WisdomTree Battery Solutions UCITS ETF

VOLT

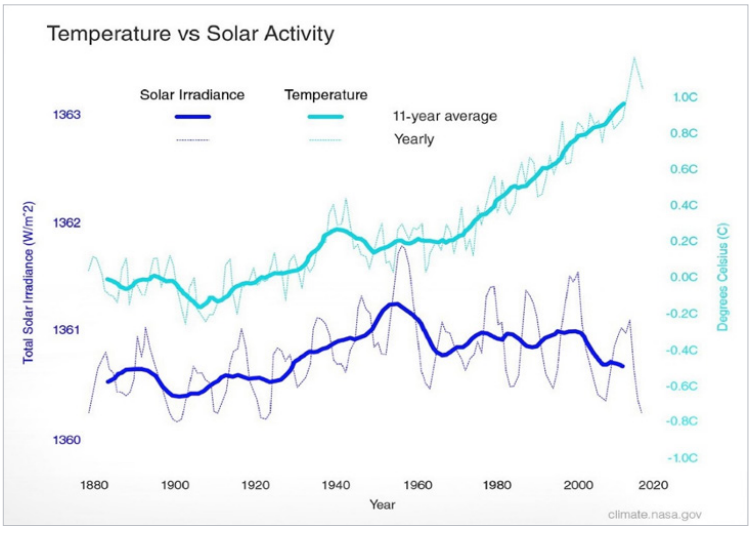
Developments in battery technology represent an emerging megatrend, fuelled by massive attention to climate change alongside rapidly evolving technologies. WisdomTree's approach to developing an index that captures the battery value chain is is informed by true experts in the field: Wood Mackenzie. Leaning on WisdomTree's 14 years of expertise in innovative index construction, investors now have access to a thematic investment vehicle which is tilted toward parts of the battery value-chain that have the highest growth potential. The Index is also both geographically and industrially diverse, and it was designed with the capability to continually evolve with rapidly developing technology.

ENERGY TRANSITION TAKING PLACE

Climate change

Climate change is real. Global temperatures have increased by 1.0°C above pre-industrialised levels due to human activities (IPCC[1]). The Figure 1 shows that the sun's irradiance has not risen significantly over the past century, yet the earth's temperature has risen in the industrial age, indicating that human behaviour has a lot to do with global warming. In the absence of new policies, global warming is expected to reach 4.1°C – 4.8°C above pre-industrial levels by the end of the century (The Climate Action Tracker[2]). The unconditional pledges and targets that governments have made, including nationally determined contributions as of December 2019, would limit warming to about 2.8°C above pre-industrial levels. Temperatures above 2°C are likely to raise sea levels, depleting habitats for humans and animals alike. Coral reefs are also likely to become non-existent[3]. The world is likely to experience more weather extremes: the frequency of droughts in some parts of the world will rise while flooding in other parts are likely to be more commonplace. Environmental policies are likely to become tighter as governments strive to reach the goals they have signed up to.

Figure 1: Global surface temperature change versus solar activity



Source: climate.NASA, as of February 2020. 11-year average is used to smooth over the Sun's natural cycles. W/m^2 is watts per square meter.

[1] The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.
[2] Independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C."
[3] NASA, A Degree of Concern: Why Global Temperatures Matter, 19 June 2019.

Transport and power production are the source of most carbon emissions

An increase in carbon dioxide has contributed to the expansion of the "greenhouse effect" which is warming that results from the atmosphere trapping in heat radiating from the Earth's surface towards space. According to NASA, carbon dioxide emissions are the most important long-lived "forcing" of climate change. Road transportation and power sectors were responsible for around two thirds of all carbon emissions in 2017 (International Energy Agency). It is unsurprising therefore that most of the policy changes target these sectors.

Energy transformation driven by technological change

Technology can help us reduce the emissions we create, without fully compromising on consumption. Advances in car technology mean that our reliance on hydrocarbons can be reduced. Renewable electricity can also drastically cut emissions. Batteries form a key part of the technical delivery.

BATTERIES ARE A KEY ENABLER IN THE ENERGY TRANSFORMATION STORY

In the transportation market, electric vehicles (EVs) need a portable electricity source. Batteries are that solution.

In power markets, renewable sources of electricity including wind and solar are intermittent. Some days you get a lot of sun or wind; other days not so much. It is difficult to match the demand for electricity with the instability in natural elements. Batteries can store excess production and release it at times of higher demand. These stationary storage solutions can be employed both at source at the utility level or at the consumer level with residential battery storage.

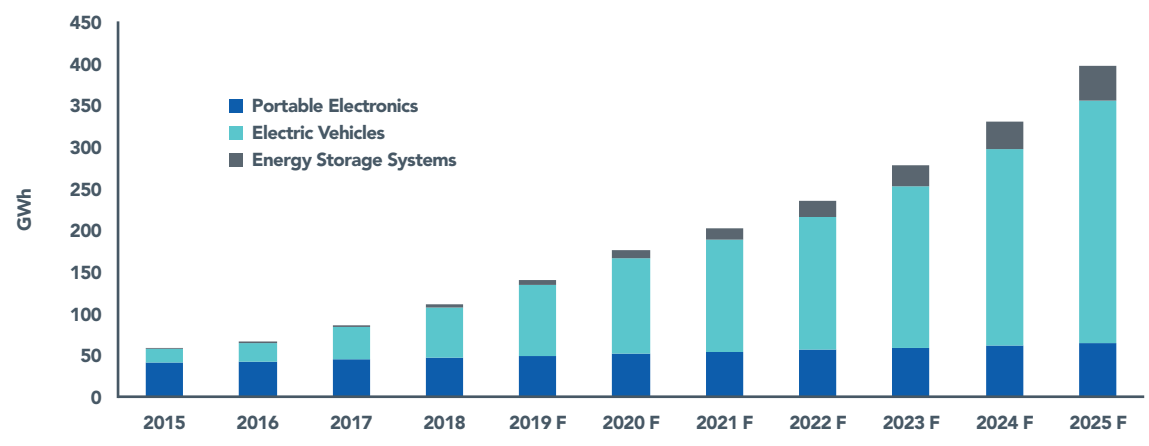
EVOLUTION OF LITHIUM-ION BATTERIES NOW FAVOURS LARGER APPLICATIONS

The first lithium-ion battery (LiB) was commercialised in 1991 by Sony, after 20 years of research. Until recently, the primary use was in portable electronics, including mobile phones. As technology has improved and scaled, it has been used in EVs and stationary storage solutions. Going forward, while stationary storage will grow significantly, the biggest driver will be EVs – which already constitute more than half of global battery demand.

ADOPTION OF ELECTRIC VEHICLES IS LIKELY TO BE THE MAIN CATALYST FOR BATTERY DEMAND

EVs are likely to be the strongest source of growth for batteries. Even under conservative demand growth forecasts for EVs, battery demand from this sector is likely to eclipse battery demand from portable electronics and energy storage systems.

Figure 2: Total storage demand by sector



Source: WisdomTree, Wood Mackenzie, forecasts from 2019. ***Forecasts are not an indicator of future performance and any investments are subject to risks and uncertainties.***

COST DECLINE WILL DRIVE EXTRA DEMAND

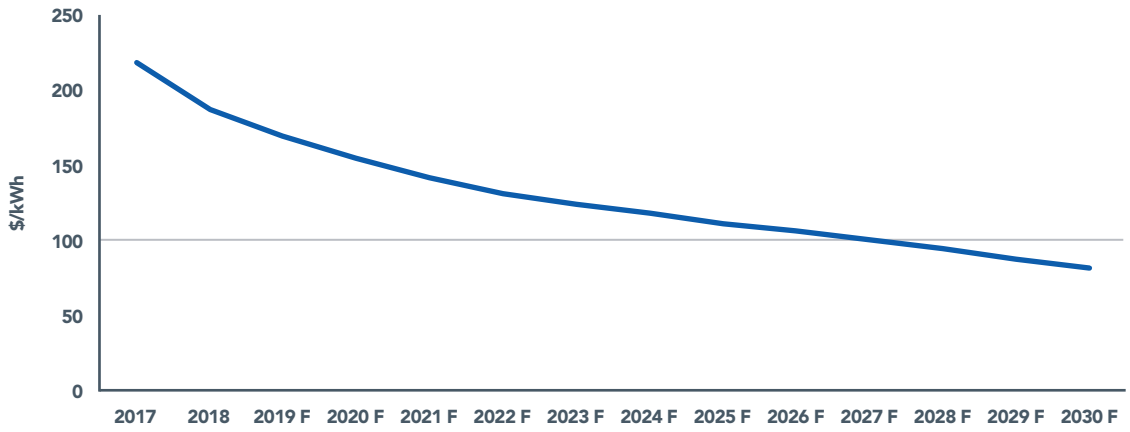
The rise in battery storage is fuelled by falling costs. LiB costs have declined 80% this decade, primarily driven by two things.

Economies of scale. Every doubling of production capacity results in a 5-8% reduction in cost.

Energy density improvements. Market competition accelerates improvements that lead to reductions in battery prices.

As battery costs continue to fall, we expect wider usage. At around US$100/kWH, we could get cost parity between EVs and internal combustion engine (ICE) mid-sized cars, which would be a catalyst for higher battery demand.

Figure 3: Lithium-ion battery cost forecasts



Source: WisdomTree, Wood Mackenzie, forecasts from 2018. $100/kWh is considered an important tipping point for battery adoption. ***Forecasts are not an indicator of future performance and any investments are subject to risks and uncertainties.***

RENEWABLE ENERGY CAPACITY BUILD-OUT IS PLANNED

Global new renewable energy build capacity is forecast to grow by a compound annual growth rate (CAGR) of 7% from 2019 to 2040 – driven primarily by wind and solar. The levelized costs of electricity (LCOE)[4] of wind and solar are rapidly declining and in the mid-2030s are likely to be competitive with combined cycle gas turbines (CCGT). Large scale photovoltaics (excluding batteries) are already as competitive as CCGT.

THE BATTERY VALUE-CHAIN

The battery value chain is made up of a myriad of industries across the globe. The mining and chemical industries each provide raw materials to manufacture battery cell components. Cells are then packed for different applications – such as the increasingly popular EVs. At the end of life, batteries are recycled or used for secondary applications, such as electrochemical storage systems (ESS). Many companies stretch across different elements of the value chain, perhaps integrating the sourcing of raw materials with manufacturing.

In addition, a series of industries evolve symbiotically with this value chain. Charging infrastructure and smart grid software providers can both benefit from, and support, the growth of the EV industry.

[4] Levelized costs treat technologies on an equal basis, stripping out the distortions from taxes and subsidies.

Key components of the value chain we aim to get exposure to

Raw materials: The basis of the value chain – ranging from raw materials mining, such as lithium and nickel, to the processing of chemicals such as lithium carbonate and cobalt chemicals, specifically used for Electrochemical Storage Systems (ESS).

Manufacturing: This encompasses both materials processing to develop battery cells and the development of components, such as anodes and cathodes.

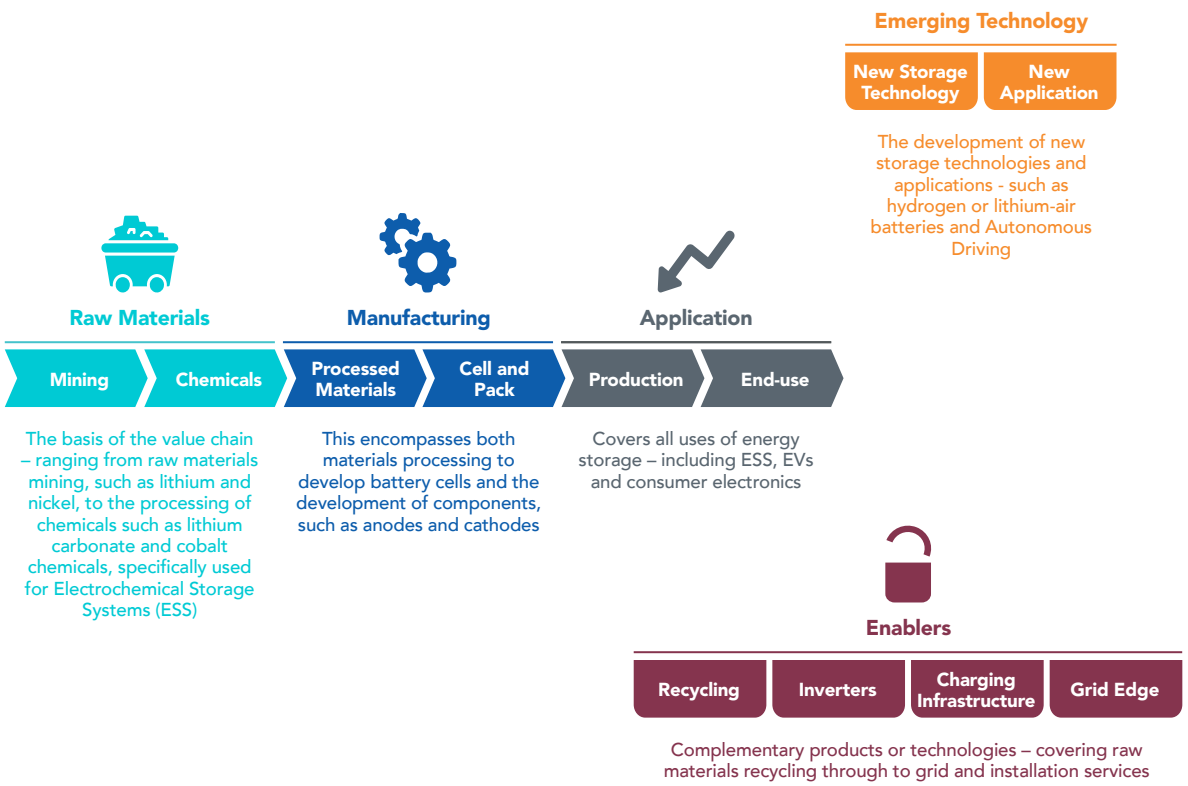
We view raw materials and manufacturing as linear parts of the value chain.

Enablers: Complementary products or technologies – covering raw materials recycling through to grid and installation services.

Emerging Technology: The development of new storage technologies and applications - such as hydrogen or lithium-air batteries and Autonomous Driving.

Enablers and emerging technology are important elements of the battery ecosystem but do not sit in a linear part of the chain.

Figure 4: Stylised battery value chain



Source: Wood Mackenzie.

With this scale of growth in renewable energy production and electric vehicle demand, the projection of demand for batteries is immense. But is the whole value chain ready for such disruptive growth?

Is there enough mining of the raw material?

A dearth of investment in the mining sector in recent years amid weak prices in base metals is likely to see shortfalls in material availability especially in metals like nickel. As a result, we expect nickel prices to rise. Some investors are positioning in the metal directly, while others are thinking about the companies that benefit from being able to turn and sell the nickel they extract at a higher price.

Are there provisions for recycling the material?

As the battery industry grows – and bearing in mind the industry is born from the need for better environmental outcomes – the need for a recycling industry will increase. Currently, this is an underdeveloped part of the value chain. Although there is widespread recycling of material in traditional batteries[5], the infrastructure for recycling was developed in an age of zinc and lead battery dominance. With take-up of LiB in vehicles only starting in earnest in last few years, the aftermarket has not really developed yet.

Is the charging infrastructure in place?

The charging infrastructure in most cities across the world doesn't match car demand projections. If governments were to match their emission abatement aspirations with a charging network that allows 130 million[6] cars to charge. Easy access to charging is essential to mitigate the range-anxiety fears (fear of losing battery power and not having a charging facility close-by to complete a journey). Not only are copper miners to benefit from the what is likely to be a 100,000 tonne market for the copper needed to improve the global EV infrastructure by 2027 (up from 25,000 tonnes in 2019)[7], but the companies building that infrastructure stand to benefit.

THE FUTURE OF BATTERIES

The battery storage sector is constantly evolving. We expect next generation LiB batteries will be commercialised in the coming decade, notably solid state batteries (which are potentially safer than their liquid equivalent).

A range of technologies will be required to fully satisfy storage demand. For example:

- Flow batteries, which use tanks of electrolytes, could push the boundaries of scale even further than LiB batteries – providing electricity to power thousands of homes for many hours
- Liquid air batteries, which is a process of cooling down ambient air and then utilising the energy released from re-gasification, can also help smooth production of energy from variable sources such as wind and solar
- Power-to-gas, which uses electrolysis to separate water into hydrogen and oxygen, can also use excess electricity production from variable sources to produce the hydrogen used in fuel cells.

Many of these newer battery technologies are in earlier stages of research. They are capable of disrupting the status quo and for that reason, our index tries to get exposure to these emerging technologies.

[5] For example, in the EU the Battery Directive set standards for industrial and automotive battery waste management since 2006 including the ban of landfilling and incineration (Article 14). It mandates companies to collect and recycle them. It fixes a minimum required recycling rate for different types of battery (EC, 2014).
[6] The International Energy Agency expects the stock of electric vehicles to reach 130 million by 2030 if all new energy policies announced are enacted.
[7] According to forecasts from Navigant Research.

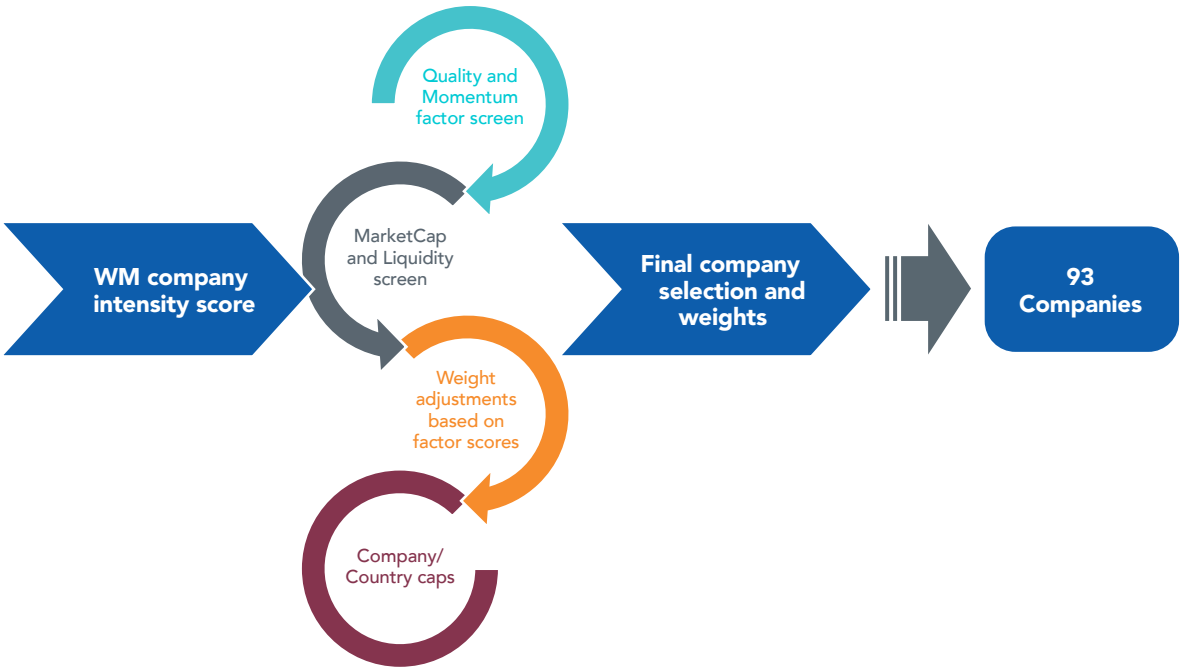
Up-stream to mid-stream focus

Vehicles and other applications may be the engine of growth for the value chain but may not offer the best investable opportunities due to other challenges in those markets. For example, thinking about the auto industry, we view the shift in production to EVs a matter of necessity rather than forward-thinking behaviour by the industry. Most auto manufacturers are likely to remain diversified with large exposure to flagging internal combustion engine vehicles (ICE). They are unlikely to provide investors with strong opportunities. We prefer to focus on the up-stream to mid-stream parts of the value chain.

INDEX CONSTRUCTIONS

Our process starts with identifying companies that operate across the battery value chain. We partner with Wood Mackenzie who has a depth of expertise in the industry. A scoring process helps identify parts of the value chain that deserve a higher weight and then individual companies are also scored on the basis of their exposure to the battery theme. This scoring provides us a first level screen – the WM Intensity Score. We use a number of other screening techniques to mitigate the risk of exposure to illiquid or extremely high-risk companies in positions of high weight. The process combines Wood Mackenzie's domain expertise with WisdomTree's 14-years of experience in developing factor and fundamental based indices.

Figure 5: Index construction process

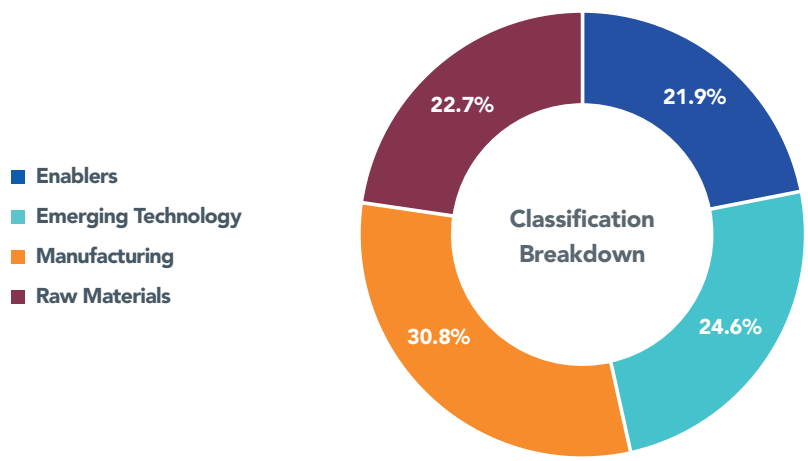


Source: WisdomTree, Wood Mackenzie. Please Note: ***Quality Screen*** *refers to indicators such as Return on Equity, Return on Assets, Gross Profits over Assets, Cash Flow over Assets.* ***Momentum Screen*** *refers to Risk-adjusted total returns over historical periods (6 and 12 months).* ***Liquidity Screen*** *refers to stocks that pass the US$250mn market cap, US$1mn 3-month average daily dollar trading volume (ADDTV) and Hong Kong Stock Connect for China A shares.* ***Country and Sector caps*** *refer to 40% for US and 25% for all other countries.* ***Weight Adjustments*** *implies if a stock's volume factor (ADDTV/weight) is less than US$250mn, its excess weight will be distributed to the stocks from the same category.*

THE PROCESS OVERWEIGHTS THE SECTORS THAT SCORE HIGHER

Our method overweights sectors that score well in Wood Mackenzie's analysis. Namely, our index has greater exposure to manufacturing and emerging technologies – where greater growth opportunities lie – than raw materials and enablers.

Figure 6: Breakdown across sectors



Source: WisdomTree, Wood Mackenzie, FactSet, Bloomberg. As of 3 February 2020. For classification breakdown see page 4. ***You cannot invest in an index. Historical performance is not an indication of future results and any investments may go down in value.***

DIVERSE ACROSS GICS SECTORS

While there is no "Battery" Global Industry Classification Standard (GICS), we can map the companies in our index to the GICS sub-industries. It highlights that our index is diversely spread across mainly Industrials, Materials and Information Technology sectors.

Figure 7: Industry breakdown

GICS Sub-Industry Breakdown	Overall	Enablers	Emerging Technology	Manufacturing	Raw Materials
Total	100.0%	21.9%	24.6%	30.8%	22.7%
Electrical Components & Equipment	18.5%	2.8%	2.4%	12.5%	0.8%
Specialty Chemicals	17.5%	3.4%	0.0%	4.2%	9.9%
Diversified Metals & Mining	14.9%	4.0%	0.0%	0.8%	10.1%
Electronic Components	8.8%	0.0%	3.4%	5.4%	0.0%
Aerospace & Defence	5.1%	0.0%	3.3%	1.7%	0.0%
Automobile Manufacturers	4.5%	1.5%	3.0%	0.0%	0.0%
Multi-Utilities	3.9%	1.0%	2.9%	0.0%	0.0%
Construction Machinery & Heavy Trucks	3.3%	0.4%	2.9%	0.0%	0.0%
Semiconductor Equipment	3.1%	3.1%	0.0%	0.0%	0.0%
Semiconductors	2.8%	0.0%	1.6%	1.1%	0.0%
Other	17.7%	5.8%	5.0%	5.0%	1.9%

Source: WisdomTree, Wood Mackenzie, FactSet, Bloomberg. As of 3 February 2020. GICS is the Global Industry Classification Standard. ***You cannot invest in an index. Historical performance is not an indication of future results and any investments may go down in value.***

GEOGRAPHICALLY DIVERSE

The index is geographically diverse spanning 19 countries. Our process implements country caps, such that the US cannot be more than 50% of the index and any other country can't represent more than 25% of the index.

Figure 8: Geographic breakdown

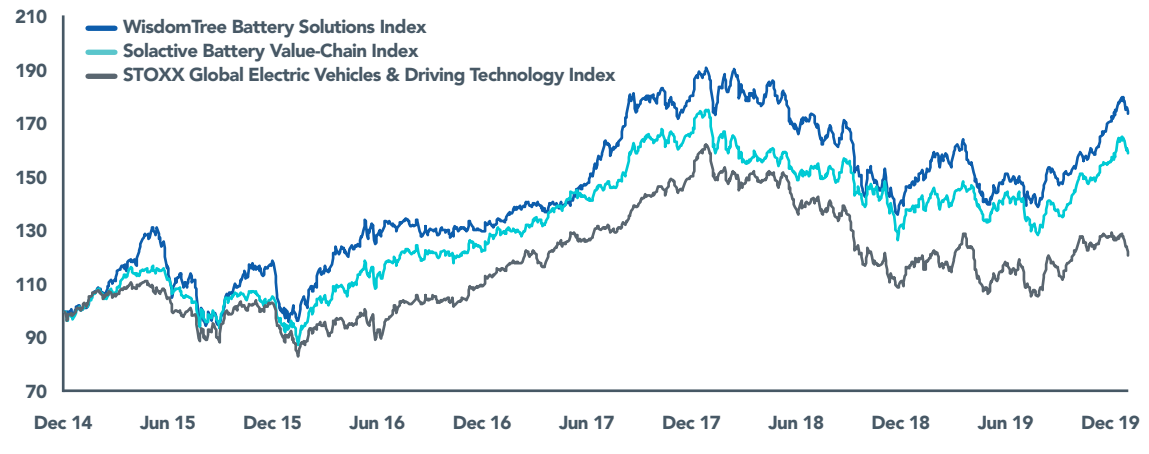
Country Breakdown	Overall	Enablers	Emerging Technology	Manufacturing	Raw Materials
Total	100.0%	21.9%	24.6%	30.8%	22.7%
U.S.	28.5%	6.8%	7.0%	7.6%	7.1%
Japan	20.7%	1.0%	9.0%	5.8%	4.8%
China*	20.6%	7.3%	0.0%	9.1%	4.1%
Germany	5.7%	0.0%	5.2%	0.5%	0.0%
Taiwan	3.9%	0.0%	0.0%	3.9%	0.0%
Belgium	3.4%	3.4%	0.0%	0.0%	0.0%
South Korea	3.3%	0.2%	0.0%	3.1%	0.0%
Indonesia	2.8%	0.0%	0.0%	0.0%	2.8%
Australia	2.4%	0.3%	0.0%	0.0%	2.1%
Netherlands	2.0%	0.0%	1.7%	0.3%	0.0%
Other	6.8%	2.9%	1.7%	0.5%	1.8%

Source: WisdomTree, Wood Mackenzie, FactSet, Bloomberg. As of 3 February 2020.
Index is open to all China share classes.* ***You cannot invest in an index. Historical performance is not an indication of future performance and any investments may go down in value.*

INDICATIVE PERFORMANCE OF THE INDEX

Based on a backtest over the past 5 years, the index appears to outperform other indices that try to capture the themes around electrification and the role of batteries in that transition. Furthermore, Sharpe Ratios indicate that our index would have performed better on a risk-adjusted basis than peers.

Figure 9: Cumulative performance based on backtest



Source: WisdomTree, Bloomberg. Period from 31 December 2014 to 31 January 2020. ***Calculations are based on net total returns in USD and include backtested data. Backtested data does not simulate the scoring process to redefine the universe. However, other screens are applied so that the constituents change at every rebalance.*** *The WisdomTree Battery Solutions Index has started its live calculation on 24 January 2020.* ***You cannot invest directly in an index. Historical performance is not an indication of future performance and any investments may go down in value.***

Figure 10: Risk and return comparison with other indices based on backtest										
Index name	YTD	1Y			3Y			5Y		
	Return	Return	Std. dev	SR	Ann. return	Std. dev	SR	Ann. return	Std. dev	SR
WisdomTree Battery Solutions Index	1.62%	14.91%	13.15%	0.96	9.17%	13.36%	0.53	11.60%	15.55%	0.65
Solactive Battery Value-Chain Index	1.93%	12.39%	12.25%	0.82	7.41%	12.29%	0.44	9.65%	13.79%	0.59
Nasdaq Yewno Global Future Mobility Index	-5.28%	2.83%	13.16%	0.04	-	-	-	-	-	-
STOXX Global Electric Vehicles & Driving Technology Index	-5.57%	1.00%	15.18%	-	1.69%	13.04%	-	3.78%	14.32%	0.16

Source: WisdomTree, Bloomberg. Data as of 31 January 2020. ***Calculations are based on net total returns in USD and include backtested data. Backtested data does not simulate the scoring process to redefine the universe. However, other screens are applied so that the constituents change at every rebalance.*** *Return figures for time periods longer than 1 year are annualized. Standard deviations estimates are based on daily returns. The WisdomTree Battery Solutions Index has started its live calculation on 24 January 2020. Sharpe ratio (SR) is not reported if the return in excess of the risk-free rate in the computed period is negative.* ***You cannot invest directly in an index. Historical performance is not an indication of future performance and any investments may go down in value.***

In conclusion, WisdomTree's approach to developing an index that captures the battery value chain is informed by true experts in the field (Wood Mackenzie) and leverages off our 14 years of expertise in innovative index construction. With WisdomTree Battery Solutions UCITS ETF (VOLT), investors now have access to a financial product which is tilted toward parts of the value chain that have highest growth potential, is also both geographically and industrially diverse, and it was designed with the capability to continually evolve with rapidly developing technology.

Fund info: WisdomTree Battery Solutions UCITS ETF – USD Acc						
Ticker	Exchange	ISIN	Bloomberg Code	Listing Currency	Base Currency	TER%*
VOLT	LSE	IE00BKLF1R75	VOLT LN	USD	USD	0.40%
CHRG	LSE	IE00BKLF1R75	CHRG LN	GBx	USD	0.40%
VOLT	Borsa Italiana	IE00BKLF1R75	VOLT IM	EUR	USD	0.40%
W1TA	Xetra	DE00A2PUQR0	W1TA GY	EUR	USD	0.40%

** Total Expense Ratio.*

IMPORTANT INFORMATION

Communications issued in the European Economic Area ("EEA"): This document has been issued and approved by WisdomTree Ireland Limited, which is authorised and regulated by the Central Bank of Ireland.

Communications issued in jurisdictions outside of the EEA: This document has been issued and approved by WisdomTree UK Limited, which is authorised and regulated by the United Kingdom Financial Conduct Authority.

WisdomTree Ireland Limited and WisdomTree UK Limited are each referred to as "WisdomTree" (as applicable). Our Conflicts of Interest Policy and Inventory are available on request.

For professional clients only. Past performance is not a reliable indicator of future performance. Any historical performance included in this document may be based on back testing. Back testing is the process of evaluating an investment strategy by applying it to historical data to simulate what the performance of such strategy would have been. Back tested performance is purely hypothetical and is provided in this document solely for informational purposes. Back tested data does not represent actual performance and should not be interpreted as an indication of actual or future performance. The value of any investment may be affected by exchange rate movements. Any decision to invest should be based on the information contained in the appropriate prospectus and after seeking independent investment, tax and legal advice. These products may not be available in your market or suitable for you. The content of this document does not constitute investment advice nor an offer for sale nor a solicitation of an offer to buy any product or make any investment.

An investment in exchange-traded products ("ETPs") is dependent on the performance of the underlying index, less costs, but it is not expected to match that performance precisely. ETPs involve numerous risks including among others, general market risks relating to the relevant underlying index, credit risks on the provider of index swaps utilised in the ETP, exchange rate risks, interest rate risks, inflationary risks, liquidity risks and legal and regulatory risks.

The information contained in this document is not, and under no circumstances is to be construed as, an advertisement or any other step in furtherance of a public offering of shares in the United States or any province or territory thereof, where none of the issuers or their products are authorised or registered for distribution and where no prospectus of any of the issuers has been filed with any securities commission or regulatory authority. No document or information in this document should be taken, transmitted or distributed (directly or indirectly) into the United States. None of the issuers, nor any securities issued by them, have been or will be registered under the United States Securities Act of 1933 or the Investment Company Act of 1940 or qualified under any applicable state securities statutes.

This document may contain independent market commentary prepared by WisdomTree based on publicly available information. Although WisdomTree endeavours to ensure the accuracy of the content in this document, WisdomTree does not warrant or guarantee its accuracy or correctness. Any third party data providers used to source the information in this document make no warranties or representation of any kind relating to such data. Where WisdomTree has expressed its own opinions related to product or market activity, these views may change. Neither WisdomTree, nor any affiliate, nor any of their respective officers, directors, partners, or employees accepts any liability whatsoever for any direct or consequential loss arising from any use of this document or its contents.

This document may contain forward looking statements including statements regarding our belief or current expectations with regards to the performance of certain assets classes and/or sectors. Forward looking statements are subject to certain risks, uncertainties and assumptions. There can be no assurance that such statements will be accurate and actual results could differ materially from those anticipated in such statements. WisdomTree strongly recommends that you do not place undue reliance on these forward-looking statements.

The products discussed in this document are issued by WisdomTree Issuer ICAV ("WT Issuer"). WT Issuer is an umbrella investment company with variable capital having segregated liability between its funds organised under the laws of Ireland as an Irish Collective Asset-management Vehicle and authorised by the Central Bank of Ireland ("CBI"). WT Issuer is organised as an Undertaking for Collective Investment in Transferable Securities ("UCITS") under the laws of Ireland and shall issue a separate class of shares ("Shares") representing each fund. Investors should read the prospectus of WT Issuer ("WT Prospectus") before investing and should refer to the section of the WT Prospectus entitled 'Risk Factors' for further details of risks associated with an investment in the Shares.

This document constitutes an advertisement of the financial product(s) mentioned herein.

Notice to Investors in Switzerland – Qualified Investors:

This document constitutes an advertisement of the financial product(s) mentioned herein.

The prospectus and the key investor information documents (KIID) are available from WisdomTree's website: https://www.wisdomtree.eu/en-ch/resource-library/prospectus-and-regulatory-reports

Some of the sub-funds referred to in this document may not have not been registered with the Swiss Financial Market Supervisory Authority ("FINMA"). In Switzerland, such sub-funds that have not been registered with FINMA shall be distributed exclusively to qualified investors, as defined in the Swiss Federal Act on Collective Investment Schemes or its implementing ordinance (each, as amended from time to time). The representative and paying agent of the sub-funds in Switzerland is Société Générale Paris, Zurich Branch, Talacker 50, PO Box 5070, 8021 Zurich, Switzerland. The prospectus, the key investor information documents (KIID), the articles of association and the annual and semi-annual reports of the sub-funds are available free of charge from the representative and paying agent. As regards distribution in Switzerland, the place of jurisdiction and performance is at the registered seat of the representative and paying agent.

For investors in France: The information in this document is intended exclusively for professional investors (as defined under the MiFID) investing for their own account and this material may not in any way be distributed to the public. The distribution of the Prospectus and the offering, sale and delivery of Shares in other jurisdictions may be restricted by law. The Issuer is a UCITS governed by Irish legislation, and approved by the Financial Regulatory as UCITS compliant with European regulations although may not have to comply with the same rules as those applicable to a similar product approved in France. The Fund has been registered for marketing in France by the Authority Financial Markets (Autorité des Marchés Financiers) and may be distributed to investors in France. Copies of all documents (i.e. the Prospectus, the Key Investor Information Document, any supplements or addenda thereto, the latest annual reports and the memorandum of incorporation and articles of association) are available in France, free of charge at the French centralizing agent, Societe Generale at 29, boulevard Haussmann – 75009 Paris, France. Any subscription for Shares of the Fund will be made on the basis of the terms of the prospectus and any supplements or addenda thereto.

For investors in Malta: This document does not constitute or form part of any offer or invitation to the public to subscribe for or purchase shares in the Fund and shall not be construed as such and no person other than the person to whom this document has been addressed or delivered shall be eligible to subscribe for or purchase shares in the Fund. Shares in the Fund will not in any event be marketed to the public in Malta without the prior authorisation of the Maltese Financial Services Authority.

This communication is only intended for duly registered banks and/or licensed portfolio management companies in Monaco. This communication must not be sent to the public in Monaco.