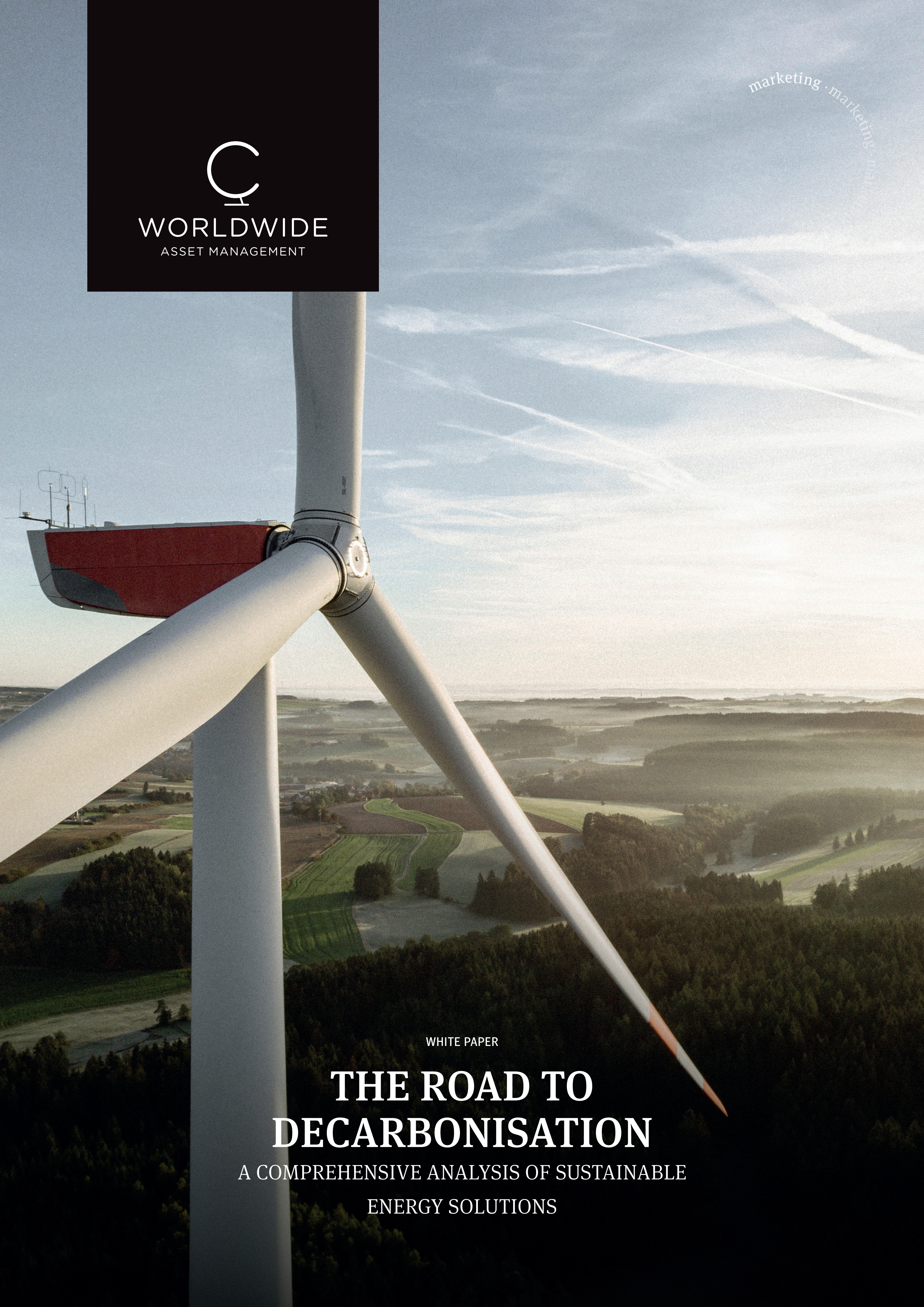
WORLDWIDE
ASSET MANAGEMENT



WHITE PAPER

THE ROAD TO DECARBONISATION

A COMPREHENSIVE ANALYSIS OF SUSTAINABLE ENERGY SOLUTIONS

The Road to Decarbonisation

A Comprehensive Analysis of Sustainable Energy Solutions

Key Insights

- *Energy transition solutions need to be aligned with the energy trilemma of sustainability, security, and affordability. Sustainable investments need to repay both monetarily and in terms of energy return on energy invested. The scale of the task is enormous, and a pragmatic approach suggests the continued use of dense fossil fuels with a focus on the least polluting types, coupled with nature-based carbon capture solutions.*
- *A pragmatic model for decarbonisation recognises that energy systems need to be balanced, with continued high growth of renewables up to 40-50% of electricity generation depending on geography, recommitment to nuclear, a coal-to-gas switch, and nature-based solutions. Increasing energy efficiency through insulation and electrification, particularly in sectors like electric vehicles, heat pumps, and electric motors, has significant CO_2 abatement potential at par with the roll-out of renewables.*
- *As electricity's share of total energy increases from 40% to perhaps 60%, the importance of grid densification, expansion, and smart grid technology cannot be underestimated.*
- *Nuclear energy, both existing and potential advancements with Small Modular Reactors (SMRs), are essential long-term solutions for decarbonisation, and fusion energy will eventually emerge as a key source of energy, increasingly likely already from the 2030s.*

Morten Springborg
Global Thematic Specialist
C WorldWide Asset Management

"Solutions can only be sustainable if the related investments can repay themselves to investors and society, both in monetary form and in terms of energy return on energy invested."

For the energy transition to have any chance of succeeding, proposed solutions must conform with the energy trilemma of sustainability, security, and affordability. Inexpensive solutions are to be preferred to expensive solutions, while proven technologies are to be favored over unproven ones. Above all, solutions can only be sustainable if the related investments can repay themselves to investors and society, both in monetary form and in terms of energy return on energy invested.

The energy transition must support a growing energy supply because much of the global population cannot access abundant modern energy today - and they will demand it. This goes against many "reverse-engineered" net-zero exercises, where one has the impression that the starting point is net-zero in 2050, and then the input variables are fitted to deliver the targeted result. The IEA and the COP28 are examples of this, where a variable like energy efficiency magically has been set at 4% per annum so that total primary energy doesn't have to increase as we advance[1], thereby making the transition "easier" – on paper. While energy efficiency is of utmost importance for the transition, manipulation of key input variables like this is insincere, since historically, energy efficiency has only briefly reached this level in the severe energy crisis years of the 1970s[2].

To illustrate the sheer size of the task in front of us, and maybe also indicate the likelihood of net-zero happening within any reasonable timeframe, to completely replace all

1 COP28: Global Renewables And Energy Efficiency Pledge
Energy Efficiency 2023 – Analysis - IEA
2 Historically energy efficiency improvements have run at approx. 1.3 %pa: Energy efficiency gains forecasts optimistic? - Thunder Said Energy

"A pragmatic approach to climate change is that we will also need dense fossil fuels for the foreseeable future."

the energy we derive from fossil fuels today (137.000 TWH) by 2050 would require the equivalent of constructing two new nuclear reactors (1GW) every day from today until 2050, or in total more than 17.000 reactors. To put this into perspective, there are 440 operational reactors globally. For this reason alone, and if one does not want to starve the world for energy, a pragmatic approach to climate change is that we will also need dense fossil fuels for the foreseeable future, but we should focus on the least polluting types.

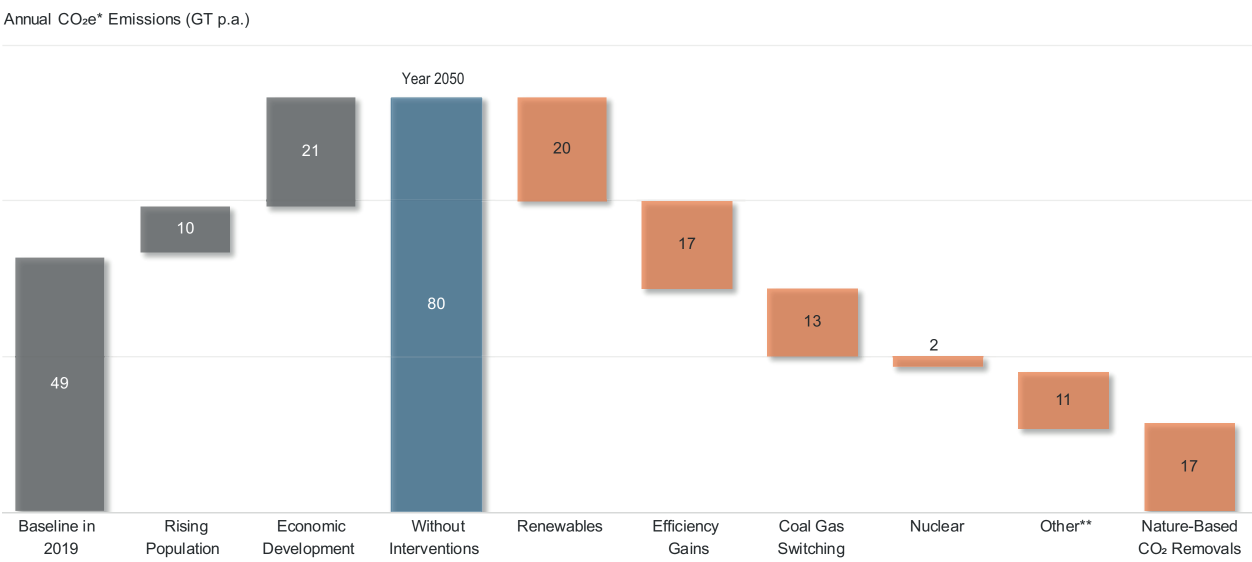
A pragmatic framework for the energy transition

We believe in the framework, but not necessarily in the actual numbers, from ThunderSaidEnergy, the research consultancy for energy technologies, presented in Figure 1, is a good reference to think about an effective energy transition.

In 2019, the world emitted 49GT of CO2 into the atmosphere. A growing and wealthier world population will, all things being equal, drive emissions to around 80 GT by 2050, as represented by the blue bar. So, the task in front of us is to abate 80 GT of CO2 by 2050. We are all guessing, but we believe this is a pragmatic and realistic model for decarbonisation, in contrast to reverse-engineered models, which eventually will lead to malinvestments and failure in reaching decarbonisation goals.

Renewables will be a critical part of this, removing ¼ of global emissions, while an aggressive rollout of nuclear and life extension of existing nuclear plants will reduce CO2 emissions by 2 GT. This might seem a trivial contribution in the larger scheme of things. Still, nuclear plays a very important role in grid stability, industrial and residential heat, and as a dense source of electricity for hydrogen.

Figure 1
A Roadmap to Net-Zero



* Carbon Dioxide Equivalent
** Demand Shift, Decarbonised Supplies

Source: ThunderSaid Energy Models, December 2023

"Nuclear also has time on its side, as newly constructed plants will produce energy for up to a century."

Nuclear also has time on its side, as newly constructed plants will produce energy for up to a century, thereby contributing to the abatement of CO2 way past 2050, while 100% of today's wind and solar facilities, assuming a 20–25-year asset life, will need to be replaced by 2050, a headwind for maintaining 'exponential' renewables growth.

An aggressive coal-to-gas switch where coal is reduced by 90-95% by 2050 and substituted by natural gas and energy efficiency improvements has significant potential for large CO2 reductions. The remaining emissions of CO2 need to be removed by nature-based solutions, as described in earlier white papers, here and here.

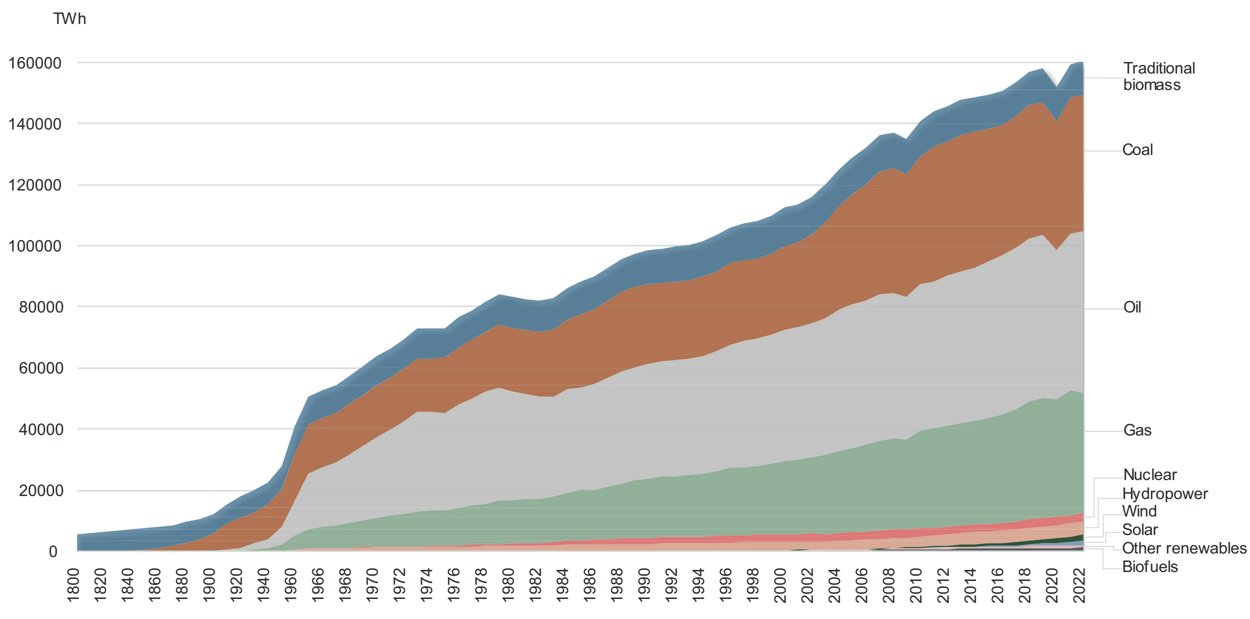
It is unrealistic to assume this will play out before 2050, but we believe the described direction of travel realistically will take the world closer to decarbonisation than the path we are on today. Let us get into the details.

Higher energy efficiency through Electrification

In 2022, the world produced 160,000 TWh of primary energy, see Figure 2. However, this is only converted into 75,000 TWh of useful energy. In other words, the energy efficiency of the "world energy system" is only 47%. That's an enormous waste of 53% of all primary energy produced. However, this is also the opportunity.

Today, electricity is only 30,000 TWh, or 40%, of total useful energy. Electrons are much more efficient than molecules in generating useful energy and work. Electricity's share of total energy will have to increase significantly in the decades to come. Therefore, the obvious task is to move as much of our energy demand to the electrical grid as we can produce electricity from fossil-free sources like hydro, nuclear, and renewables. In addition, electrical processes are much more energy efficient, thereby reducing the need for growth in primary energy.

Figure 2
Global primary energy produced



Source: Global direct primary energy consumption (ourworldindata.org), November 2023

Increasing electricity to perhaps 60% of total useful energy will do a lot to increase energy efficiency and reduce CO2 emissions. Done sensibly, this transition will also be the low-cost roadmap to decarbonising our economies, as many of the solutions for electrification pay for themselves through savings on energy.

Electric Vehicles – the biggest efficiency opportunity

As an example, an internal combustion engine car has an energy efficiency of 20-25%, as most of the energy is lost as heat going into the atmosphere. In contrast, an electric car has an 80-90% efficiency. In other words, the same amount of primary energy can power either one car with an internal combustion engine or 3-4 EVs. Assuming 2 bn electric vehicles on the roads by 2050, the oil demand will be reduced by 30 million BOE per day, or some 30% of total oil consumption, and the global CO2 emissions by 3-4 GT p.a. The roll-out of EVs is the biggest opportunity in efficiency technologies.

"The roll-out of EVs is the biggest opportunity in efficiency technologies"

Heat Pumps – another opportunity to lift energy efficiency

Another opportunity to lift energy efficiency is heat pumps. It is often stated that heat pumps generate 3-4x as much energy as they consume. That may seem like a violation of the laws of thermodynamics, but it is not: heat pumps do not generate heat – they merely move heat from one place to another. The energy in the heat moved around in this system is far greater than the electricity needed to power it. That is why heat pumps are said to have an efficiency ratio of 300-400%. We have recently written about heat pumps and how we invest in this space here.

One caveat regarding the shift towards heat pumps is that the electricity in the grid needs to be low CO2 for the shift away from, for example, a gas furnace to make sense from an environmental point of view. The "average" global CO2 intensity of electricity is 0.3-0.4kg/kWh, which is 50-100% more than using natural gas in an 85% efficient gas boiler (natural gas is a "clean" fossil fuel). Converting the heat energy in gas into electricity will invariably be 50% less efficient than consuming the heat energy in gas as heat directly. This also means it is quite nonsensical to ban gas furnaces like seen, for example, in the US in recent years or as proposed in Germany, where the CO2 intensity of electricity has gone up after the closure of the country's nuclear plants.

Electric Motors

The single largest use of electricity globally is to drive induction motors. There are c50bn electric motors in the world, consuming c50% of all global electricity. This might sound surprisingly high. But consider that there is an electric motor inside practically every appliance with moving parts, from the compressors in refrigerators to pumps in water systems. Traditional motors are inefficient, rotating at a fixed speed determined by the frequency of the power grid, rotating faster than they need to, which matters as power consumption is a cube function of rotating speed.

Variable frequency drives (VFD), with the use of power electronics, precisely control the rotating speeds of motors. Energy savings from replacing fixed-speed motors with VFDs can be significant, and future energy savings easily re-pay the up-front costs of installing VFDs. This means these technologies pay for themselves. It is estimated that VFDs can reduce CO2 emissions by up to 1 GT of CO2 by reducing global electricity consumption by 10%[3].

Renewables – the fastest-growing subsegment of global energy for the foreseeable future

Electricity production must expand massively in the decades ahead to enable decarbonisation while energy efficiency must increase. In a recent White Paper, we argue that renewables will see significant growth but will be capped at perhaps 40-50% of total electricity production globally, depending on local market structures and climatic conditions. Taking renewables above a certain threshold leads to falling grid utilisation, rising curtailment and backup investments, therefore accelerating electricity prices and skyrocketing CO2 abatement costs. However, renewables will continue to be the fastest growing subsegment of global energy for the foreseeable future, as wind and solar will scale up by another 10x from 2023 levels to generate perhaps 35,000 TWh of electricity in 2050, which will be towards 50% of the world's total electricity, 30% of the world's total energy, and over 25% of all decarbonisation. The costs will be higher in regions where renewables displace existing and fully depreciated (inexpensive) power generation, Germany and Denmark being examples, and lower if renewables compete against new capacities in growth markets. This rewards renewable developers who can appraise these different contexts and seek exposure in growing power markets where renewable penetration rates, to begin with, are low.

"Electricity production must expand massively in the decades ahead to enable decarbonisation."

Regarding the growth mix of renewables, it's our view that solar PV will outgrow wind. Solar PV is a semiconductor technology exposed to the cost reduction dynamics of Moore's Law, and solar efficiencies can likely be improved significantly through technology upgrades. In contrast, wind will most likely experience diminishing scale advantages as there are limits to the size of windmills, and we are most likely coming to an end of ever larger and therefore more efficient windmills.

Superficially, one would think that an industry with the aforementioned growth characteristics and policy support like renewables would be an area with attractive investment opportunities. However, equipment producers and most developers have little pricing power and are facing technology risks as well as high-interest rate sensitivity, as described in our recent White Paper. Additionally, an investment is only sustainable if the com-

3 Electric motors: variable star? - Thunder Said Energy

pany is operating under the constraints of the energy trilemma, that is, the company must produce energy that is sustainable, secure, and affordable. This reduces the number of attractive companies within renewables. For example, most green hydrogen businesses fail on the affordability and sustainability criteria and reduce the energy efficiency of our overall energy system because of very large energy losses.

A more resilient and adaptable Grid infrastructure is needed

As electricity's share of total useful energy doubles in the coming decades, and as power generation moves from large centrally based plants to distributed renewables production, the energy arteries of the economy, the transmission and distribution networks, will need to expand. There is probably no country where the grid is not an obstacle to the energy transition. BloombergNEF, a data provider, estimates that 80 million km of new grid is needed by 2050, more than enough to replace the entire global grid today. In much of the Western world, grids were developed after the Second World War to serve big power stations burning fossil fuels. A more resilient and adaptable grid infrastructure is required to handle the growth and volatility of distributed intermittent energy.

Today, only a small percentage of electricity moves across borders. This will have to change in the decades ahead as national grids become regional and longer-term continental in size. To ensure that the grid remains stable, it is necessary to have grids connected across a larger geographical area. This is because a larger grid

"Natural gas peaker capacity is the cheapest backup capacity available and will be vital in securing the stability of the grids in the coming decades."

can help to balance the variability of renewable energy sources by allowing electricity to be transported between geographies with low weather correlation and from areas with excess generation to areas with excess demand. A larger grid can also help to reduce the need for expensive backup generation capacity.

Smart Grid Technology

The use of smart grid technology will be crucial to ensure that the grid can accommodate the growing electricity demand. Smart grid technology can help manage the variability of renewable energy sources, reduce energy consumption during peak periods, and improve the reliability of the grid. On the margin, the use of energy storage systems such as batteries can help to ensure that electricity is available when it is needed most, although pumped hydro and natural gas peakers will retain a dominant share of the stability market for the foreseeable future.

The switch from Coal-to-Gas is essential

The burning of 8 GT of coal today provides 28% of the world's primary energy, while natural gas provides 24% of the world's primary energy. Coal emitted 15,5 GT of CO_2 in 2022, while natural gas released 7,3 GT of CO_2[4]. In broad terms, natural gas provides double the amount of energy per unit of CO_2 compared to coal. In addition, the laws of thermodynamics limit coal-fired power generation to c40% efficiency, while combined cycle gas turbines can reach c60% efficiency. Hence, compared to a world that could realistically ramp up to consuming 10GT p.a. of coal in 2050 without climate action, the world needs to dramatically reduce coal consumption while filling the void by doubling the production of natural gas out to 2050, thereby contributing massively to lower the CO_2 emissions, see figure 1.

For the foreseeable future, the world needs abundant dense fossil energies, and natural gas is a much cleaner source of energy than coal. This is one reason for supporting the use of natural gas. Another reason is that renewably based energy systems need backup capacities when the sun is not shining, and the wind is not blowing. Natural gas peaker capacity is the cheapest backup capacity available and will be vital in securing the stability of the grids in the coming decades.

4 CO2 Emissions in 2022 – Analysis - IEA

“We are at the beginning of a new Renaissance for nuclear power.”

Finally, we cannot support a global population of 8-9 bn people without natural gas. Famine would be instantaneous. Today and in the medium term, there is no alternative to natural gas in the production of fertilisers. Natural gas is used as a feedstock in the production of nitrogen fertiliser in the form of ammonia and urea and without fertilisers, the productivity of global agriculture would collapse.

Therefore, almost heretically and completely “out-of-fashion”, natural gas is a vital pillar in the transition towards 2050 and onwards until our dependence on dense fossil energies fades out hopefully in the later parts of the century. Energy transitions take a long time!

Because of the continued use of fossil sources of energy and to address the associated emissions of CO_2, the world needs to massively increase the nature-based carbon sinks, see also Figure 1 and previous White Papers on the subject.

Nuclear – a New Energy Renaissance

As of 2022, the world’s 440 nuclear reactors produced a total of 2600 TWh of electricity, accounting for around 10% of global electricity generation. Most of the world’s nuclear reactors were constructed between 1970 and 1990. The all-time peak period of nuclear additions was in 1984- 1989, over which time the world added 25 GW p.a. of new capacity. This came after the two major energy crises of 1973-74 and 1979-80, which incentivised a vast acceleration of alternatives to Middle East oil. It was also the peak of the Cold War when Western governments were concerned about energy security. One cannot help but observe that the ‘wheel of time’ has now come full- circle, giving reason to believe we are at the beginning of a new Renaissance for nuclear power.

What has historically been a relatively stagnant 400 GW market is now changing. Countries like the UK, France, Finland, Sweden, Poland, and a host of other countries have recommitted to an acceleration of nuclear construction over the coming decade, most recently when more than 20 countries launched the Declaration to Triple Nuclear Energy at COP28. This comes on top of countries like China, India, Korea, and several countries in the Middle East, who have continued to invest in nuclear throughout the last decade. As of June 2023, there were 57 nuclear reactors under construction worldwide. China ranked first with 21 units. It was followed by India, with eight reactors under construction at the time.

The average age of the global fleet of nuclear plants is close to 40 years. Therefore, the coming replacement cycle for the nuclear industry is significant. If we assume the average nuclear plant will get phased out after 50-60 years[5] due to reaching its full operable life, then two-thirds of all the existing nuclear plants will need to be replaced by 2050. This advocates against too optimistic assumptions of how significant nuclear in the shorter term will be able to take market share in electricity production and, therefore, CO_2 reduction.

Opposition to nuclear has been centred around three issues:

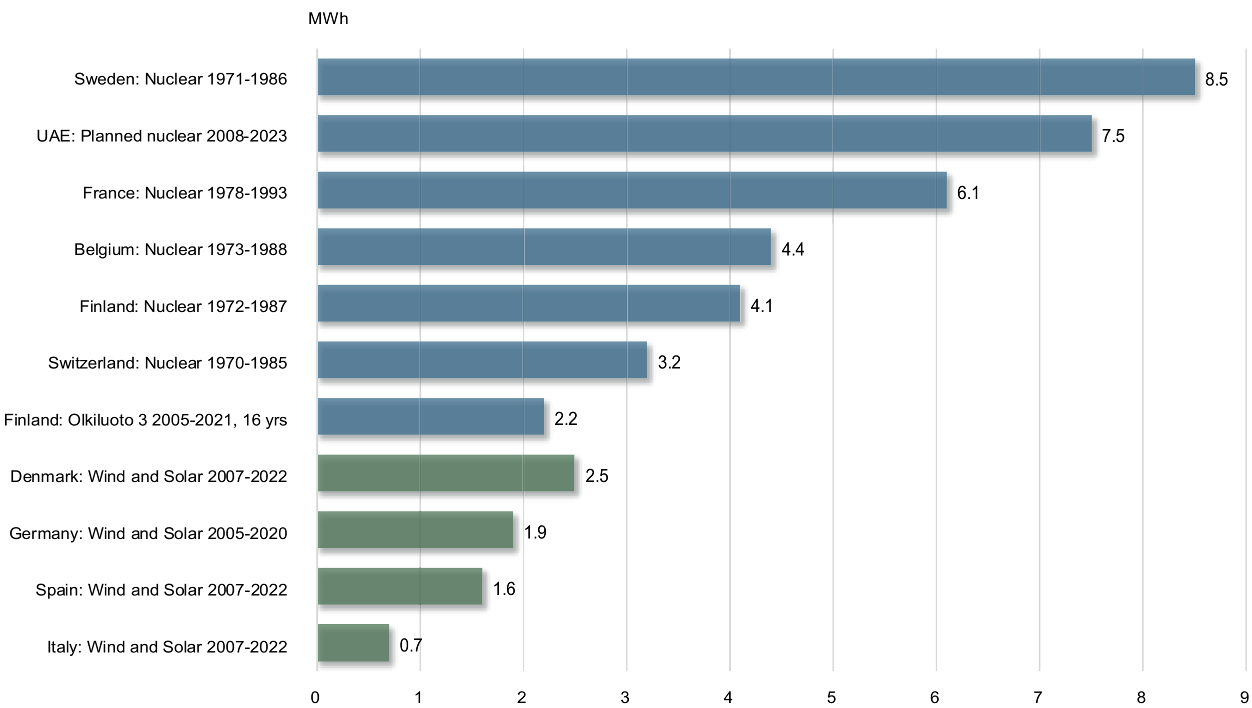
- Deployment is too slow to matter for 2050 targets, wind and solar are much faster
- Safety
- Economics

Reality is more nuanced. Regarding the timeframes for the deployment of new energies, the reality is that nuclear historically has been the fastest deployable source of energy.

As shown in Figure 3, the world record for the fastest construction of energy capacity goes to Sweden, which, in its 15-year deployment phase of nuclear constructed capacities, is capable of producing 8.5 MWh per capita

Figure 3

Best Increase in electricity generation per capita over 15-year period



Source: Rauli Partanan, The Climate Gamble, September 2023

5 Lifetime extensions up to 80 years are now being seen.

p.a., more than three times faster than the fastest deployment of renewable capacities, done in Denmark, since 2010[6]. And just to refute the idea that mankind has lost the ability to construct nuclear quickly and on budget, the second fastest deployment of any energy capacity has been the buildout of nuclear in UAE over the last 15 years, three times faster than the renewable buildout in Denmark over the same timeframe. One of the reasons for the quick deployment of nuclear energy production is the very high density of nuclear, see also our recent White Paper.

Up until the 1970s, nuclear construction costs were competitive with coal. However, perceived safety issues with nuclear have since the early 1970s gradually made nuclear construction in the West close to impossible. The core problem is the view that any release of radioactive material is regarded as intolerable. If this is the case, any expenditure that might conceivably reduce the probability of a release has been justifiable. But such thinking quickly pushed the cost of nuclear power up multiple times, making nuclear prohibitively expensive[7].

Proper data analysis reveals that nuclear energy together with modern renewable energy sources is the safest and cleanest source of energy. Nuclear power has been more meaningfully impacted by regulatory practices than any other industry has ever seen, thereby driving up costs to prohibitive levels.

While one can hope the regulatory processes can be simplified and reformed, it will take time. Increasingly the hope for fast nuclear deployment in the West centres around new nuclear technologies, first and foremost 4th generation Small Modular Reactors.

Small Modular Reactors offer several advantages over larger reactors

Small modular nuclear reactors (SMRs) are a type of nuclear reactor that is smaller in size and output (up to 300 MW) compared to traditional nuclear reactors. They offer several advantages over larger reactors. One of the most significant is enhanced safety and security. SMRs employ passive safety concepts that have the potential for enhanced safety and security. Therefore, there is less reliance on active safety systems and additional pumps

6 For comparison, the EU average annual household electricity consumption was in 2022 3,9 Mwh with large variations between countries.
7 nuke_too_dear_v6.pdf (gordianknotbook.com)

"Small modular nuclear reactors offer several advantages over larger reactors, including enhanced safety and security, modularity, reduced capital investment, and lower cost of electricity."

and AC power for accident mitigation. These passive safety systems can dissipate heat even after the loss of offsite power (which led to the Fukushima nuclear plant accident in 2011).

Another advantage of SMRs is their modularity. The term "modular" in SMRs refers to its scalability and the ability to mass-fabricate major components of the nuclear system in a factory environment and then transport them to the sites. This can help limit the on-site preparation and reduce the construction time. This is very important since the lengthy construction times are one of the key problems of the traditional larger units. The Danish SMR company Copenhagen Atomics[8] claims they will be able to manufacture one 100 MW thermal thorium-based molten salt reactor per day with the footprint of a 40-foot shipping container! If this proves to be anywhere close to the eventual outcome, the world will see rapid decarbonisation from the 2030s onwards.

In summary, SMRs offer several advantages over larger reactors, including enhanced safety and security, modularity, reduced capital investment and lower cost of electricity, and the ability to be deployed into smaller grids/economies and for industrial applications. However, licensing is the biggest hurdle and needs to be addressed before SMRs can be widely adopted.

In broad terms, nuclear energy, whether traditional 3rd gen. or 4th gen., will be a vital component in a future decarbonised energy system. Nuclear offers stability, inertia, frequency regulation, and voltage support to the grid, something that renewables cannot and something that will be required to prevent grid failures. Nuclear energy is an excellent source of process heat for various industrial and district heating applications. Desalination and hydrogen production are examples of nuclear energy being the most credible non-carbon option due to its superior power density.

Fusion Energy – accelerating developments

Mark P Mills published in 2021 the book The Cloud Revolution. In it, he described how revolutions happen at the intersection of three spheres of technological progress, namely machines, materials, and information technology. As an example, the smartphone would not have arrived in 2007 if it were not for the simultaneous development of machines (CNC), materials (LCD Screen), and information technology (sufficient computing power). This model is worth keeping in mind when looking at the recent acceleration of fusion technology. In the last three years, there have been several significant milestones in information technology and materials science that will accelerate developments in the field of fusion energy, and companies have since raised a significant amount of private capital. Historically, fusion energy was considered too experimental and too long-term for private capital, so public investment has historically dominated. These technological landmarks have likely shortened the time-frame for the successful development of fusion, thereby attracting private capital. Leading companies within the field are General Fusion, Canada, Tokamak Energy, UK, and Commonwealth Fusion Systems (CFS) from Massachusetts, USA.

In 2021, Commonwealth Fusion Systems (CFS), a spin-off from Massachusetts Institute of Technology (MIT), caught our attention. At that time, CFS and MIT announced that they had successfully ramped-up a high-temperature superconducting electromagnet to a field strength of 20 tesla, the most powerful magnetic field ever created on Earth[9]. This breakthrough in materials science helps resolve the greatest uncertainty in the quest to build the world's first tokamak-based fusion power plant that can produce more power than it consumes. Super powerful

8 Potential (copenhagenatomics.com)
9 It is said the magnet can lift a weight similar to more than 400 Boing 747 or 70.000 ton

“One preferred area of investment is within efficiency solutions. Another preferred investment segment is integrated utilities with a strategy of investing in renewables and grid infrastructure.”

magnets are needed to contain extremely hot plasma suspended in the air within the tokamak chamber. Then in 2022, Google DeepMind announced they had developed a deep neural network that could control fusion plasma in a tokamak using deep reinforcement learning. Combining the advancements in material science (magnets) and information technology (deep neural networks) with the machine (tokamak) potentially paves the way for the long-sought creation of the ultimate energy source of the stars, practical, inexpensive, carbon-free power plants that could make a major contribution to humankind. According to Commonwealth Fusion Systems, the company aims to have a test plant running in 2025 and for a commercial system in the early 2030s.

Investment conclusions

Investing sustainably in the energy transition means investing in companies that adhere to the energy trilemma. Sustainable energy transition solutions need to provide inexpensive, abundant, and secure energy. The investments need to be profitable for both companies in terms of return on capital as well as society in terms of energy return on energy.

One preferred area of investment is within efficiency solutions because these tend to be the least expensive and repay the incremental capital cost many times through reduced energy costs. One example is the market for heat pumps, where we have exposure to companies like Carrier Global, Daikin, Nibe, and Amber. Another area is insulation, where we are invested in Kingspan.
Another preferred investment segment is integrated utilities with a strategy of investing in renewables and grid infrastructure. An example is NextEra, the largest US utility, a company with an integrated business model being both a regulated utility in an attractively regulated and growing market (Florida) as well as operating NextEra Energy Resources, NEER, the wholesale electricity provider focused on unregulated power generation, regulated transmission and an energy trading business across many states in the US. Like another of our portfolio companies, UK-based SSE, the company is well positioned to invest profitably in grid reinforcement and expansion as well as renewable electricity in markets where there still is room to add renewable capacities.

Finally, we are exposed to commodities through the Swedish capital goods company Epiroc, which operates in an oligopolistic market of supplying equipment for hard rock underground mining. The energy transition will be very resource-intensive, and the global mining industry will need to increase the output of critical minerals significantly. We believe this is a less cyclical way of getting exposure to the cyclical growth of the global mining industry, which needs to expand dramatically to make it possible to realise the energy transition.

Disclaimers

EU: This is marketing material. This publication is prepared by C WorldWide Asset Management Fondsmaeglerselskab A/S. It is provided for information purposes only and does not constitute, and shall not be considered as, an offer, solicitation or invitation to engage in investment operations, as investment advice or as investment research. The publication has thus not been prepared in accordance with legal requirements designed to promote the independence of investment research, and it is not subject to any prohibition on dealing ahead of the dissemination of investment research. Opinions expressed are current opinions only as of the date of the publication. The publication has been prepared from sources C WorldWide Asset Management Fondsmaeglerselskab A/S believes to be reliable and all reasonable precautions have been taken to ensure the correctness and accuracy of the information. However, the correctness and accuracy is not guaranteed and C WorldWide Asset Management Fondsmaeglerselskab A/S accepts no liability for any errors or omissions. The publication may not be reproduced or distributed, in whole or in part, without the prior written consent of C WorldWide Asset Management Fondsmaeglerselskab A/S. Past performance does not indicate future performance.

US: This is marketing material. This publication has been prepared by C WorldWide Asset Management Fondsmaeglerselskab A/S (CWW AM). CWW AM is a registered Danish investment firm located at Dampfaergevej 26, DK-2100 Copenhagen, Denmark. CWW AM's Danish company registration no is 78420510. CWW AM is registered with the SEC as an investment adviser with CRD no 173234. This publication is provided for information purposes only and does not constitute, and shall not be considered as, an offer, solicitation or invitation to engage in investment operations, as investment advice or as investment research. The publication has thus not been prepared in accordance with legal requirements designed to promote the independence of investment research, and it is not subject to any prohibition on dealing ahead of the dissemination of investment research. Opinions expressed are current opinions only as of the date of the publication. The publication has been prepared from sources CWW AM believes to be reliable and all reasonable precautions have been taken to ensure the correctness and accuracy of the information. However, the correctness and accuracy is not guaranteed and CWW AM accepts no liability for any errors or omissions. The publication may not be reproduced or distributed, in whole or in part, without the prior written consent of CWW AM. All figures are based on past performance. Past performance does not indicate future performance. The return may increase or decrease as a result of currency fluctuations.

UK: This document has been prepared by C WorldWide Asset Management Fondsmaeglerselskab A/S(CWW AM). CWW AM is a focused asset manager registered as an investment firm with the Danish FSA. CWW AM is located at Dampfaergevej 26, DK-2100 Copenhagen, Denmark, CVR registration number 7842 0510. This document is directed at persons having professional experience of participating in unregulated schemes (investment professionals) and high net worth companies (as defined under art. 14 and 22 of the Financial Services and Markets Act 2000 (Promotion of Collective Investment Schemes) (Exemptions) Order 2001). The document and any investment or investment activity to which it relates is available only to such persons and will be engaged in only with such persons. Any other person should not rely or act on the statements made in this document. The content of this presentation is confidential, and redistribution or reproduction is prohibited. The presentation is provided for information purposes only and does not constitute, and shall not be considered as, an offer, solicitation or invitation to engage in investment operations as investment advice or as investment research. CWW AM is not responsible for the suitability of the information in the presentation. Opinions expressed are current opinions only as of the date of the presentation. The presentation has been prepared from resources CWW AM believes to be reliable and all reasonable precautions have been taken to ensure the correctness and accuracy of the information. However, the correctness and accuracy are not guaranteed and CWW AM accepts no liability for any errors or omissions. This presentation contains information on investments which does not constitute independent research. Accordingly, it is not subject to the protections afforded to independent research and CWW AM, and its employees may have dealt in the investments concerned. It is emphasised that past performance is no reliable indicator of future performance ant that the return on investments may vary as a result of currency fluctuations.

Active Investments

C WorldWide Asset Management Fondsmaeglerselskab A/S is a focused asset manager. Our objective is to deliver consistent, long term capital growth for clients through active investments in listed equities on global stock exchanges.

Our clients are primarily institutional investors and external distribution channels. Our product range includes discretionary asset management services and commingled fund products.

The combination of a unique investment philosophy based on careful stock picking and long-term global trends coupled with a stable team of experienced portfolio managers, has since 1986 resulted in world-class investment performance.

Please find more of our White Papers on cworldwide.com

This publication was printed on MultiArt® Silk, which is FSC and EU Ecolabel-certified.

C WORLDWIDE ASSET MANAGEMENT FONDSMAEGLERSELSKAB A/S

Dampfaergevej 26 · DK-2100 Copenhagen

Tel: +45 35 46 35 00 · VAT 78 42 05 10 · cworldwide.com · info@cworldwide.com

Q1 2024