Chemical contents of sodium-ion (Na-ion) and lithium-ion (Li-ion) batteries



Sodium-ion batteries do not have the same energy density as lithium-ion batteries and do not last as long on each charge. A major advantage of sodium-ion batteries over lithium-ion batteries is their lower price and reduced environmental impact. Sodium-ion batteries could be a viable alternative to lithium-ion. However, they are not without their problems and may not be an immediate replacement for lithium-ion batteries.

Engineers and scientists continue to look for alternatives to lithium. One of the first elements studied as a potential replacement for lithium was zinc. Zinc is more abundant in the natural world, and it is also fairly stable and inexpensive. However, it is not as efficient as lithium. Another alternative is **the** cheap and environmentally friendly **hydrogen battery.** However, hydrogen is highly flammable and expensive to store.

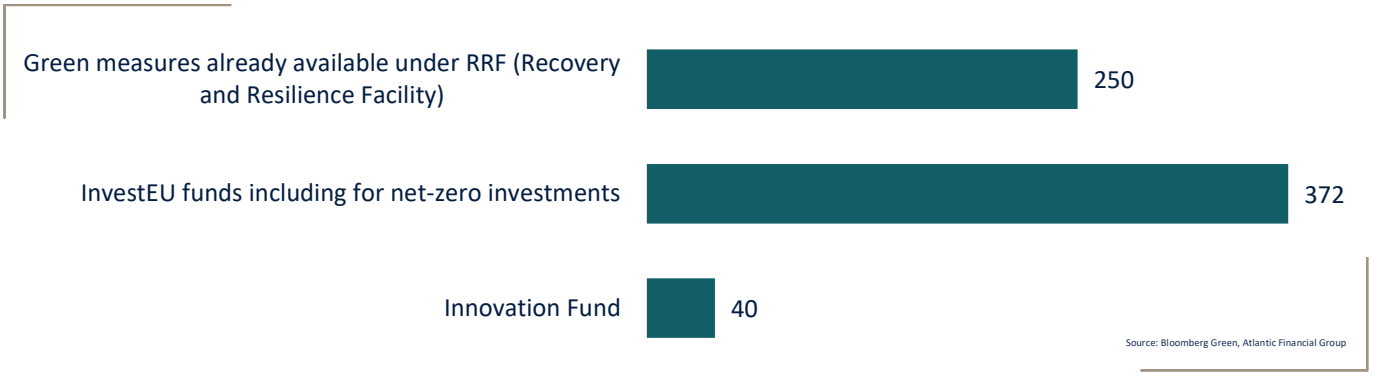
Lithium-ion batteries will continue to be the preferred option for many applications, including electric cars and grid storage. However, lithium scarcity and the environmental damage caused by lithium mining will need to be addressed.

♦ Political support is becoming more concrete

In the United States, **President Biden is committed to accelerate the energy transition with the goal of having renewables account for 80% of energy produced by 2030.** The Inflation Reduction Act (IRA) passed at the end of 2022 includes USD 369 billion in assistance for the transition to renewable energy. The Biden administration has proposed tax credits for a wide range of storage technologies, in addition to tax credits for transmission and various clean generation technologies, including wind and solar.

In Europe, various programmes have been set up to support investment in renewable energy and energy storage, especially long-term storage (see Fig. 5). The **European Union's energy storage needs should be of c. 200 GW by 2030**.

Fig. 5 - European financing for the energy transition (in billion euros)



The Long Duration Energy Storage Council (LDES Council), launched last year at COP26, estimates that by 2040, **long-term energy storage capacity needs to increase 8 to15-fold from its current level** - to 1.5-2.5 TW (85-140 TWh) - to enable a net-zero energy system at the lowest cost. Investment in this sector is still minimal, only USD 130 million in 2018 and USD 910 million in 2021. The investment needed to create this amount of long-term storage would be between USD 1.5 and 3 trillion cumulatively between 2022 and 2040.

Conclusion:

Whether it is a powerwall battery for home or grid-scale, energy storage systems will play a key role and provide vital flexibility to the electricity system. More and more countries and companies are planning and developing energy storage projects, which remain an essential element in enabling the integration of renewable energy. Currently, the most widely used technology for energy storage is hydro, but this has many drawbacks. Future technologies must be simple, reliable, efficient and adaptable in an environmentally friendly way and on a large scale without geographical limitations..

RETURN ON FINANCIAL ASSETS

Markets Performances (local currencies)	Last Price	Momentum Indicator (RSI)	1-Week (%)	1-Month (%)	2023 Year-to-Date (%)	2022 (%)	2021 (%)
Equities							
World (MSCI)	639.7	51.34	1.9%	-2.3%	6.0%	-17.9%	19.0%
USA (S&P 500)	4 046	52.32	2.0%	-2.0%	5.7%	-18.1%	28.7%
USA (Dow Jones)	33 391	49.63	1.9%	-1.3%	1.2%	-6.9%	20.9%
USA (Nasdaq)	11 689	54.13	2.6%	-2.5%	11.9%	-32.5%	22.2%
Euro Area (DJ EuroStoxx)	461.2	61.07	2.4%	0.7%	12.7%	-11.4%	23.5%
UK (FTSE 100)	7 947	57.40	1.1%	1.2%	7.4%	4.6%	18.4%
Switzerland (SMI)	11 190	48.78	0.1%	-1.4%	4.3%	-14.3%	23.7%
Japan (Nikkei)	28 238	62.96	1.8%	1.6%	7.1%	-7.3%	6.7%
Emerging (MSCI)	988	45.24	1.7%	-4.8%	3.4%	-19.8%	-2.3%
Brasil (IBOVESPA)	103 866	34.95	-1.8%	-4.3%	-5.3%	4.7%	-11.9%
Russia (MOEX)	2 272	60.91	2.9%	1.1%	5.8%	-36.9%	21.9%
India (SENSEX)	60 449	47.03	0.6%	-1.6%	-1.5%	5.8%	23.2%
China (CSI)	4 105	55.13	1.7%	-0.2%	6.7%	-19.8%	-3.5%
Communication Serv. (MSCI Worl	77.82	51.15	3.0%	-6.0%	10.7%	-35.3%	10.9%
Consumer Discret. (MSCI World)	308.4	49.86	2.3%	-4.0%	11.4%	-31.5%	9.2%
Consumer Staples (MSCI World)	265.2	44.12	0.1%	-1.4%	-0.5%	-6.0%	11.7%
Energy (MSCI World)	242.9	52.90	2.8%	2.1%	1.5%	34.6%	37.5%
Financials (MSCI World)	139.5	48.58	1.1%	-2.0%	6.0%	-9.2%	25.1%
Health Care (MSCI World)	329.9	39.80	0.4%	-2.8%	-3.4%	-5.7%	18.0%
Industrials (MSCI World)	302.9	59.74	2.9%	-0.1%	7.0%	-12.7%	16.6%
Info. Tech. (MSCI World)	441.2	55.26	2.6%	-2.3%	12.6%	-30.9%	27.6%
Materials (MSCI World)	333.6	56.19	4.3%	-1.6%	7.2%	-11.0%	15.4%
Real Estate (MSCI World)	178.5	43.14	1.2%	-5.6%	3.9%	-24.0%	23.6%
Utilities (MSCI World)	144.2	39.32	-0.4%	-3.0%	-4.3%	-3.8%	11.1%
Bonds (FTSE)							
USA (7-10 Yr)	3.94%	38.92	-0.1%	-3.3%	-0.5%	-14.5%	-2.4%
Euro Area (7-10 Yr)	3.40%	31.42	-1.3%	-4.2%	-0.2%	-19.4%	-2.9%
Germany (7-10 Yr)	2.72%	27.66	-1.4%	-3.6%	-1.1%	-17.8%	-2.7%
UK (7-10 Yr)	3.85%	31.49	-0.7%	-5.0%	-0.2%	-17.1%	-4.9%
Switzerland (7-10 Yr)	1.55%	33.76	-0.8%	-2.6%	0.7%	-12.5%	-2.3%
Japan (5-10 Yr)	0.51%	51.21	0.2%	-0.4%	0.2%	-2.8%	0.0%
Emerging (5-10 Yr)	8.19%	41.33	-0.4%	-2.7%	0.4%	-17.4%	-2.3%
USA (IG Corp.)	5.51%	43.55	0.3%	-2.5%	0.9%	-15.8%	-1.0%
Euro Area (IG Corp.)	4.48%	28.23	-0.8%	-2.5%	0.3%	-13.6%	-1.0%
Emerging (IG Corp.)	7.81%	37.86	-0.1%	-2.2%	0.8%	-14.9%	-3.0%
USA (HY Corp.)	8.55%	50.94	0.4%	-1.4%	2.8%	-11.2%	5.3%
Euro Area (HY Corp.)	7.57%	42.76	-0.3%	-1.3%	2.9%	-10.6%	3.4%
Emerging (HY Corp.)	11.13%	41.54	-0.5%	-2.7%	1.1%	-12.4%	-3.2%
World (Convertibles)	377.3	51.84	1.1%	-2.0%	5.2%	-18.2%	2.4%
USA (Convertibles)	500.8	53.32	1.2%	-1.6%	5.6%	-20.1%	3.1%
Euro Area (Convertibles)	188	52.49	0.3%	-1.1%	4.0%	-12.1%	1.2%
Switzerland (Convertibles)	173.2	33.21	-0.4%	-1.2%	0.7%	-7.5%	-0.5%
Japan (Convertibles)	205.2	66.83	0.4%	1.8%	3.7%	-1.3%	3.3%
Hedge Funds (Crédit Suisse)							
Hedge Funds Indus.	748	69.58	n.a.	1.8%	n.a	1.0%	8.2%
Distressed	937	57.82	n.a.	1.4%	n.a	-4.5%	12.5%
Event Driven	774	57.17	n.a.	2.2%	n.a	-6.8%	12.9%
Fixed Income	395	66.58	n.a.	1.4%	n.a.	-1.0%	5.2%
Global Macro	1435	66.57	n.a.	2.7%	n.a	15.9%	9.6%
Long/Short	903	59.84	n.a.	3.3%	n.a	-5.8%	8.3%
CTA's	396	61.87	n.a.	-2.6%	n.a	19.1%	8.2%
Market Neutral	297	66.21	n.a.	0.8%	n.a	1.7%	6.2%
Multi-Strategy	710	63.52	n.a.	0.5%	n.a	1.3%	7.0%
Volatility							
VIX	18.49	41.41	-14.7%	0.9%	-14.7%	25.8%	-24.3%
VSTOXX	18.12	44.44	-16.4%	8.1%	-13.3%	8.4%	-17.6%
Commodities							
Commodities (CRB)	548.6	n.a.	-0.2%	-1.0%	-1.1%	-4.1%	30.3%
Gold (Troy Ounce)	1 853	51.03	2.0%	-0.8%	1.6%	-0.3%	-3.6%
Oil (WTI, Barrel)	79.68	57.34	5.3%	8.6%	-0.7%	4.3%	58.7%
Oil (Brent, Barrel)	84.34	53.05	1.0%	4.2%	-0.7%	9.7%	51.4%
Currencies (vs USD)							
USD (Dollar Index)	104.49	55.80	-0.2%	0.8%	0.9%	8.2%	6.4%
EUR	1.0644	47.13	0.3%	-0.8%	-0.6%	-5.8%	-7.5%
JPY	135.65	39.71	0.4%	-2.2%	-3.3%	-12.2%	-10.2%
GBP	1.2028	46.62	-0.3%	0.1%	-0.5%	-10.7%	-1.0%
AUD	0.6755	40.25	0.2%	-1.9%	-0.9%	-6.2%	-5.6%
CAD	1.3594	40.48	-0.1%	-1.1%	-0.3%	-6.8%	0.7%
CHF	0.9355	44.81	0.0%	-0.8%	-1.2%	-1.3%	-3.0%
CNY	6.9144	42.82	0.4%	-1.7%	-0.2%	-7.9%	2.7%
MXN	17.974	72.93	2.2%	6.6%	8.5%	5.3%	-3.0%
EM (Emerging Index)	1 675.5	46.52	0.5%	-1.9%	0.9%	-4.3%	0.9%

Source: Bloomberg, Atlantic Financial Group

Total Return by asset class (Negative \ Positive Performance)

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