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Energy transition:
the future is now

March 2021

For investment professionals only

TRANSITION HAS TURNED INTO DISRUPTION AS OF 2020

In 2018, we anticipated disruptive effects as of 2020. This trend did prove to bring investments opportunities and resulted in sharply lower valuations for traditional fossil fuel related sectors.

DRIVERS OF ENERGY TRANSITION & DISRUPTION

Drivers

The planet and hence humanity is under threat from severe climate change due to rapidly growing concentrations of greenhouse gasses (GHG's). The threshold of the atmosphere is 450 ppm beyond which Greenland's and Antarctic ice will melt, changing sea-level and weather patterns in giant proportions, with devastating economic and social consequences. Current CO_2 levels hoover between 410-415 ppm and growth is about 3-5 ppm annually[1]. The earth can absorb around 50% of the CO_2 produced 40 Gigaton in 2019, 80% fossil fuels.

At the same time, due to global population growth from 3.7 billion in 1970 to 7.8 billion in 2020 to 10 billion by 2050 (United Nations estimate), and the world's real income increasing over 100% (2011-2050), global energy-consumption will rise 50% in 2014-2040 and electricity-demand will almost double between 2010-2050. As a result, many governments, enterprises, companies and individuals have embarked on a race to massively reduce GHG emissions. This path of Energy Transition is leading to accelerating investments in two areas of energy: (1) Energy Efficiency measures and (2) Zero-emission (renewable) technologies.

Disruption

This paper discusses why investors should anticipate that the acceleration in the adoption of both energy-efficiency measures and zero emissions technologies will continue to be disruptive to the energy sector and hence for investors. Although most people nowadays are used to viewing wind turbines or solar-PV installation, this is only a small prelude to what is to come. And the reason is that there's a very strong economic rationale appearing for both trends: Not only do consumers and shareholders increasingly demand more sustainable efforts from the companies they buy from or invest in, also new business models in energy-efficiency and new technologies are developing and entering the market at a high pace. When both effects will continue to converge, old business models will inevitably be pushed out.

ENERGY EFFICIENCY

Investing in energy efficiency generally leads to savings which are directly margin-enhancing for a company, creating extra free cash-flows. At the same time, risks are limited as energy savings can be realized using proven technologies, while the CO_2 reduction effects are the same or better than for e.g. renewable energy. Opportunities in efficiency can be sought mostly in the Industry, in Real-Estate or in Recycling. Often, measures come in packages and may include insulation, LED-lighting, heat-pumps, heat-recovery ventilation, heat- & cold-storage, thermal-solar, sensor systems, battery storage, combined heat-power systems, waste-heat, biomass and biogas installations, and last but not least the recycling of increasing numbers of materials. Initiatives towards accelerating energy-efficiency have already started since 2009 and ever since is continuing on a steep growth path in the next decades, not least because of the savings leading to attractive return on investment.

Examples

Detaching buildings from the gas-grid will lead to important CO_2 reductions as about 1/3 of total emissions come from the built-environment. Today the levelized cost of heat (LCOH) of a sustainable heat-pump installation (€/mBTU) is approaching that of a natural gas boiler. As a result, the global heat pump market size by revenues is estimated at $92 billion by 2025, growing at a CAGR of 8%. The market witnessed reasonable growth in 2019 where over 50% of the contribution came from established markets such as China, the US and Japan.

Likewise, LED can reduce electricity consumed by lighting by some 70%. Of global electricity 19% is used by lighting and yet LED has reached 46% penetration world-wide in 2019 (International Energy Agency). At the same time the lumens per watt ratio is improving every year while the cost of LED has exponentially dropped. LED is expected to reach a market share of 87% in 2030[2].

ZERO EMISSION TECHNOLOGIES' GROWTH

Zero emission technologies started to see a surprise acceleration since 2020, due to to rapidly falling cost curves and equally fast improving technological achievements. The combination leads to a typical S-curve growth: for years the market share remains at (early adopter) low single digit percentages, and all of a sudden it reaches 85%-95% share within a few years. The effects are likely to be most imminent in energy generation, in energy-storage and in transportation.

[1] Bron: https://www.globalcarbonproject.org/carbonbudget/20/highlights.htm

[2] Bron: https://www.iea.org/reports/lighting

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Examples

Solar PV

The costs of solar energy drop 22% every time the installed base doubles. In 2020, Solar PV share of electricity generation has increased 2,8%[3]. The cost price of solar electricity, depending on the geography, has reached €0.03 - €0.05[4]. In the sunniest places, the latest solar PV power purchase agreements (PPA) have been struck at €0,04/kWh. That's a level competitive with a barrel of oil at $9 or $10. And, this is not the end of price-drops in solar PV. In 2020, large scale solar and storage projects in the US offered all-in electricity prices around 0.03 and 0.04 USD/kwh[5], which was cheaper than just the transmission costs of fossil fuel utilities (€0.07 - €0.12/kWh). Now that solar electricity has become among the lowest cost sources, its application and use are expected the accelerate going forward.

Batteries and Electric Vehicles

Similarly, lithium-ion batteries needed for electricity storage and electric vehicles have seen an acceleration in price-declines, from 14% per annum in 2012 to 20% today. In 2017 the price hit $200/kWh, two to three years earlier than cleantech hawk Professor T.Seba of Stanford University had expected. As the battery prices have dropped further to 135 USD/kWh levels in 2020, with expectations of this level to drop to 60 USD, the pricing of the average EV is becoming truly competitive with combustion powered vehicle[6].

Currently up to 115 mega battery factories are being planned and built, which will drive down battery prices and with that the average price of EV's well below ICE cars in the near future. As a result, the market for new and second hand ICE cars will disappear, not so long after. Especially because EV's operational costs are only a fraction of ICE's: Annual charging costs amount to just 6% of fuelling costs, while maintenance costs are 65% lower as EVs have 95% fewer moving-parts which also leads to a much longer technical lifetime (>800.000 km) and hence lower depreciation. The consequences for automotive companies which won't adapt will be severe. The challenges to the oil industry have started to be priced in equity valuations with oil majors loosing around 50% of their market value during 2020, the same number that caused the last dent in oil-prices. The 'old' combustion based incumbent vehicle producers are now fully embracing EV production with Volkswagen taking the lead to catching up with Tesla, being market leader by far in terms of sales, capacity and technology.

Examples

LIDAR and self-driving vehicles

The last blow to the ICE could well be given by self-driving (SV) technology: just like solar PV and lithium ion batteries, the price of lidar (laser-radar) is falling exponentially, as are the costs of self-learning computing power (AI). Both are key to safe SVs, which could be approved in the US as soon as 2021. If combined with hail-riding (Uber type of business), by 2021 a self-driving EV car-service will have a cost-price of €0.10/km. Whoever lives in a city would want to own a car any longer, if your own car is parked 95% of the time and costs 4x to 10x more?

The holy grail: Hydrogen

When burning hydrogen as a fuel for engines instead of fossil fuels, only clean water (H20) comes out as waste material. In turn, hydrogen can be produced by so-called 'electrolysers', the hardware that facilitates the process called 'electrolysis'. For electrolysis all we need is water, an electrolyser and a source of electricity. The price of production of hydrogen is driven by the level of the electricity price, the cost and efficiency of the electrolyser. A combination of cost reductions in electricity and electrolysers, combined with increased efficiency and operating lifetime, can deliver 80% reduction in hydrogen cost[7]. When this electricity comes from (excess) renewable sources such as wind or solar, hydrogen then is a highly sustainable super fuel. It is expected that as of 2021 increasingly large amounts of hydrogen will be produced in Germany and Canada, from peak-production of wind- and solar energy, i.e. a means to store power. Recently in the UK hydrogen was produced from electrolysis at €0,06/kWh, a level competitive with all other energy sources. S-curve type of adoption for hydrogen should be expected as of 2023 in applications such as energy storage, generators, lifts, drills, tractors, trucks, ships etc.

INVESTMENT POSITIONING

Since the field of energy-efficiency and -savings is quite fragmented, private debt investment funds aggregating those type of projects seems attractive for asset owners like pension funds and family offices. Such funds are likely to provide both somewhat better CO_2 reduction and returns than renewable energy, derived from steady cashflows from savings, based on proven technologies. The innovation here is in the organization/ structuring of such transactions and portfolios. Within the theme Energy Transition attractive returns can be made in Private Markets, conditional upon careful company selection, transaction structuring and effective transaction documentation. ACTIAM provides its clients with the opportunity to invest in a private debt strategy. Alternatively, asset owners may consider investing directly in the corporate bonds and equities of companies active in energy efficiency, such as in insulation, LED, heat pumps, energy services, monitoring-sensors etc. Green bonds don't provide exact exposure to energy efficiency: they're merely a mixed bag of green investments which not always can't be verified on their real green merits.

[3] https://www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf

[4] https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

[5] https://ieefa.org/solar-plus-storage-projects-spreading-across-the-u-s/

[6] https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/

[7] Irena: https://irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_Green_hydrogen_cost_2020.pdf

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ENERGY TRANSITION INVESTMENTS

Energy Efficiency (EE)	New zero emission technology
• **Savings** to generate predictable **cash flows** • Proven technologies made more efficient	• After initial introduction • **S-curve** adoption • New technologies • **Dropping cost** curves

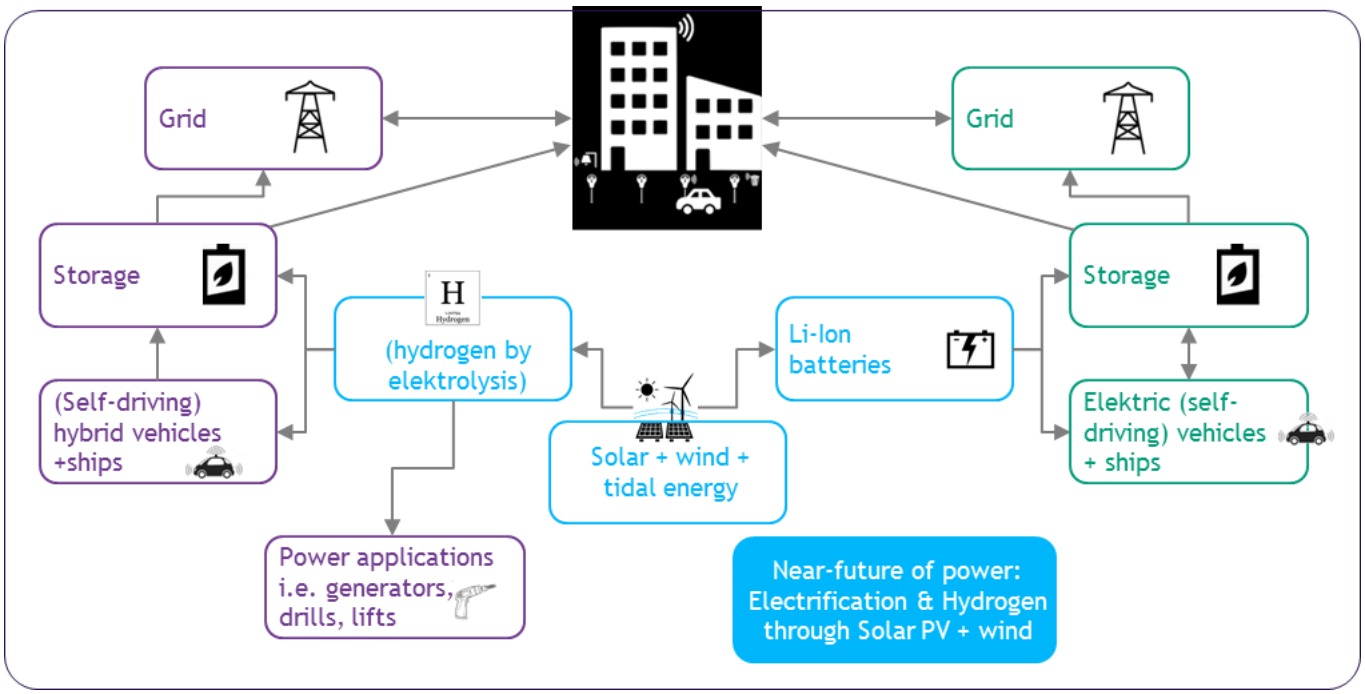
In common: Pushing out old business models
(Utilities, Oil, Coal, Internal combustion car)

With regards to new technologies and applications, to get exposure to (I) generation (solar, wind, tidal) pension funds have good investment opportunities in (I-a) high-tech upstream , e.g. more efficient solar-cells, wind- and tidal-turbines, via selected listed equities, private equity funds, and to a lesser extend (private) debt. And in (I-b) more steady cash-flow downstream e.g. park developments, via both debt and equity markets, both liquid as well as more private. That said, the downstream market for wind and solar increasingly is becoming a market for strategic investors like oil companies and utilities, and hence may not provide the best returns to financial investors, who might want to switch attention to energy efficiency therefore.

Investment opportunities in (II) storage and (III) transportation are increasingly abundant too. As of 2020 large amounts of debt and equity will be needed to finance energy storage through both batteries and hydrogen, exposure to which can be obtained via both project-financing of storage-facilities (direct debt or via a fund) and through investing in corporate bonds and equities of leading companies (makers of anodes/cathodes, battery materials, hydrogen engines and applications, mega-factories). In transportation, exposure to automakers launching successful EV's need to be watched, while also charging-infrastructure poses an investment opportunity in both debt and equity. Needless to say homework needs to be done to select the best bets, which can also can be outsourced to specialized funds.

INVESTMENT RISKS

The effects of several energy efficiency measures and the rapid growth of zero emissions technology adoption at the same time could lead to 10% to 50% revenue drops for some utilities between now and 2025, analysts anticipate. Share-prices of utilities relative to indices are underperforming since many years. Stock prices of regular utilities and coal companies have already been underperforming indices over the last years but are likely to show worse performances going forward. In a similar way, traditional oil, gas, coal, automotive companies will come under further pressure should they not adapt very rapidly. The incumbent players have been very slow in reacting and even though the first strategic changes are made now (RWE & E.ON deal, Volkswagen changes, Shell investing a bit in wind) it remains to be seen whether part of their assets will not get stranded!



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ACTIAM stands for: active and passive management, sustainable investment strategies and impact investing. We aim for financial results, social returns and risk management. With our focus on sustainability, we structurally lower the risks and increase the opportunities in our investment portfolios. We serve clients through both funds and mandates; we supply a variety of tailor-made solutions.

For equity investments, our objective is an optimal financial and sustainable return via passive and active solutions. Our equity team has a long-standing history in sustainable investments and realizes a solid performance, both financially and socially. All our equity funds receive no less than four stars in the Morningstar rating (source: Morningstar, September 2020). The ACTIAM Global Equity Impact product also receives four Morningstar globes in the field of sustainability! It is not without reason that we were awarded Winner Lipper Group Awards "Equity Large" in 2019.

We also pursue an active and passive fixed-income policy for our bond investments with far-reaching ESG integration. We succeed in achieving stable long-term results for our clients, over multiple cycles. The ACTIAM Sustainable Euro Bond Fund receives four stars in the Morningstar rating (source: Morningstar, September 2020).

Finally, we are a trendsetter in impact investing. In 2007 and 2008 we launched our first institutional microfinance funds, ACTIAM Institutional Microfinance Fund I and II. Our strength is making investment opportunities scalable in high-impact themes. In 2020, we were voted the best impact investing provider by the readers of Cash magazine and achieved a top score of 51 (out of 62) in a survey conducted by Phenix GEMS.

Find out what our investment solutions can do for you or go directly to our funds.

ACTIAM manages assets of over €58 billion (ultimo December 2020), making us one of the ten largest Dutch asset management companies. Our solid (impact) strategies and sound performance track record will help you to achieve your goals. We offer sustainable solutions to insurance companies, pension funds, banks and distribution partners. This is achieved through actively and passively managed investment funds and mandates.

Read more about ACTIAM or go directly to our fund overview.

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March 2021