

# Energy transition: the future is now

## TRANSITION CAN TURN INTO DISRUPTION AS OF 2020

As of 2020 investors should anticipate disruptive effects in the energy and transportation sectors, as a result of the convergence of energy efficiency measures and S-curve type of growth of new technologies. This surprisingly fast trend will pose considerable investment opportunities in new areas but also threats to the status quo.

## 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<sub>2</sub> levels hover between 405-410 ppm and growth is about 3-5 ppm annually. The earth can absorb around 5bn metric tons CO<sub>2</sub> a year, however 9.2bn metric tons is produced (and rising).

At the same time, due to global population growth from 4bn in 1974 to 7bn 2015 to 9bn by 2050, 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 become disruptive to the energy sector and hence for investors, as soon as 2020. 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 converge as of 2020, old business models will inevitably be pushed out.

This is a publication of our Impact Investing team, consisting of 8 professionals with an average experience of 15 years in the industry.

As per end of March 2018 the team manages approximately €1 billion.

**Sebastiaan Masselink**  
Portfolio Manager Impact Investing

## CONTACT Marketing & Communications

 +31-20-543 6777

Sales Belgium, France,  
Luxemburg

 +33-6-4409 3746

 [marcom@actiam.nl](mailto:marcom@actiam.nl)

 [www.actiam.com](http://www.actiam.com)

## 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<sub>2</sub> 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<sub>2</sub> 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, between now and 2021, 100% heat-pump growth is expected in the US, and 12%-13% CAGR 2017-2021 in EMEA and Asia.

Likewise, LED can reduce electricity consumed by lighting by some 70%. Of global electricity 19% is used by lighting and yet LED has reached only 3% penetration world-wide. 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 95% within 7 to 8 years (2025).

## ZERO EMISSION TECHNOLOGIES' GROWTH

The adoption of zero emission technologies is set to see a surprise acceleration as of 2020, due 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.

### EXAMPLES

#### Solar PV

The costs of solar-energy drop 22% every time the installed base doubles. In 2015 solar PV provided only 1% of global electricity and the cost price, depending on geography, had reached between €0,046/kWh and €0,07/kWh while the cost price of electricity of a new natural gas plant is around €0,06 /kWh, excluding distribution. In the sunniest places, the latest solar PV power purchase agreements (PPA) have been struck under €0,03 / 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. By 2020 a tipping point will be reached when new solar PV plus battery storage will cost less than €0,065 /kWh , which is cheaper than just the transmission costs of fossil fuel utilities (€0,07 - €0,12 / kWh). After that point, a massive adoption of solar PV will rapidly become reality, which will have disruptive consequences for regular utilities and coal producers.

#### 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 T.Seba of Stanford University had expected . As a result, the price of average full electric vehicles (EV's) in many countries is now almost the same as the average price (€35k) of a diesel or petrol car (ICE, internal combustion engine).

At this very moment 15 mega-factories for batteries are being built (by Tesla, LG, Samsung, BYD, Dyson, Bosch among others) which will drive the average price of EVs well below that of ICE cars by 2020. 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 fueling 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 oil industry should fasten seatbelts as well: if the EV market share growth continues as it is, by 2022 two million barrels of oil per day will be displaced, the same number that caused the last dent in oil-prices. When comparing share-price data 2012-2017 of Tesla with e.g. VW and Ford and BMW, it seems markets have started to price in these expectations.

#### 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 (H<sub>2</sub>O) comes out as waste material. In turn, hydrogen can be produced by electrolysis. For electrolysis all we need is water and a source of electricity. 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 seem attractive for pension funds. Such funds are likely to provide both somewhat better CO<sub>2</sub> reduction and returns than renewable energy, derived from steady cashflows from savings, based on proven technologies. The innovation here is in the organization and structuring of such transactions and portfolios. Actiam is actively investigating the launch of such an energy efficiency fund. Alternatively, pension funds may consider investing directly in the corporate bonds and equities of companies active in energy efficiency, such as in insulation, LED, heatpumps, 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.

#### ENERGY TRANSITION INVESTMENTS

##### Energy Efficiency (EE)

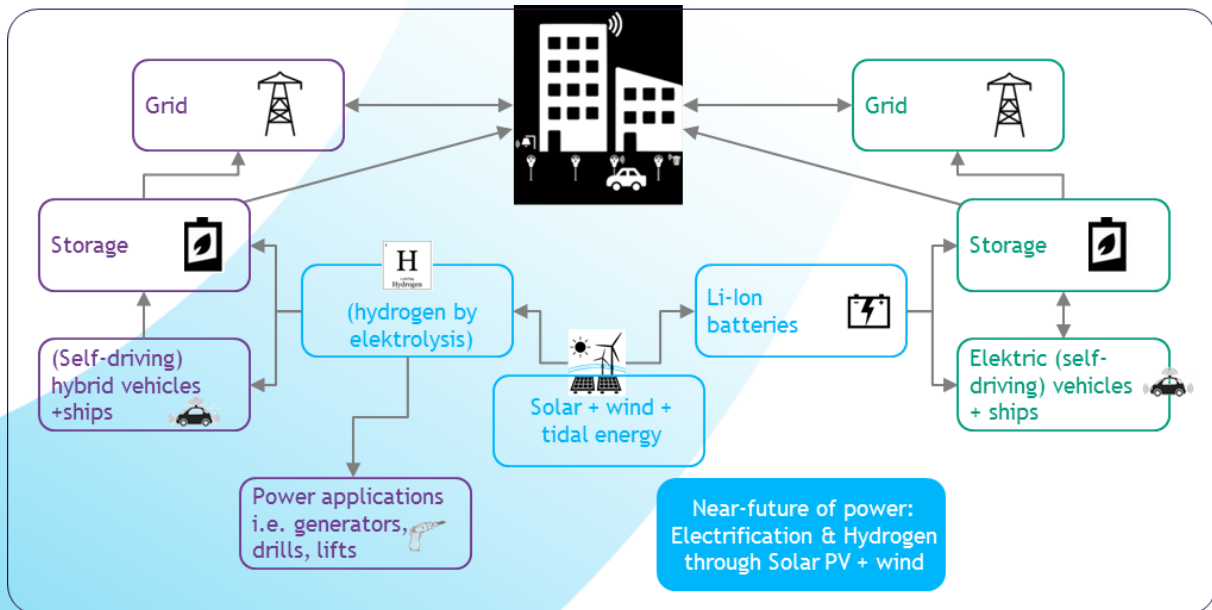
- Savings to generate predictable cash flows
- Proven technologies made more efficient

##### Innovative Clean Technologies

- 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) pensionfunds 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 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 2018 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 severe 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!

#### DISCLAIMER

ACTIAM N.V. endeavours to supply accurate and up-to-date information from sources deemed to be reliable. However, ACTIAM N.V. cannot guarantee the accuracy and completeness of the information contained in this document, referred to below as 'the Information'. The Information may contain technical or editorial inaccuracies or typographical errors. ACTIAM N.V. gives no express or implied guarantees that the information contained in this document is accurate, complete or up to date. ACTIAM N.V. is not obliged to update or correct errors or inaccuracies in the Information. The Information is based on historical data and is not a reliable basis for predicting future values or equity prices. The Information is similar to, but possibly not identical to, the information used by ACTIAM N.V. for internal purposes. ACTIAM N.V. does not guarantee that the quantitative yields or other results from the Information will be the same as the potential yields and results according to ACTIAM N.V.'s own price models. Comments about risks pertaining to any Information should not be regarded as a complete disclosure of all relevant risks. The information should not be interpreted by the recipient as business, financial, investment, hedging, commercial, legal, regulatory, tax or accounting advice. The recipient of the Information is personally responsible for the way in which the information is used. Decisions made on the basis of the information are at the expense and risk of the recipient. Accordingly, the recipient cannot derive any legal rights from the Information.

This document is reserved for French professional investors as defined by Directive 2004/39/CE (MIFID) and not for retail distribution.