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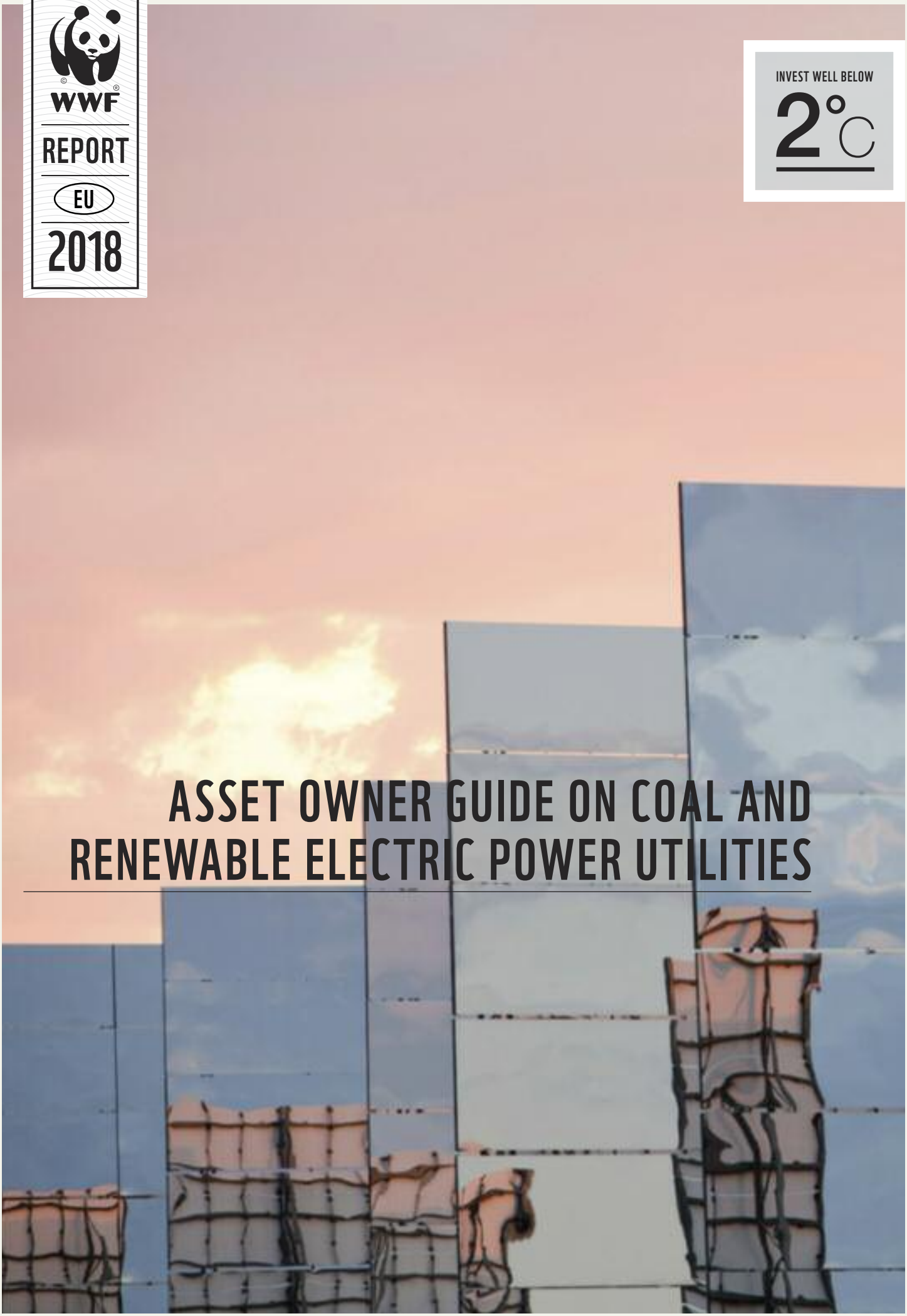
REPORT

EU

2018

INVEST WELL BELOW

2°C



ASSET OWNER GUIDE ON COAL AND RENEWABLE ELECTRIC POWER UTILITIES

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! PRIORITY

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Transmission pylons.

INTRODUCTION:
HOW TO USE THIS GUIDE

In the Paris Climate Change Agreement ('Paris Agreement'), 195 countries committed to curb the current emissions trajectory in accordance with climate science. This commitment translated into an objective to 'hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C'.

There is a growing consensus amongst leading investors globally that we are moving irreversibly towards a low carbon economy. With this Guide, WWF wishes to support asset owners and show how they can align their electric power sector investments with the objectives set in the Paris Agreement. The Guide focuses on coal and renewable power: such focus does not stem from a disregard of the challenges in gas power or heating, but from the recognition that coal and renewables offer both the most visible and urgent climate-related risks and opportunities to asset owners.[1]

This Guide complements the **WWF Climate Guide to Asset Owners**, which presents 15 topline recommendations of a more general nature (see reminder on page 32). While this Guide does not duplicate each of the Climate Guide recommendations, it follows its structure that is based on asset owners' key roles: learning and seeking advice; decision-making; and monitoring service providers and engaging with key stakeholders.

The recommendations argue that asset owners should address all the electric power utilities that have coal assets in their investment portfolio in light of the financial risks and opportunities that spring from climate science and disruptive developments in the power sector. The Guide presents recommendations on how asset owners can mitigate these risks, most notably through the development and adoption of a coal and renewable power policy.

In this document, we refer to 'coal power' for electric power generated by coal plants, and 'renewable power' for electric power generated by wind, solar, hydro, biomass, etc. Categorisation of companies, for example between the Industry Classification Benchmark (ICB) and Global Industry Classification Standard (GICS), differs. We refer to 'electric power utilities' as all the companies whose main business model is to produce or distribute electricity – including multi-utilities that have significant electricity production and independent power producers; and for both conventional and alternative/renewable electricity.

Finally, WWF is publishing simultaneously an **Asset Owner Guide on Coal Mining**. It notably provides more details to asset owners on specific climate science, key developments and financial risks related to the coal mining sector. WWF encourages asset owners to use this Guide as well, in order to better address the urgent coal issue.

1 The focus on power means that emissions from heat are not covered by this Guide, and the focus on coal power implies that gas power is not addressed either. This Guide's focus on emissions from coal power builds on its climate impact: coal is the most polluting fossil fuel and hence should be addressed as a priority. However, asset owners should address emissions from high-carbon sectors in a holistic manner – in particular as there is overlap between sectors (e.g. combined heat and power): WWF provides guidance in its Climate Guide to Asset Owners. In addition, WWF opposes nuclear power given its intrinsic risks and costs.

LEARNING & SEEKING ADVICE

1. ASSESS WHAT THE PARIS AGREEMENT IMPLIES FOR COAL AND RENEWABLE POWER

WWF RECOMMENDATION 1

WWF recommends that asset owners assess what the Paris Agreement implies for coal and renewable power. Latest climate science would mean that under a least-cost strategy no new coal plant can be built globally, and existing coal plants have to be phased out extremely quickly so that the EU and OECD fully exit coal by 2030, China by 2040 and the rest of the world by 2050. Investments in renewable power have to increase drastically.

No more carbon budget for new coal

According to latest climate science, limiting warming to 2°C by 2100 means that the net emissions of greenhouse gases need to be reduced by 40-70% by the time we reach 2050, and brought to zero by the end of the century.[2] Respecting the more stringent limit of 1.5°C will require reducing emissions of greenhouse gases even more rapidly in the coming years and decades, and bring them to zero around mid-century.[3]

Coal is the most carbon-intensive fossil fuel, responsible for about 46% of global carbon emissions from fossil fuels.[4] While immediate action across all sectors is required to decarbonise the economy, it is particularly important to replace coal power by sustainable renewable power, and enhance energy demand reduction through energy efficiency measures.[5]

Researchers at the Martin School at University of Oxford finds that for a 50% probability of limiting warming to 2°C, assuming other sectors play their part, no new investments in fossil electricity infrastructure are feasible from 2017 at the latest.[6] Carbon lock in is by far highest for coal power, and eight times higher than the second largest risk by sector (see figure 1).[7]

.

2 IPCC (2014), AR5.

3 Climate Action Tracker (Climate Analytics, Ecofys, NewClimate Institute, Potsdam Institute for Climate Impact Research).

4 Olivier, Greet, Marilena and Jeroen (2016), Trends in Global CO_2 Emissions: 2016 Report. JRC Science for Policy Report: 103428. European Commission, Joint Research Centre.

5 It should be noted that replacing existing coal plants by so-called 'high efficient low emission' (HELE) coal plants is no option whatsoever. Research by Ecofys states that: "HELE coal-fired electricity generation is incompatible with the goal to keep temperature rise under 2°C. The global carbon budget and the time remaining to reduce greenhouse gas emissions simply do not allow for replacement of retired coal plants with new more efficient coal plants, let alone capacity extensions". HELE technologies for coal-fired power generation could reduce emissions from over 1,000 gCO_2/kWh for current coal plants in operation to 670 gCO_2/kWh for future most efficient coal plants – to be compared with 350-490 gCO_2/kWh for gas turbines or 0 gCO_2/kWh direct emissions for wind and solar power. Source: Ecofys (2016), The incompatibility of high-efficient coal technology with 2°C scenarios.

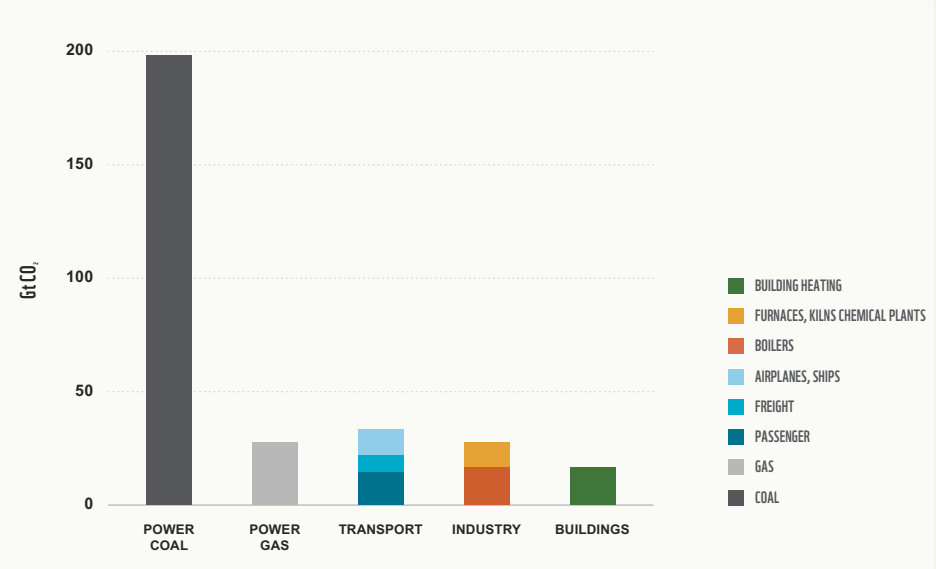
6 Pfeiffer, Millar, Hepburn, Beinhocker (2016), The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy, in Nature.

7 Bertram, C., Johnson, N., Luderer, G., Riahi, K., Isaac, M. and Eom, J. (2015). Carbon Lock-in through Capital Stock Inertia Associated with Weak near-Term Climate Policies. Technological Forecasting and Social Change 90, Part A (January): pp. 62–72.

FIGURE 1 LIFETIME OVER-COMMITTED CO_2 EMISSIONS BY BUSINESS AS USUAL INVESTMENTS 2015-2030 THAT WOULD NOT BE COMMITTED IN A 2°C PATHWAY (IN GIGATONNES, SOURCE: ERICKSON P. E.A.)[8]

'AVOIDING BUILDING NEW COAL PLANTS AND PHASING OUT EXISTING ONES IS CRUCIAL TO CLOSING THE EMISSIONS GAP'

UNEP[9]



Early retirement of existing coal plants

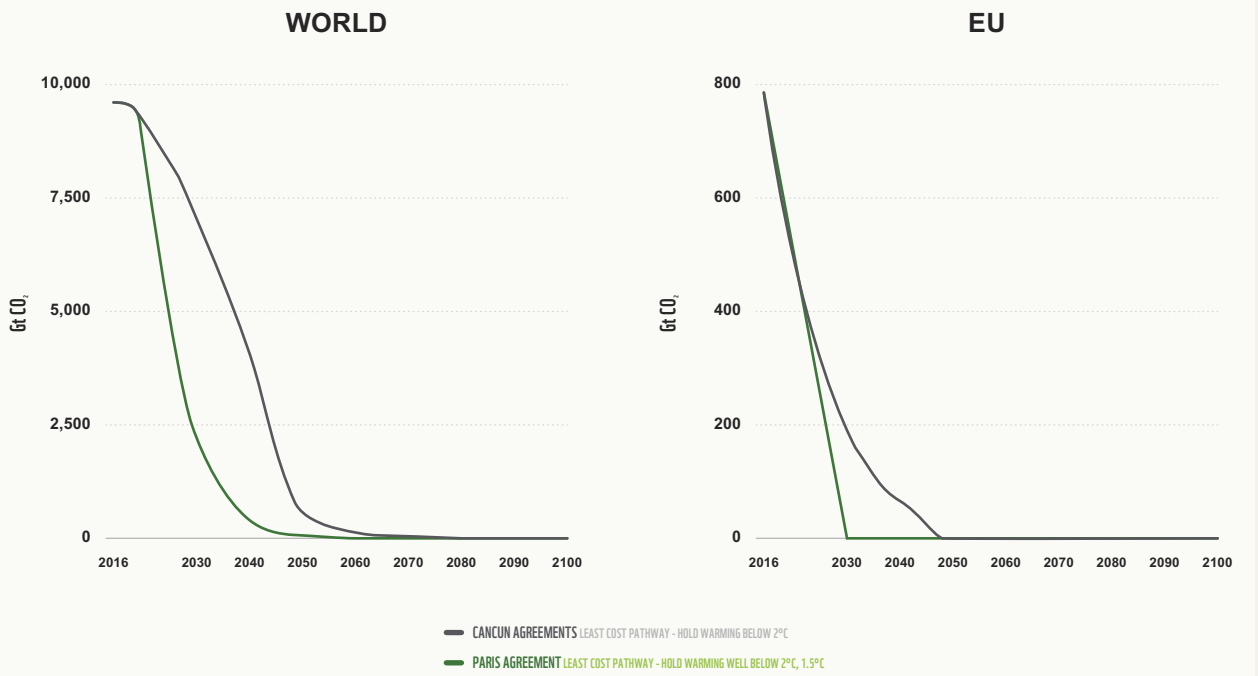
A number of scientific studies have shown that the 2°C target requires early retirement of coal plants.[10]

Climate Action Tracker – a research consortium composed of the Potsdam Institute for Climate Impact Research, Ecofys, Climate Analytics and the NewClimate Institute – finds that 'even with no new coal plant construction, emissions from coal power generation in 2030 would still be 150% higher than what is consistent with scenarios limiting warming to below 2°C above pre-industrial levels'.[11] This implies that **a substantial part of existing coal infrastructure will have to undergo early closure**. Complementary research estimates that catching up with 2°C-consistent pathways would involve stranding about 1,500 GW of coal and gas plants worldwide after 2030, while another study finds that a carbon price consistent with the 2°C target would strand at least $165 billion worth of coal plants worldwide.[12]

A Climate Analytics study that assesses the implication of the Paris Agreement for coal in the power sector concludes that: **'under a least-cost strategy (...),the EU and the OECD would need to phase out coal by 2030, China by 2040 and the rest of the world, including the majority of emerging economies, would need to phase out coal by 2050'**.[13] In a follow up study they found that in the European Union, a quarter of the coal plants already in operation would need to be switched off before 2020, and a further 47% should go offline by 2025.[14] It concludes that 'if the EU is to meet its commitments under the Paris Agreement, any investments in new plants and most investments in existing power plants will not be recovered by investors'.

8 Erickson P., Sivan Kartha S., Lazarus M., Tempest K. (2015), Assessing carbon lock-in, Environmental Research Letters, Volume 10, Number 8.
9 UN Environment (2017), The Emissions Gap Report 2017.
10 Pfeiffer, A., Millar, M., Hepburn, C. and Beinhocker, E, (2016), The '2°C Capital Stock' for Electricity Generation: Committed Cumulative Carbon Emissions from the Electricity Generation Sector and the Transition to a Green Economy. Applied Energy 179 (October): pp. 1395–1408; Rogelj, J., McCollum, D. L., O'Neill, B.C. and Riahi, K, (2013), 2020 Emissions Levels Required to Limit Warming to below 2?, Nature Climate Change 3 (4): pp. 405–412.
11 Climate Action Tracker (2015), The Coal Gap: planned coal power plants inconsistent with 2˚C and threaten achievement of INDCs.
12 Johnson, N., Krey, V., McCollum, D. L., Rao, S., Riahi, K. and Rogelj, J. (2015). Stranded on a Low-Carbon Planet: Implications of Climate Policy for the Phase-out of Coal-Based Power Plants, Technological Forecasting and Social Change 90, Part A (January): pp. 89–102. Iyer, G. C., Clarke, L. E., Edmonds, J.E., Flannery, B. P., Hultman, N.E. (2015), Improved Representation of Investment Decisions in Assessments of CO_2 Mitigation, Nature Climate Change 5 (5): pp. 436–440.
13 ClimateAnalytics (2016), Implication of the Paris Agreement for coal use in the power sector.
14 ClimateAnalytics (2017), A stress test for coal in Europe under the Paris Agreement: scientific goalposts for a coordinated phase-out and divestment.

FIGURE 2 LEAST COST CO_2 EMISSIONS PATHWAYS FOR COAL POWER GENERATION (SOURCE: CLIMATEANALYTICS)[15]



More efforts needed for renewables

While investments in renewable energy are soaring (see Recommendation 3), they are still not in line with the Paris Agreement:

- Bloomberg New Energy Finance estimates that 72% of the $10.2 trillion spent on new power generation worldwide to 2040 will be invested in wind and solar plants, but that respecting climate thresholds, would require an additional $5.3 trillion investment in zero-carbon capacity.[16]
- The International Energy Agency (IEA) also finds that globally, energy investment is not yet consistent with the transition to a low-carbon energy system envisaged in the Paris Climate Agreement.[17]

According to the IEA, a 2°C scenario requires nearly 60% of power generated in 2040 to come from renewables. Variable power would become the largest source of generation in the four largest power markets (China, USA, EU and India) between 2030 and 2035.

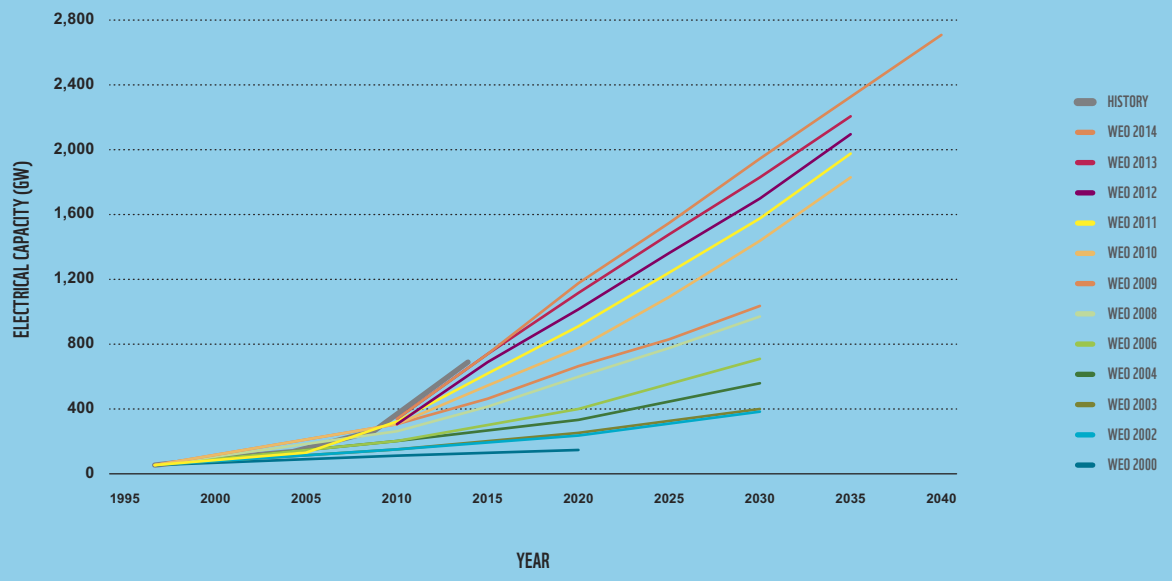
It should be reminded that the IEA 2°C scenario is not aligned with the well below 2°C target of Paris Agreement, and is notoriously conservative in its renewable energy assumptions (see box 1). Building on climate science, WWF position is to achieve a 100% renewable-based energy system globally by 2050 at the latest.[18]

15 ClimateAnalytics (2017), A stress test for coal in Europe under the Paris Agreement: scientific goalposts for a coordinated phase-out and divestment.
16 Bloomberg New Energy Finance (2017), New Energy Outlook.
17 IEA (2016), World Energy Investment 2016.
18 WWF in collaboration with Ecofys and OMA (2011), The energy report - 100% renewable energy by 2050.

BOX 1. THE INTERNATIONAL ENERGY AGENCY'S UNDERESTIMATION OF RENEWABLE ENERGY DEVELOPMENTS

The IEA renewable forecasts have almost systematically underestimated the real world renewable developments in the last 23 years. IEA forecasts should therefore be treated with caution; renewable energy could well grow quicker than what the IEA is forecasting in 2017 – increasing investment opportunities.

FIGURE 3 ACTUAL SHARE OF ELECTRICITY GENERATION OF NON-HYDRO RENEWABLES FROM DIFFERENT IEA PROJECTIONS 1994-2016 (GREY LINE: REAL SHARE) (SOURCE: METAYER ET AL.)[19]



TOOLBOX FOR RECOMMENDATION 1

WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 1. Assess the evidence of climate-related financial risks and opportunities
MAIN REFERENCES	• Pfeiffer, Millar, Hepburn, Beinhocker (2016), The '2°C capital stock' for electricity generation, in Nature • Climate Action Tracker (2015), The Coal Gap: planned coal power plants inconsistent with 2˚C and threaten achievement of INDCs • ClimateAnalytics (2017), A stress test for coal in Europe under the Paris Agreement • IEA (2016), World Energy Investment 2016

19 Metayer M., Breyer C., Fell H-J (2015), The projections for the future and quality in the past of the World Energy Outlook for solar PV and other renewable energy technologies.

2. ASSESS THE EVIDENCE OF GROWING FINANCIAL RISKS FOR COAL POWER

WWF RECOMMENDATION 2

WWF recommends that asset owners assess the evidence of growing financial risks for coal power: many analysts see a structural decline in most key geographies.[20]

'FINANCIAL INSTITUTIONS WORLDWIDE SHOULD REALIZE THAT FINANCING COAL IS QUICKLY BECOMING RISKIER, AS THESE INVESTMENTS WOULD BECOME STRANDED'

UNEP.[22]

Mercer finds that coal power, together with coal mining, are the sectors that will be most negatively affected by the low carbon transition.[21]

Coal power has been impacted by several complementary long term trends: growing competition from alternative power sources (renewables and gas) in key geographies, increased competitiveness of energy efficiency and grid efficiency improvements, decentralisation and diversification of the power system, lower energy demand growth, structural economic change in China, tighter air pollution standards and regulations, and energy and climate policies.

These recent energy market developments confirm that coal power assets are increasingly at risk of becoming stranded, and hence constitute a growing financial risk to investors. The part below provides more details on global developments, while regional developments are elaborated in **Annex 1**.

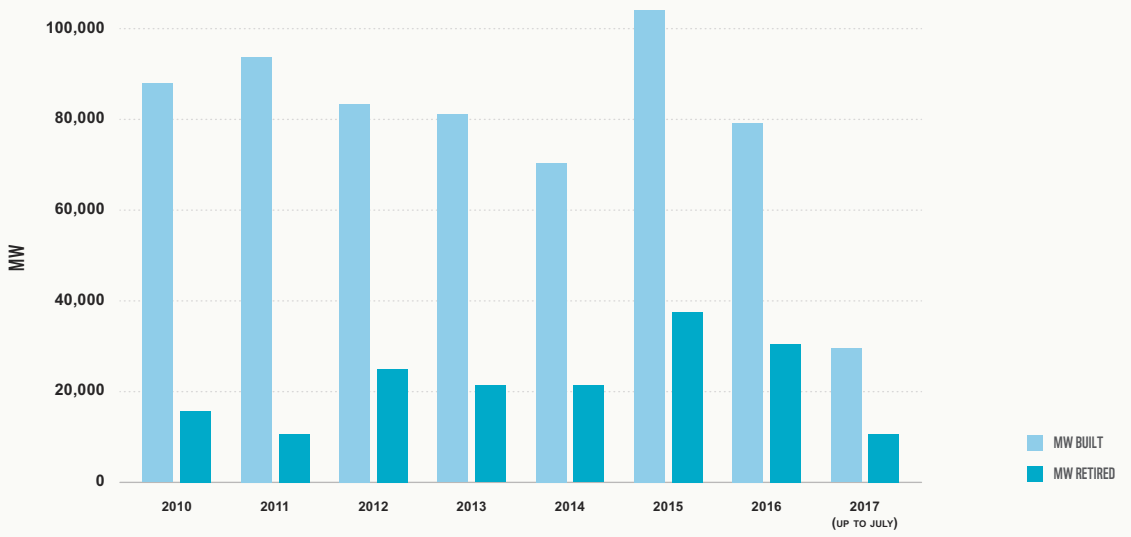
New coal plants: sharp decline of the global pipeline

Investments in coal plants have seen a sharp decline in 2016, falling to historical lows.[23] After a decade of unprecedented expansion, the amount of global coal power capacity under development has dropped dramatically between end 2015 and end 2016: the pre-construction pipeline has shrunk by almost half (-48%), construction starts have dropped by 62%, and ongoing construction has declined by 19%. These shifts are mainly due to shifting policies and economic conditions in China and India.

The current developments in the global energy market are projected to continue and accelerate in the future. The IEA foresees a dramatic slowdown in investments in coal power.[24] Bloomberg New Energy Finance estimates that only 18% of planned new coal plants will get built: that means that 369GW of projects stand out to be cancelled.[25]

20 WWF (2014), Global coal: the market has shifted; and WWF (2015), Global coal: the acceleration of market decline.
21 Mercer (2015), Investing in at time of climate change.
22 UNEP (2017), Emission Gap Report.
23 International Energy Agency (2017), World Energy Investment 2017.
24 International Energy Agency (2017), World Energy Investment 2017.
25 Bloomberg New Energy Finance (2017), New Energy Outlook.

FIGURE 4 GLOBAL COAL POWER CAPACITY BUILT AND RETIRED, 2010-2017 (SOURCE: COALSWARM)[26]



Existing coal plants: load factors go down, decommissioning goes up

The amount of electricity produced globally by coal plants has fallen each year since 2013, even though there are more power plants.[27] The load factor (i.e the number of hours per year that coal plants are producing power) has decreased significantly: this has, in turn, reduced income and financial viability of these power assets.[28]

In parallel, the global coal power capacity being retired is increasing, from 10-15GW a year in 2010-2011 to 20GW year in 2012-2014 to 30-40GW a year in 2015-2016 (see Figure 4).[29]

The retirement trend will likely accelerate as the operational coal fleet gets older: the IEA clean coal centre estimates that, as a rule of thumb, coal plants require serious re-investments after about 25 years of operation. Approximately 800GW of coal plants would require such investments by 2030, increasing to approximately 1400GW by 2040.[30] Re-financing the life-extension of these assets will likely become unviable in light of decreasing costs for renewable technologies (see Recommendation 3), hence leading to closing-down of assets before end-of-lifetime.

26 CoalSwarm (2017), Boom and Bust 2017.
27 CoalSwarm (2017), Boom and Bust 2017.
28 In China, the coal fleet ran at only 47,5% capacity in 2016 (Institute for Energy Economics and Financial Analysis (2017), China: A glut in the Chinese electricity market). India, in September 2017, reported its national coal fleet on average ran at little more than 60% of its capacity - well below what is generally considered necessary for an individual generator to be financially viable.
29 CoalSwarm (2017), Boom and Bust 2017.
30 CoalSwarm (2017), Global Coal Plant Tracker.

BOX 2. NON-LINEARITY OF COAL DECLINE: THE UK EXAMPLE OF TECHNOLOGY AND POLICY DISRUPTION.

Cost-optimisation models, which are for instance used for IEA scenarios, often struggle to integrate non-linearity. Investments are subject to technology and policy disruptions that may impact the profitability of coal plants.

The UK provides a concrete example of such disruptions. A government White Paper from 2007 forecasted a smooth decline of coal power.[31] But tightening policy (e.g. carbon floor price) led to a much more dramatic decline in coal power.[32]

FIGURE 5 PROJECTIONS OF UK COAL GENERATION (2007 WHITE PAPER) COMPARED TO ACTUAL COAL GENERATION (TWH) (SOURCE: UK GOVERNMENT)[33]

An acceleration of trends is required in light of climate targets

Recent market developments have severely put into question the financial viability of investments in the coal power sector. Even more is needed, however, to respect climate thresholds:

- Climate science requires no new coal build as from 2017 (see Recommendation 1). In January 2017 the global coal plant capacity amounted to 1964GW (+3%); 273GW of new coal plants were under construction and another 570GW were still planned. Of highest concern are coal plant expansion plans in Vietnam, Indonesia, Japan and Turkey; and concerns remains as well for Bangladesh, Pakistan, Egypt, South Korea, South Africa, Philippines, Poland, Russia and Thailand.
- More coal capacity is still being built than closed each year. Avoiding new coal plant construction will not suffice, as existing coal plants and plants under construction would still commit approximately 240Gt of CO_2 over their lifetime.[34] Closing the emissions gap requires that these plants run with lower load factors, and are phased out before the end of their lifetime (i.e. stranded assets).

31 UK department of trade and industry (2007), Meeting the Energy Challenge – A White Paper on Energy.
32 UK Department for business, energy and industrial strategy (2017), Coal statistics.
33 UK department of trade and industry (2007), Meeting the Energy Challenge – A White Paper on Energy. UK Department for business, energy and industrial strategy (2017), Coal statistics.
34 CoalSwarm (2017), Boom and Bust 2017 – Tracking the Global Coal Plant Pipeline.

Asset owners can contribute to closing the gap between current new coal investment and what is required by climate science. WWF presents concrete options in recommendations 4, 6 and 7 of this Guide. Taking these actions will also contribute to better protect asset owners' investment portfolios from financial risks for coal power.[35]

BOX 3. CARBON CAPTURE AND STORAGE (CCS) IS NOT A RELEVANT OPTION FOR COAL POWER

One specific technological issue that can be raised about coal power is CCS. CCS has been framed by its proponents as the solution to give coal power a mid-long term future in a low carbon economy.

WWF considers that CCS may have a larger role to play in reducing non-energy CO_2 emissions from *industrial processes*, only after all other options including energy and material efficiency have been exhausted, and subject to truly safe geological CO_2 storage.[36] High costs and technological challenges (e.g. storage) have heavily put into question the feasibility to apply CCS for coal plants. Recent development with several large scale CCS demonstration projects confirms these challenges:

- In **Europe**, RWE and Engie have retired their participation in the Dutch ROAD demonstration project, despite government subsidies.[37] It was the only CCS coal plant project in the EU.
- In the **US**, the Kemper Country Power plant was meant to be the first large-scale facility to use coal with CCS. Mississipi Power increased the estimated cost to over $7.5 billion instead of $2.9 billion initially; the plant is more than three years behind schedule.[38] In June 2017, it was announced that the plant would finally use gas instead of coal. The US had already decided in 2015 to stop funding the FutureGen project aimed at demonstrating the feasibility of capturing emissions from coal stations.
- In **Canada**, the Boundary Dam CCS plant managed by SaskPower – the world's first commercial-scale plant opened in 2014 – is facing major financial and technical problems according to leaked internal documents. The plant has been shut down for long periods due to technical problems and the utility is paying millions of dollars in penalty payments to an oil company for breaches of the contract for the sale of carbon dioxide.[39]

Power generators say they cannot afford to create CCS facilities without government subsidies. For Ben Caldecott, director of the Stranded Assets Programme at the University of Oxford's Smith School of Enterprise, 'policymakers are not willing to write a blank cheque for this.'[40]

The **IEA** found that 'for both nuclear power and CCS, the major ramp up of investment envisaged by 2DS [IEA 2°C scenario] is unlikely to be delivered under current carbon-pricing policies and electricity market frameworks'.[41] As a consequence the new IEA well below 2°C scenario ('B2DS') foresees no such development in Europe anymore.[42]

35 Mercer (2015), Investing in at time of climate change.
36 WWF (2013), Reaction to the European Commission's 'Consultative Communication on The Future of Carbon Capture and Storage in Europe'.
37 Rijksoverheid (2017), Kabinet blijft techniek voor afvang en opslag broeikasgassen stimuleren.
38 Associated Press (2017), Mississippi Power Plant Costs Cross $7.5B; Rate Plan Delayed.
39 End Coal, Boundary Dam CCS hype goes up in a puff of green smoke, 4 November 2015.
40 Financial Times, Carbon capture at risk of running out of steam, 17 January 2016.
41 IEA World Energy Investment 2016.
42 IEA (2017), Energy Technology Perspectives.

CCS for large-scale power generation is heavily debated:

- Ben Caldecott finds that 'there are multiple risks including competition from new technologies such as renewables and energy storage. There are also performance penalties in relation to efficiency and water use, while there is also political opposition, especially for onshore storage [of CO_2]'.[43]
- Carbon Tracker Initiative finds that the CCS technology really comes into play for emissions in industries such as steelmaking where there is hardly any alternative way of cutting emissions – but not for power generation.[44]
- A recent study by Energy Innovation shows that coal plants equipped with CCS are nearly three times more expensive than onshore wind power and more than twice as expensive as solar photovoltaics (PV). Although these costs may decline with research and development, the potential for cost improvement is limited. Coal with CCS will systematically need significant subsidies to compete with wind and solar.

BOX 4. THE NEED FOR A JUST TRANSITION AWAY FROM COAL

Phasing out coal can have important societal benefits, going beyond climate change mitigation. Key among these are improved air quality and increased water availability.[45]

However, in some cases a transition away from coal can be politically difficult. Lessons learned from previous successful experiences provide guidance and show that social dialogue, social protection and economic diversification are instrumental in ensuring just transitions.[46]

Interests of workers and coal communities need to be taken into account and addressed by additional measures. Public support for workers, such as wage subsidies (for hiring in expanding sectors, training, re/upskilling) and unemployment insurance, helps effectively mitigate most of the losses at generally modest costs.[47] It is instrumental to kick-start the viable economic transformation of coal regions.

The just transition issue gets increasing interest from investors: the Investor Group on Climate Change published a recent report with relevant recommendations about investing in a just transition in Australia to move away from coal.[48] Asset owners should take the just transition issue into account to facilitate the coal exit and smoothen related social impacts.

TOOLBOX FOR RECOMMENDATION 2	
WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 1. Assess the evidence of climate-related financial risks and opportunities
MAIN REFERENCES	• Mercer (2015), Investing in at time of climate change • CoalSwarm (2017), Boom and Bust 2017

43 Financial Times, Carbon capture at risk of running out of steam, 17 January 2016.
44 Ibid.
45 IEA/OECD. (2016). Coal Information 2016.
46 Caldecott, B., Sartor, O. and Spencer, T., (2017), Lessons from Previous Coal Transitions: High-Level Summary for Decision-Makers.
47 Louie, E. P., and Pearce, J.M., (2016), Retraining Investment for U.S. Transition from Coal to Solar Photovoltaic Employment, Energy Economics 57, pp. 295–302.
48 IGCC (2017), Coal, carbon and the community – Investing in a just transition.

3. ASSESS THE EVIDENCE OF GROWING OPPORTUNITIES FOR RENEWABLE POWER

WWF RECOMMENDATION 3

WWF recommends that asset owners assess the evidence of growing financial opportunities for renewable power globally.

Global renewable energy market and investment flows

According to Mercer, renewable energy will be the sub-sector benefitting the most from the low carbon transition.[49] Depending on the climate scenario which plays out, Mercer finds that the average annual returns from the renewable sub-sector could increase by between 4% and 97% over the next decade – meaning annual returns could potentially double.

Recent developments in the global energy market confirm Mercer's conclusion:

- Renewables accounted for almost two third of net new power capacity around the world in 2016, with almost 165GW coming online. This was another record year. Renewable capacity additions will continue to dominate the energy market. In the next five years, renewable electricity capacity is forecast to expand by over 920GW, an increase of 43%.[50] Bloomberg New Energy Finance estimates that 72% of investments to 2040 in new power generation capacity will go to renewables.[51]
- Average generation costs by 2022 are set to fall by 25% for utility-scale solar PV, by 15% for onshore wind, and by 33% for offshore wind.[52] Solar power, in particular, is entering a new era of mainstreaming. In 2016, new solar PV capacity around the world grew by 50%. For the first time, solar PV additions rose faster than any other fuel, surpassing the net growth in coal. Low announced prices for solar and wind were recorded in a variety of places, including India, the United Arab Emirates, Mexico and Chile, with new record-low auctions prices as low as 2 cents per kilowatt hour.[53] As the experience curve phenomena implies, solar power will continue to get cheaper through improved technology and economies of scale. With the cost of production negligible in comparison to the cost of transmitting and distributing the power, capital will continue to be mobilised into storage and innovative grid technologies.
- Battery storage markets are expected to reach 21GW by 2025, driven by cost reductions of over 50%.[54] Cost reductions in batteries and solar PV have opened up many new markets – the number of off-grid systems grew by 41% between 2015 and 2016, with 8.2 million systems sold.

49 Mercer (2015), Investing in a time of climate change.
50 IEA (2017), Renewables 2017 – Analysis and Forecasts to 2022.
51 IEA (2017), Renewables 2017 – Analysis and Forecasts to 2022. Bloomberg New Energy Finance (2017), New Energy Outlook.
52 IEA (2017), Renewables 2017 – Analysis and Forecasts to 2022.
53 Bloomberg (2017), Saudi-Arabia get cheapest ever bids for solar power in auction.
54 International Finance Corporation (2017), Creating Markets for Climate Business - An IFC Climate Investment Opportunities Report.

High renewable growth translates into investments flows. The International Finance Corporation, part of the World Bank Group, found in its Climate Investment Opportunities Report that:[55]

- 2016 renewable power investments, with $280 billion, were twice as large as fossil fuel-based power investments.
- There is $6 trillion in new investment potential in wind and solar power up to 2040: half of that in the Asia-Pacific region, but Africa is also beginning to attract major solar investment – with Algeria, South Africa and Zambia leading the way.
- For off-grid solar and storage, the global market was already $2.5 billion in 2016, with key markets in Sub-Saharan Africa and South Asia, and investment in emerging market energy storage will grow to $23 billion in 2025.

Recently, the investor coalition Ceres published a study showing that the opportunities for investing in **early stage clean energy** technology companies have changed significantly and favourably in recent years, and offer the potential for greater risk adjusted returns in the sector than ever before: 'markets, teams, and strategies have changed recently to fundamentally improve the investment landscape'.[56]

Renewable power dynamics in key geographies

- China alone will be responsible for over 40% of global renewable capacity growth. In fact, China already surpassed its 2020 solar PV target, and the IEA expects it to exceed its wind target in 2019.
- By 2022, India is expected to more than double its current renewable electricity capacity – becoming the joint second-largest renewable growth market after China. For the first time, this growth over the forecast period will be higher than the EU. Solar PV and wind together will represent 90% of India's capacity growth as auctions yielded some of the world's lowest prices for both technologies. In several Indian states, these recent contract prices are already comparable to coal tariffs.
- Despite policy uncertainty, the United States will remain the joint second-largest growth market for renewables.
- In the EU, wind power is expected to cover 50% of Danish electricity consumption by 2020. In other countries (Ireland, Germany and the United Kingdom), the share of wind and solar in total generation will exceed 25% by 2022.

55 International Finance Corporation (2017), Creating Markets for Climate Business - An IFC Climate Investment Opportunities Report.
56 Ceres (2017), Clean Tech 3.0: Venture Capital Investing in early stage clean energy - A Changing Investment Climate.

BOX 5. ENERGY ACCESS FOR THE POOR: WHEN SOLAR PV DWARFS FOSSIL FUELS

The phenomenal growth in solar PV will help bridge the electrification gap in developing Asia and sub-Saharan Africa. A detailed analysis from the IEA finds that clean and affordable energy for all is within reach by 2030, compatible with meeting global climate goals, preventing millions of premature deaths each year. Women (that currently gather fuelwood) will benefit most from these evolutions.

The IEA plans that to provide electricity to roughly 650 million people by 2030, more than 75% of them should be equipped with solar photovoltaic panels (especially through mini-grids and off-grid). This compares with roughly 50 million people to be equipped with fossil fuel-fired electricity – or ten times less – in the IEA analysis: renewables become the new normal especially for the poorest. The IEA makes clear that in most cases solar PV is indeed cheaper than kerosene, diesel, etc.

TOOLBOX FOR RECOMMENDATION 3	
WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 1. Assess the evidence of climate-related financial risks and opportunities
MAIN REFERENCES	• Mercer (2015), Investing in a time of climate change • IEA (2017), Renewables 2017 – Analysis and Forecasts to 2022 • Bloomberg New Energy Finance (2017), New Energy Outlook

DECISION-MAKING

PRIORITY

4. ADOPT A COAL AND RENEWABLE ELECTRIC POWER UTILITY POLICY AT PORTFOLIO LEVEL

WWF RECOMMENDATION 4

WWF recommends that asset owners adopt a coal and renewable power policy with the following elements:

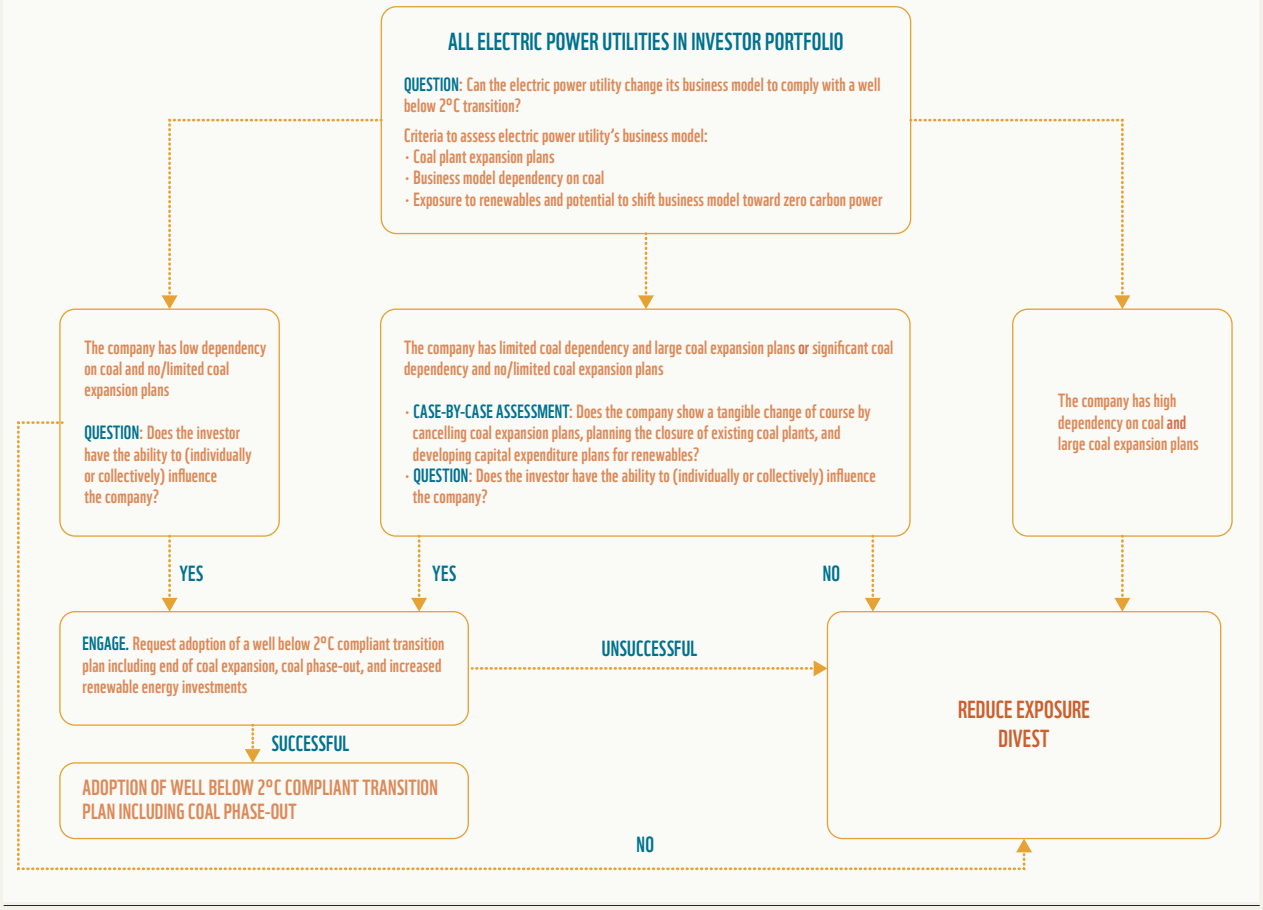
- **An urgent request to electric power utilities –prioritising those owning coal assets – to rapidly align with the Paris Agreement;**
- **Criteria to engage (or divest) with all electric power utilities owning coal assets (see Recommendation 6), time-bound requests to engaged companies (see Recommendation 7), and criteria for follow up in case of success or failure of engagement (see Figure 8);**
- **Guidelines that guarantee tight implementation of the coal and renewable power policy by investment managers and other service providers, and an update of the proxy voting policy;**
- **Commitments to publicly and regularly signal the coal and renewable-related decisions and activities (see Recommendation 9).**

Three factors incentivise asset owner to develop a coal and renewable power policy: climate science and the need to align their investment portfolio with the Paris Agreement (see Recommendation 1); increasing risks associated with changing dynamics in the coal power sub-sector (see Recommendation 2); and growing opportunities in the renewable power sub-sector (see Recommendation 3).

WWF believes that asset owners can carefully define criteria in their coal and renewable power policy to maximise their ability to harness change in the electric power utilities sector. These criteria must enable identifying relevant companies for engagement and companies not suited for engagement, guarantee an impactful dialogue with electric power utilities owning coal assets, and ensure implementation of the policy by service providers.

Figure 6 provides an overview of questions and criteria that will help asset owners in developing their coal and renewable power policy. More details are provided in Recommendations 6 and 7, and **Annex 2** provides a template coal and renewable power policy.

FIGURE 6 DEVELOPING AN ELECTRIC POWER UTILITY SECTOR INVESTMENT POLICY AND ENGAGEMENT STRATEGY (WWF)



TOOLBOX FOR RECOMMENDATION 4

WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 6. Integrate climate change in investment policy • 8. Adopt sector-specific policies
AVAILABLE TOOLS	• Global Investor Coalition on Climate Change (GICCC) (2016), Investor expectations of Electric power utilities Companies • GICC (2015), Climate change investment solutions: a guide for asset owners • PRI (2015), Developing an asset owner climate change strategy: pilot framework
MAIN REFERENCES	• FSB Task Force on Climate-related Financial Disclosures (2017), Final Report • Mercer (2015), Investing in a time of climate change • WRI, UNEP-FI, 2° Investing Initiative (2015), Climate strategies and metrics: exploring options for institutional investors

5. INTEGRATE SUSTAINABILITY CRITERIA FOR RENEWABLE POWER INVESTMENTS AT PORTFOLIO LEVEL[57]

WWF RECOMMENDATION 5

WWF recommends that asset owners integrate sustainability criteria for renewable power investments at portfolio level, to ensure that hydropower and bioenergy truly contribute to decarbonise the energy system in a sustainable way.

WWF believes that asset owners should have sustainability criteria for all their energy investments – including for renewables.

The least controversial and risky renewable power sources are wind, solar and geothermal. WWF believes these technologies should be prioritised in the decarbonisation of the energy system – in combination with energy efficiency, demand side response and energy storage.

Even renewable power sources can have significant sustainability impacts on local communities and their livelihoods, ecosystems, emission reductions and biodiversity. This is especially the case for hydropower and biomass. To address the significant challenges in this area and ensure truly sustainable power production, WWF urges asset owners to approach any investment in such assets with caution, and to integrate sustainability criteria – including biodiversity considerations – to adequately assess, avoid and mitigate these risks. **Annex 3** provides detailed sustainability considerations for hydropower and biomass.

TOOLBOX FOR RECOMMENDATION 5	
WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 6. Integrate climate change in investment policy • 8. Adopt sector-specific policies
AVAILABLE TOOLS	• WWF SIGHT tool: http://wwf-sight.org/
MAIN REFERENCES	• World Commission on Dams (2000), Dams and Development: A New Framework for Decision-Making • WWF (2003), An Investor's Guide to Dams • WWF (2017), EU bioenergy policy

57 This guide focuses on power generation, and does not cover biomass used for heat or transport: for more information on the latter, see the WWF position paper on EU bioenergy policy (2017).

MONITORING SERVICE PROVIDERS & ENGAGING WITH KEY STAKEHOLDERS

PRIORITY

6. IDENTIFY ELECTRIC POWER UTILITIES SUITED FOR FORCEFUL SHAREHOLDER ENGAGEMENT

WWF RECOMMENDATION 6

WWF recommends that asset owners, in collaboration with relevant service providers and like-minded peers, identify electric power utilities suited for forceful shareholder engagement, building on three criteria of 1) coal expansion plans, 2) business model exposure to coal and to renewable power and 3) related potential to shift their business model towards zero carbon power.

Electric power utilities owning coal assets should either be actively engaged, with timelines, or divested. There is no relevance to engage with companies that have no future in a well below 2°C economy.

The WWF Climate Guide to Asset Owners highlights the need to prioritise sustained and meaningful engagement with a carefully selected number of companies, given the limited engagement capacity of asset owners and the scale and pace of action required by climate science. Shareholder engagement with electric power utilities is critical to ensure they will realise a meaningful low-carbon transition within the relevant timeframe, and thus maintain or enhance shareholder value while complying with well below 2°C pathways.

WWF believes that asset owners should not keep electric power utilities that own coal power assets in their portfolio without taking action, as inaction can only exacerbate risks. However, some electric power utilities are not willing or will not be able to transition rapidly enough. Identifying the electric power utilities suited for engagement is therefore critical so that the engagement will bear fruits.

Three criteria to identify an asset owner approach to electric power utilities

1. **Coal plant expansion plans:** climate science indicates that no new coal plant should be built globally (see Recommendation 1). Whatever their coal dependency, electric power utilities that have capital expenditure in their books for new coal plants and/or the purchase or the refurbishment of existing coal plants go counter climate imperatives and will face growing risks of stranded assets in a context of stricter carbon regulations following the Paris Agreement. This issue should thus be addressed as the top priority by asset owners.
2. **Business model's dependency on coal:** the degree to which an electric power utility is entrenched in coal will influence its ability to shift to a low carbon business model in a timely fashion. The share of coal in the electric power utilities' total *annual power* production is the most relevant metric to identify coal dependency. Alternatively, the coal share in the utility fleet's *total capacity* can be used. The share of coal power in total *revenues* is a much less relevant indicator, and can even be misleading: there are cases (e.g. USA power market) where revenues from coal power have reduced significantly – hence the coal power revenues can appear small in comparison with revenues from other power sources, while related emissions (and climate impact) are high. There is already a relatively common industry practice amongst European institutional investors that have employed a 30% divestment threshold (e.g. the Norwegian Sovereign Wealth Fund, Allianz, etc.). Some asset owners even go beyond that threshold.[58]

58 E.g. FRR, CNP Assurances, Caisse Des Dépôts use a divestment threshold of 15 or 20%.

3. **Business model's exposure to renewables and potential to shift their business model towards zero carbon power:** on the opportunity side, the same criteria can be applied – capital expenditure for renewables and related sectors/assets that will benefit from to the low-carbon transition (including smart grids, electricity storage, demand response) and share of power production/capacity from those sectors.

The 'Global Coal Exit List' is a new database of 775 coal parent companies that asset owners can use to identify electric power utilities owning coal assets.[59] The Global Coal Exist List is described in **Annex 4**. This annex also provides the 120 largest coal-based electric power utilities and the 120 largest coal plant developers. For the latter it is important to note that a large part of coal-power developments is planned by companies that are not electic power utilities – most notably diverse trading and industrial companies (e.g. Marubeni, Sumitomo), manufacturers and equipment providers (e.g. Harbin Electric) and other industrial companies (e.g. Petrovietnam and Toyo Ink).

FIGURE 7 DISTINGUISHING ELECTRIC POWER UTILITY BUSINESS PLANS (WWF)

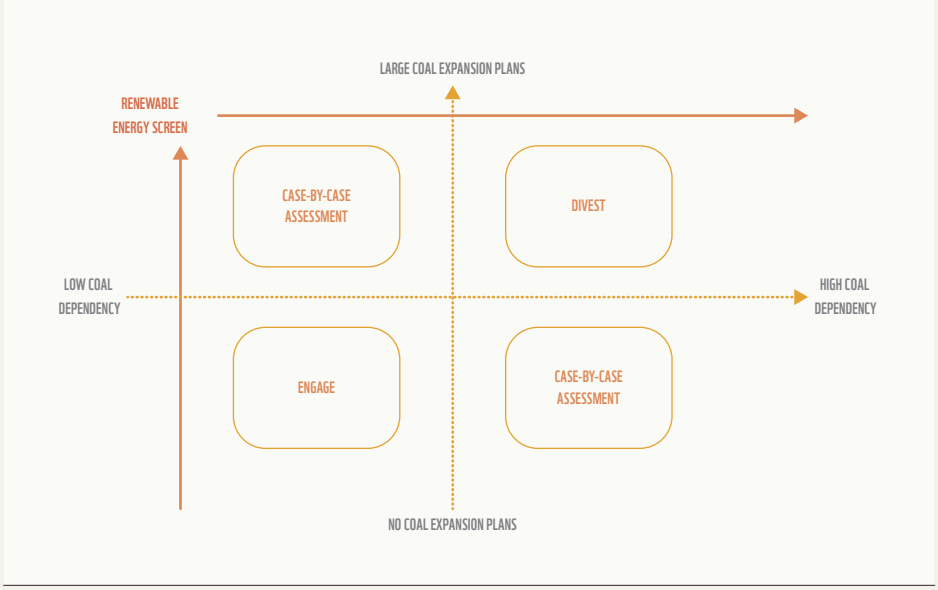


Figure 7 suggests three courses of action an asset owner can take based on the business model of the electric power utilities that own coal assets. Each is elaborated on in more detail on the following page.

59 Urgewald (2017), Global Coal Exit List. The Global Coal Exit List uses the Global Coal Plant Tracker, developed by CoalSwarm, as its primary source to track coal power developments. The latter provides information on all existing coal plants of 30 MW or more globally, as well as every plant proposed since January 1, 2010 – and has a detailed overview of the planning stage for each coal power plant (i.e. announced, pre-permit development, permitted, under construction, operational).

- **Engagement** is a worthwhile option for electric power utilities with low coal dependency and no or limited coal expansion plans, as they are well placed to adapt to the low-carbon transition. This group covers a wide range of utilities; most importantly for the scope of this paper are utilities that have started to decrease coal power generation in favour of renewable energy (e.g. Iberdrola, Dong Energy, Engie). When asset owners have few shareholder rights, and wish to engage, they should systematically do it through collective action in investor coalitions, in order to reach the critical mass forcing the company to change (see Recommendation 7). Engagement should be time-bound, and followed by gradual exposure reduction if not successful (see Figure 8).
- **Case-by-cases assessments** are required for electric power utilities with significant coal dependency and limited coal expansion plans, and electric power utilities with limited coal dependency and large coal expansion plans:
  - Power utilities with low coal dependency but large coal expansion plans are mostly state-owned or private-owned companies that aim to take their part in the construction of the large coal plant pipeline in their country – generally based in China (e.g. Shaanxi Provincial Investment Group), India (e.g. General Electricity Authority) and Turkey (e.g. Hattat Holding).
  - Power utilities with high coal dependency and no or small coal expansion plans are mostly electric power utilities in Europe (e.g. RWE, Uniper) and the USA (e.g. NRG, Southern Company, Duke Energy), geographies where coal power is losing terrain against other sources of energy.

  Engagement with such companies should be made strictly conditional on the positive outcome of the assessment – i.e. if the company shows a tangible change of course by cancelling coal expansion plans, planning the closure of existing coal plants, and developing capital expenditure plans for renewables (renewable energy screen). Engagement should be time-bound (see Figure 6) and, in case of a negative assessment or unsuccessful engagement, the company should be divested from.
- **Divestment** is the only option for electric power utilities with both high coal dependency and large coal expansion plans, as they are in no position to shift their business model *within the necessary timeframe*.
  - This group covers large state-owned or state-controlled enterprises in non-OECD countries that have a large coal plant pipeline like China (e.g. China Huaneng, China Guodian), India (e.g. NTPC), South-Africa (Eskom) and Vietnam (EVN). It also includes some companies in OECD countries where the government is an active coal supporter like Poland (e.g. PGE), South-Korea (e.g. TEPCO) and Japan (e.g. Marubeni, Sumitomo, JPower).
  - Companies that are climate deniers or aggressively lobby against climate and energy regulations relevant for the achievement of the Paris Agreement should also be divested.

  WWF does not see relevance to engage with such companies: the asset owner policy must indicate that equity and bonds in these companies will be sold, and that no new bonds and shares will be purchased until further notice.

Low coal dependency is not enough to stop engagement: all companies must have a coal exit strategy

The fact that an electric power utility has relatively limited power production or capacity from coal (e.g. less than 30%) does not mean that it is adequately managing its climate-related risks nor is aligned with the Paris Agreement. As a result, 'the job is not done': such companies have simply a higher potential to exit coal in a timely fashion than those more coal-dependent – and in fact are more likely to fully exit coal. WWF therefore believes they should be actively engaged by asset owners to gradually align their business model with the Paris Agreement.

TOOLBOX FOR RECOMMENDATION 6

WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 13. Engage forcefully with portfolio companies
AVAILABLE TOOLS	• Global Coal Exit List: open-source database of 775 coal parent companies • Global Investor Coalition on Climate Change (GICCC) (2016), Investor expectations of Electric power utilities Companies • CDP, Global Compact, WRI, WWF: sciencebasedtargets.org • League tables of coal mining companies: Transition Pathway Initiative (2017), The toolkit • InfluenceMap (2017), Corporate Carbon Policy Footprint
MAIN REFERENCES	• Preventable Surprises (2017), Forceful Stewardship • Portfolio Decarbonisation Coalition (PDC), UNEP-Finance Initiative, CDP (2016), Investment portfolios in a carbon constrained world: the second annual progress report of the PDC • PRI (2015), Investor expectations on corporate climate lobbying

PRIORITY

7. DEFINE MEANINGFUL REQUESTS TO PORTFOLIO ELECTRIC POWER UTILITIES

WWF RECOMMENDATION 7

WWF recommends that asset owners develop an assertive engagement strategy to ensure that electric power utilities in their portfolio, in the very near term, publish time-bound well below 2°C transition plans and climate science-based targets, and deliver TCFD-aligned reporting. A litmus test for engagement is a corporate commitment to immediately end capital expenditures for coal expansion. Asset owners should reduce exposure/divest from electric power utilities, and require investment managers to act accordingly, if engagement efforts do not result in the targeted companies publishing meaningful climate targets and transition plans in a timely fashion.

Shareholders' requests and additional guiding questions to electric power utilities

The explicit ultimate objective of engagement should be the alignment of electric power utilities' business models with the Paris Agreement. Asset owners should request electric power utilities to adopt and publish time-bound well below 2°C transition plans composed of the six following elements:

- **Long term goal:** a commitment to align business models with the Paris Agreement and, more concretely, a time-bound climate science-based target built on forward looking climate-scenario analysis. WWF recommends the sectoral decarbonisation approach, developed by Ecofys for the Science-Based Target Initiative, to set science-based targets.[60]
- **'No new coal' commitment:** an immediate end to capital expenditure for new coal plants and/or the purchase or the retrofitting of existing coal plants. WWF views such capital expenditure discipline as an imperative before any meaningful engagement can be followed up: maintaining or increasing coal dependency cannot be compatible in any way with climate science.
- **Coal exit strategy:** a clearly articulated roadmap for the gradual closure of existing coal plants, ending at the latest in 2030 in EU/OECD and in 2050 globally. This could include cash returns to shareholders through buybacks or dividends, and be accompanied with increased capital expenditure for low carbon projects. The least profitable and/or most polluting coal plants should be closed first.
- **TCFD-aligned disclosure:** the disclosure of the target and transition plan and alignment with the TCFD recommendations. Such information should be published in mainstream financial reports (integrated reporting).
- **Regular review:** a commitment to review and ratchet up targets and transition plans in the light of evolving climate science, in particular the development of 1.5°C scenarios driven by the Paris Agreement.

'GIVEN THE DIFFICULTY OF RETIRING OR PHASING OUT COAL ONCE PLANTS ARE BUILT, IT IS EVEN MORE IMPORTANT TO ENSURE THAT NO NEW COAL PLANTS ARE CONSTRUCTED'

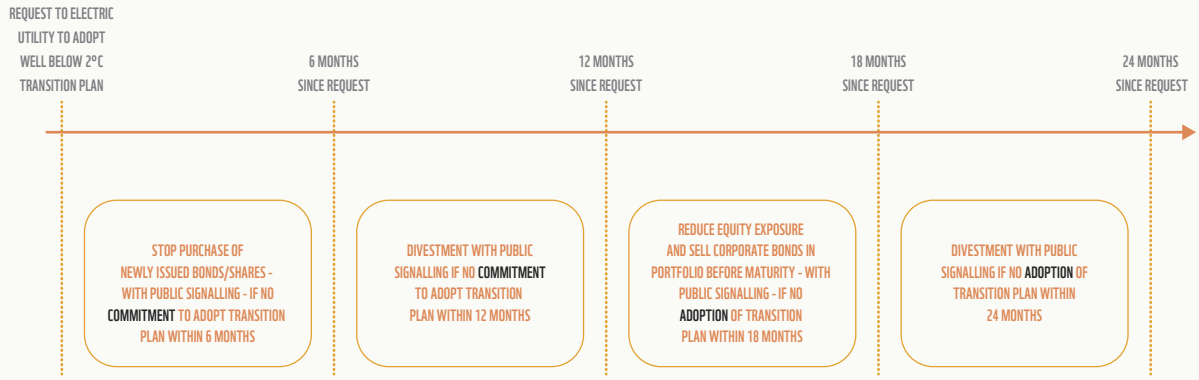
UNEP, Emissions Gap Report 2017

60 Science-Based Target Initiative (2015), sectoral decarbonisation approach (SDA) – A method for setting corporate emission reductiontargets in line with climate science.

- **No counterproductive lobbying:** a public commitment to not oppose policies that aim to reduce emissions in line with the Paris Agreement, be transparent about lobbying activities and related expenditures, and leave third party organisations (e.g. business and trade associations) that promote policies that risk to derail the Paris Agreement.

Given the urgency to tackle coal-related climate change, asset owners should require internal and external investment managers to reduce/remove exposure to the targeted companies if the engagement process does not lead to significant results within set timeframes (6, 12, 18, 24 months), as recommended in figure 8.

FIGURE 8 ROADMAP FOR EXPOSURE MANAGEMENT IN CASE OF UNSUCCESSFUL ENGAGEMENT (WWF)



In addition to the priority requests, asset owners can ask additional guiding **questions** to electric power utilities about their governance structure and just transition. A good start for formulating such questions has been made by the Global Investor Coalition on Climate Change, but asset owners should also include the following:

- Has the electric power utility put in place a **governance structure** that defines board and senior management responsibilities and accountability for overseeing the well below 2°C transition plan's implementation; and adjusted the board's remuneration policy accordingly? If not, when can it adopt such a structure?
- Has the electric power utility a just transition policy in place?

BOX 6. CLOSING NOT SELLING COAL PLANTS: AVOIDING REPEATING THE COUNTER-PRODUCTIVE 'DIVESTMENT' OF VATTENFALL

In April 2016, the state-owned Swedish company Vattenfall sold all its German open cast lignite mines and plants (with a combined power generation capacity of 8 GW) to the Czech energy company EPH. While Vattenfall chief executive, Magnus Hall, praised himself – 'We are now accelerating our shift towards a more sustainable production' – in fact the real climate impact of these coal assets has likely gone from bad to worse: EPH has no intention to close the given plants in the near future nor decarbonise its business model. Vattenfall has simply sold its responsibility on such a polluting legacy, but has not fixed it.

Throughout the engagement process, the selling of existing coal plants by the company should explicitly be discouraged by asset owners as simply selling the assets may not have any positive impact in term of reducing CO_2 emissions, and may instead extend the lifetime of the coal plant. Indeed, because the plant may be sold at a discounted price, there is a risk that the company purchasing it intends on running the plant to maximise short term profit, with little priority on efficiency and responsibility, and so selling the asset could actually result in additional negative environmental impact.

Other financial institutions are starting to clarify their position in this issue, for example BNP Paribas that committed to reject any mandate to buy or sell coal plants: 'The objective is that these plants are closed and not sold to less environmentally regarding companies'.[61]

In addition, if coal plant ownership is moving from one utility to another, global diversified investors are likely to keep them in their portfolio anyway, nullifying the impact at portfolio level. What is required instead is the timely closure of coal plants, as the only secure way to reduce climate-related risks. This is where asset owners' engagement may yield major climate benefits.

Finally, as universal owners, global diversified investors will be most affected by accelerated climate change, as they have large exposures across the economy. Therefore, the selling of an asset (for a likely discounted rate) in one part of their portfolio, has the potential to negatively affect the performance of other parts of their portfolio, for example through increased air pollution, lower agricultural yields, increased exposure to stranded assets through banks held in their portfolio.

61 Novethic (2017), Pour la première fois les financements aux énergies fossiles ont diminué et les banques françaises n'y sont pas pour rien.

BOX 7. HARD COAL VERSUS LIGNITE

Both hard coal and lignite are used to produce electric power. They have distinctive characteristics, however, that will impact their climate and air pollution related financial risks:

- Lignite (1030 grams CO_2/kWh) has a higher carbon emission factor than thermal hard coal (870-940 grams CO_2/kWh), making it more vulnerable to climate policies.[62]
- Lignite contains more local pollutants (e.g. NOx, SOx and dust) that have a proven negative impact on public health, making it more prone to air pollution regulation that aims to limit these negative externalities.[63]
- Lignite is not fit for long distance transport due to its high moisture content and low energy density. As opposed to hard coal, which can be exported, production and consumption of lignite are closely interlinked and local. In some cases both mining and power production are even undertaken by the same company (e.g. RWE).

As of 1 November 2017, lignite amounted to 35.6% of the EU coal power capacity – far more than the world's average. Total lignite capacity was 55.8GW – situated mainly in Germany, Poland and Czech Republic).[64]

EU lignite capacity and related mining activities are particularly prone to newly adopted air quality regulations (LCP BREF) that will impose stricter limits on toxic pollutants from all 2,900 Large Combustion Plants in the EU as from 2021:[65]

- 89% of lignite capacity operational in 2021 would in current conditions not be compliant with LCP BREF, compared to 78% of hard coal capacity.
- The estimated capital expenditure required to bring the lignite capacity in compliance with LCP BREF would amount to approximately €6 billion.[66]

In addition to the European regulation, individual countries – most notably Germany – might set in place specific targets to reduce lignite in the energy mix.[67]

Companies that own lignite assets are particularly vulnerable, because they will either need to heavily invest in retrofitting plants or will be forced to close-down their power stations – and related mines. In both cases, this will weigh on their balance sheet. Asset owners should therefore closely scrutinise the lignite issue.

62 IEA (2016), CO_2-emissions from fuel combustion.
63 DNV-GL (2016), Fact-based scenario to meet commitments under the LCP BREF.
64 Europe Beyond Coal Database, version of 1 November 2017.
65 European Commission (2017) LCP BREF.
66 DNV-GL (2016), Fact-based scenario to meet commitments under the LCP BREF. Research based on capacity data from 2014.
67 Platts, German forward power prices drop as coalition talks collapse amid coal closure disagreement, 20 November 2017.

WWF forthcoming investor briefings on targeted utilities

In addition to the existing tools listed in the toolbox, WWF will develop in the next semester investor briefings focused on key European electric power utilities that have the largest coal plant fleets (Enel, RWE, PGE, CEZ, etc.). They are aimed at providing more granular analysis and recommendations to asset owners for their engagement with such electric power utilities. They will focus on two specific issues:

- The potential compliance costs at utility level of the forthcoming EU air pollution standards (see the EU section of **Annex 1)**;
- The alignment with the Paris Agreement of the coal and renewable fleet at electric power utility level, assessing how much capacity needs to be phase out or developed, or which plants needs to be closed and when (see **Annex 5**).

TOOLBOX FOR RECOMMENDATION 7	
WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 13. Engage forcefully with portfolio companies
AVAILABLE TOOLS	• Global Investor Coalition on Climate Change (2016), Investor Expectations of Electric power utilities Companies • Global Coal Exit List: open-source database of 775 coal parent companies • Alignment assessment of electric power portfolio with 2°C IEA climate scenario: Sustainable Energy Investment Metrics (free tool) • CDP, Global Compact, WRI, WWF: sciencebasedtargets.org • League tables of power utilities: Transition Pathway Initiative (2017), The toolkit • Ceres (2016), Benchmarking utility clean energy deployment 2016 • CDP (2017), Charged or static - Which European electric power utilities are prepared for a low carbon transition? • ClimateAnalytics (2017), Coal Phase Out in the EU - Detailed Information (plant level) • InfluenceMap (2017), Corporate Carbon Policy Footprint
MAIN REFERENCES	• Preventable Surprises (2017), Forceful Stewardship • Portfolio Decarbonisation Coalition (PDC), UNEP-Finance Initiative, CDP (2016), Investment portfolios in a carbon constrained world: the second annual progress report of the PDC • PRI (2015), Investor expectations on corporate climate lobbying

8. ENGAGE FORCEFULLY WITH POLICY MAKERS

WWF RECOMMENDATION 8

WWF recommends that asset owners engage with policy makers to ask for electric power-related climate and energy policies and regulations that drive a timely implementation of the Paris Agreement, for adequate climate and wider ESG corporate disclosure policies and regulations, and for financial policies and regulations that drive better understanding of electric power-related risks for financial institutions, as part of wider climate assessments.

Government policies and regulations are key drivers of systemic change. Asset owners therefore need to engage with policy makers to accelerate the integration of coal-related risk analysis and mitigation across the whole investor and financial community: it is always more productive to try to influence change than to be a passive bystander. WWF believes that given the urgency of the climate challenge, asset owners should swiftly and unequivocally engage with policy makers in favour of the proper implementation of the Paris Agreement and what it implies for coal: a gradual phase out.

A group of six investor coalitions (AIGCC, CDP, Ceres, IGCC, IIGCC, PRI), covering investors across the globe, urged G7 and G20 leaders to maintain momentum on climate change, stating: 'it is imperative that the public and private sectors work closely together to get the signalling and incentives right to shift the trillions of capital required across the global economy'.[68]

Asset owners should notably support the following electric power-specific policies and regulations:

- Coal phase out plans by governments, accompanied by just transition measures to ease the transition away from coal in regions where large coal infrastructure exists;
- Policies to establish and enhance carbon pricing (in particular in the EU by tightening of ETS policies) and remove coal power subsidies;
- The legislative proposal of the European Commission for the Regulation on the internal market for electricity (Art 23§4) that introduces an Emissions Performance Standard of 550g CO_2/kWh for capacity mechanisms – preventing coal plants from benefitting such subsidy mechanisms;[69]
- Non-market based instruments such as to enact a moratorium (a ban) on new coal plants or coal mines beyond a specific timeline;[70]
- Instruments for de-risking clean investment, for example support for policy design, identification and removal of regulatory hurdles, improvement of institutional capacity and provision of bridging investment subsidies – and similar support to improved grid infrastructure and storage facilities to address renewable variable availability.

TOOLBOX FOR RECOMMENDATION 8	
WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 14. Engage forcefully with policy makers
MAIN REFERENCES	• PRI, UNEP-Inquiry, UNEP Finance Initiative, UN Global Compact (2014), Policy frameworks for long-term responsible investment - The case for investor engagement in public policy • EU High-Level Expert Group on Sustainable Finance (2017), Interim report • E3G e.a. (2016), A sustainable finance plan for the European Union

68 AIGCC, CDP, Ceres, IGCC, IIGCC, PRI (2017a), Governments urged to maintain momentum on climate change action.
69 European Commission (2017), Proposal for a regulation of the European Parliament and of the Council on the internal market for electricity.
70 Rozenberg, J., Vogt-Schilb, A. and Hallegatte, S. (2017). Instrument Choice and Stranded Assets in the Transition to Clean Capital. Inter-American Development Bank.

9. PUBLICLY SIGNAL ELECTRIC POWER RELATED DECISIONS AND ACTIVITIES

WWF RECOMMENDATION 9

WWF recommends that asset owners publicly signal their electric power related decisions and activities to add impact, notably the adoption of their coal and renewable electric power utility policy, the integration of this policy in their mandates to investment managers and proxy voting policy, the engagement with targeted electric power utilities in their portfolios and requests to such companies, the filing or support of coal-related shareholder resolutions, and the exposure reduction/divestment if engagement is not deemed relevant or does not rapidly deliver.

By signalling (i.e. making public) key electric power sector decisions and activities, asset owners will amplify their impact. Given the climate urgency, the signalling effect is critical to raise the awareness of electric power utilities, relevant service providers (notably investment managers) and stakeholders (policy makers); to emphasise the importance of the issue; and to accelerate efforts of the parties mentioned above.[71]

Signalling is particularly critical for a meaningful engagement strategy: asset owners should become **forceful stewards**, using their full influence to make business part of the solutions to address climate-related risks; and this should include sending public signals to drive deeper and faster corporate change, and gather more investors to reach a critical mass.[72] It is extremely likely that bilateral engagement behind closed doors will not have enough impact to get electric power utilities shift their business model at the pace and scale required by the Paris Agreement.[73]

Similarly, public signalling is critical when reducing exposure/divesting, also in case engagement did not deliver: for very liquid asset classes – public equity and bonds – the rapid exchange of assets can quickly cancel out potential impact on electric power utilities, except through signalling or if a critical mass is reached.[74]

Public signalling is particularly important in cases where the engagement with a given electric power utility is difficult or not very likely to deliver (see Recommendation 6).

When asset owners publicly signal their coal related intentions/activities, they should always make clear that it is with the objective to align with the Paris Agreement and/or climate science, to adequately frame the issue.

TOOLBOX FOR RECOMMENDATION 9

WWF TOPLINE RECOMMENDATIONS OF THE CLIMATE GUIDE TO ASSET OWNERS	• 11. Closely monitor investment managers • 12. Closely monitor other service providers • 13. Engage forcefully with portfolio companies
MAIN REFERENCES	• WRI, UNEP-FI, 2° Investing Initiative (2015), Climate strategies and metrics: exploring options for institutional investors • Portfolio Decarbonisation Coalition (PDC), UNEP-Finance Initiative, CDP (2016), Investment portfolios in a carbon constrained world: the second annual progress report of the PDC

71 WRI, UNEP-FI, 2° Investing Initiative (2015), Climate strategies and metrics: exploring options for institutional investors.
72 Preventable Surprises (2017), Forceful Stewardship.
73 Some investors (e.g. Norwegian Sovereign Wealth Fund, KLP, Storebrand, etc.) have already been actively signalling the names of companies with which they engage, or from which they have divested – based on clear criteria of coal dependence and/or coal expansion.
74 WRI, UNEP-FI, 2° Investing Initiative - Portfolio Carbon Initiative (2015), Climate strategies and metrics: exploring options for institutional investors.

REMINDER: TOPLINE RECOMMENDATIONS FROM THE WWF CLIMATE GUIDE TO ASSET OWNERS

To avoid duplication, this Asset Owner Guide on Coal and Renewable Electric Power Utilities does not repeat the 15 Topline Recommendations of the WWF Climate Guide to Asset Owners that have a general nature. Instead, it focuses on specific coal and renewable power-related Recommendations. This part reminds the general Recommendations from the WWF Climate Guide to Asset Owners.

LEARNING AND SEEKING ADVICE

1. Assess the evidence of climate-related financial risks and opportunities p.7
2. ! Use tools to measure portfolio climate risks and portfolio alignment with climate goals p.8
3. Assess the regulatory and policy context and ensure TCFD-aligned reporting p.9

DECISION-MAKING

4. Adopt climate-related investment beliefs p.10
5. Establish a climate governance structure p.11
6. ! Integrate climate change in investment policy p.12
7. Adjust strategic asset allocation to harness climate-related opportunities p.13
8. Adopt sector-specific policies p.14
9. ! Develop tools and metrics to set climate science based targets p.15

MONITORING SERVICE PROVIDERS AND ENGAGING WITH KEY STAKEHOLDERS

10. Work collectively with other institutional investors p.16
11. ! Closely monitor investment managers p.17
12. Closely monitor other service providers p.18
13. ! Engage forcefully with portfolio companies p.19
14. ! Engage forcefully with policy makers p.21
15. Engage with members and beneficiaries p.22

! PRIORITY

ANNEX 1. COAL POWER DYNAMICS IN KEY GEOGRAPHIES

Global coal power capacity is quite concentrated. Figure 9 indicates that the 10 main countries host 86% of global operating and planned coal power capacity.

FIGURE 9 COAL POWER CAPACITY IN THE 10 MAIN COUNTRIES GLOBALLY (GW) (SOURCE: COALSWARM)[75]

PARENT COMPANY	PRE-CONSTRUCTION PIPELINE	UNDER CONSTRUCTION	OPERATING CAPACITY	TOTAL
China	134.5	145.6	921.2	1,201.3
India	128.7	48.2	211.6	388.5
United States	0.9	0.0	281.1	282.0
EU28	9.4	7.5	160.7	177.6
Indonesia	38.5	7.8	27.4	73.7
Japan	17.3	4.3	44.1	65.7
Russia	8.7	0.2	48.4	57.3
South Africa	6.3	7.9	40.5	54.7
Vietnam	29.6	15.2	13.4	58.2
South Korea	8.8	5.9	33.4	48.1
Total world	569.6	272.9	1,964.5	2,807

China

The CoalSwarm database found an extraordinary 85% fall in new coal plant permits in China between January 2016 and January 2017.[76] The Chinese government indicated that the share of coal in total power production fell from 63.7% to 62%, and coal consumption fell by 1.3% in 2016 while total energy consumption rose by 1.4%.[77] The Chinese government has set in place a framework to limit coal power development:

- The electricity chapter of the 13th Five Year Plan sets out an objective to decrease the coal share in total energy generation to 55% by 2020. It also contains a coal capacity cap of 1100GW, aimed at curtailing a growing overcapacity crisis that has caused the load factor of coal plants to fall to 47,5%.
- In order to implement the objectives of the Five Year Plan, the National Energy Administration announced the suspension of 120 gigawatts of coal plants in 2017.
- This is not over: in October 2017, China announced it was stopping or postponing work on 151 coal plants that were either under, or earmarked for, construction.[78]

However, analysis by Carbon Tracker Initiative indicates that such forceful government policies are not sufficient: they would still allow for the construction of new coal plants, while existing capacity fulfils power generation requirements until 2050. There is consequently a **risk of up to $500 billion in wasted investments**.[79] In addition, China's power companies make up nearly half of the new coal generation expected to go online in the next decade, raising again investment risks.[80]

75 Coalswarm (2017), Boom and Bust.
76 Coalswarm (2017), Global Coal Plant Tracker.
77 Chinese government's Statistical Communique on Economic and Social Development.
78 Greenpeace (2017), China halts 150 coal fired power plants.
79 Carbon Tracker Initiative (2017), Chasing the Dragon ? China's coal overcapacity crisis and what it means for investors.
80 Urgewald (2017), Global Coal Exit List.

India

In India, investments in coal power have plummeted in 2016: the Ministry of Power has stated that the country has enough capacity to meet demand through 2019, and no coal power capacity beyond what is currently under construction will be needed until at least 2027. The government has objectives to install 215GW of renewable capacity by 2027, and more than half of India's power sector spending went towards renewables and power networks.[81] 4GW of solar-powered capacity was added to the grid in 2016: that is double the addition of the previous year.[82]

Indian energy demand growth has slowed down as well. In addition, India is now actively decommissioning old coal plants: coal plants closed or declared non-functional due to their inefficiency and pollution amounted to 30GW in 2016–2017.[83] There are plans to shut down about 37GW of antiquated, heavily polluting subcritical coal plants in the near future.[84]

Coal use in India is subject to a form of carbon tax. Total collections of around $9 billion until June 2017 are mainly used to support renewable energy programmes.[85]

United States

Data from the US Energy Information Administration indicate that net electricity production from coal declined by 38% between 2005 and 2016. The share of coal power in total power generation fell from 50% in 2005 to 30% in 2016. **Since 2010, half the nation's coal plants have been closed**.[86] The CoalSwarm website lists every single US coal plant retirement.[87]

Analysis indicates that White House efforts to weaken environmental legislation will not change the structural coal decline that is driven essentially by the market:

- The Columbia Center on Global Energy Policy concludes that increased competition from cheap natural gas, lower-than-expected demand and the growth in renewable energy are responsible for 93% of coal power decline, squeezing profit margins of the electric power utilities running coal plants.[88] This is confirmed by Wood Mackenzie.[89]
- Bloomberg New Energy Finance estimates power sector emissions in 2030 to be 30% below 2005 level, even in absence of federal policy. Gas power will drive coal displacement, but by 2030 onshore wind and solar power will be competitive even with new-build gas plants.[90]
- Despite Trump's grand promises about reviving the coal industry, there are no new coal plants under construction in the US, and the current fleet is old and nearing the end of its lifetime.

81 International Energy Agency (2017), World Energy Investment 2017. CoalSwarm e.a. (2017), Boom and Bust 2017: tracking the global coal plant pipeline.
82 IEA (2017), Energy Technology Perspectives.
83 Ministry of Power, Government of India. LOK SABHA starred question n°164 answered on 28.07.2016.
84 Singh, R. K., (2016), India Seeks to Shut 12% of Power Capacity in Anti-Pollution Move. *Live Mint*, May 8.
85 UNEP, Emission Gap Report 2017.
86 The Guardian, Michael Bloomberg's 'war on coal' goes global with $50m fund, 9 November 2017.
87 CoalSwarm (2017), U.S. Coal Plant Retirements.
88 Columbia Center on Global Energy Policy (2017), Can coal make a comeback?
89 Wood Mackenzie (2017), Taking a closer look at Trump's blueprint for US energy.
90 Bloomberg New Energy Finance (2017), New Energy Outlook.

European Union

The share of coal power in EU power generation fell from 39% in 1990 to 24% in 2015.[91] Coal burning however still accounts for about 20% of total EU emissions, with Germany and Poland the biggest polluters. Coal is declining very rapidly in some countries: until recently UK was Europe's third biggest coal polluter and coal provided 40% of the nation's electricity in 2011; the figure fell to 2% in the first six months of 2017.[92]

Europe's twenty largest electric power utilities have lost half of their market value over the period 2008-2015, highlighting the need to adapt their conventional generation based business model to the rapidly changing European electric power market.[93]

Most Western European countries have either already phased out coal (Belgium, Baltic countries), agreed on a phase-out path (UK by 2025, France by 2022, Italy by 2025, Netherlands by 2030, Portugal by 2030, Finland by 2030, Austria by 2020), or are currently discussing mid-term pathways with declining coal demand (Germany, Spain).[94]

The case of Netherlands is striking: in October 2017, the new government committed to close all coal plants by 2030, including three that were only completed in 2015.[95] The electric power utilities affected (Engie, RWE and Uniper) will not make money on the investments in question and suffer massive write-downs. The impairments reflect the impact of massive growth in renewable power in neighbouring Germany, which has depressed wholesale power prices, and the electric power utilities having failed to foresee falling electricity demand. For the Institute for Energy Economics and Financial Analysis, the decision 'sent a dramatic signal to electricity markets today that no investment in coal power in Europe is safe'.[96]

Recent or forthcoming EU policies will contribute to reducing viability of coal power even further:

- Newly adopted air quality regulations (LCP BREF) will impose stricter limits on toxic pollutants from all 2,900 Large Combustion Plants in the EU as from 2021.[97] EU-wide compliance with the new standards could cost up to €15.4 billion, and 82% of coal capacity expected to be online in 2021 is currently failing to meet the minimum standards.[98]
- Currently negotiated regulations for the EU 2030 climate and energy targets include proposals to reform Member States' capacity mechanisms and several funds, which offer retrofit subsidies or payments to power plants to generate power during periods of heavy demand. If adopted, coal power generation could over time be excluded from such mechanisms.

91 The Economist Intelligence Unit (2017), The role of coal in Europe's power mix.
92 The Guardian, The coal truth: how a major energy source lost its power in Britain, 19 July 2017.
93 Carney Mark (2016), Resolving the climate paradox, Speech at the Arthur Burns Memorial Lecture, Berlin.
94 The Economist Intelligence Unit (2017), The role of coal in Europe's power mix; Graichen, P., Kleiner, M., Buck, M. (2016), Energy Transition in the Power Sector in Europe: State of Affairs in 2015.
95 Climate Change News, Netherlands to end coal power by 2030, closing down new plants, 11 October 2017.
96 IEEFA (2017), IEEFA Update: Netherlands, in New Program to Close All Coal Generation by 2030, Sends European Energy Markets a Sharp Signal.
97 Sulphur dioxide, nitrogen oxides, particulate matters.
98 DNV-GL (2016), Fact-based scenario to meet commitments under the LCP BREF.

- The next EU ETS trading period (2021-2030) also allows for cancellation of emissions allowances and thereby potentially preventing the so called 'waterbed effect', which will otherwise increase the EU ETS oversupply. In addition to the establishment of an EU-wide cancellation mechanism, Member states may unilaterally cancel allowances to counteract the impact of closing down electricity generation due to national measures, aimed at the various coal phase out plans – up to the average verified emissions over the last five years upon preceding the closure.

While these developments appear quite rapidly and tend to accelerate, it should be noted that they are still too slow to be on track with a well below 2°C pathway. While global CO_2 emissions appeared to have hit a plateau over the last three years, first estimates indicate that global CO_2 emissions have increased again in 2017.[99]

In the EU, under a 1.5°C scenario 11.3 GW of coal power capacity should be closed annually until 2030 – while the average annual capacity shut down/fuel switch in 2005-2017 reached 4.3 GW only. The closure rate has increased over the last few years, however, with an average 7.1 GW a year shut down in 2016-2017.[100]

99 Carbon Brief (2017), Analysis: Global CO_2 emissions set to rise 2% in 2017 after three-year 'plateau'.
100 Europe Beyond Coal Database, version of 1 November 2017.

ANNEX 2.

ASSET OWNER'S TEMPLATE COAL AND RENEWABLE ELECTRIC POWER UTILITY POLICY

In the Paris Climate Change Agreement, 195 countries committed to 'hold the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C'. This has various repercussions:

- According to latest climate science, limiting warming to 2°C by 2100 means that the net emissions of greenhouse gases need to be reduced by 40-70% by the time we reach 2050, and brought to zero by the end of the century. Respecting the more stringent limit of 1.5°C will require reducing emissions of greenhouse gases even more rapidly in the coming years and decades, and bring them to zero around mid-century.
- Coal is the most carbon-intensive fossil fuel, responsible for about 46% of global carbon emissions from fossil fuels. While immediate action across all sectors is required to decarbonise the economy, it is particularly important to replace coal power by sustainable renewable power, and enhance energy demand reduction through energy efficiency measures.

[Asset owner] believes that we are moving irreversibly towards a low carbon economy. Aligning electric power sector investments with the objectives set in the Paris Agreement will ensure addressing climate-related physical and transition risks, as well as harnessing climate-related opportunities.

This policy focuses on coal and renewable power as they present the most visible and urgent climate-related risks and opportunities. [Asset owner] will request electric power utilities – in priority those owning coal assets – to rapidly align their business model with the Paris Agreement.

Definition of electric power utilities

Categorisation of companies differs, for example in the Industry Classification Benchmark (ICB) and in the Global Industry Classification Standard (GICS), differs. Here, electric power utilities are identified as companies whose main business model is to produce or distribute electricity – including multi-utilities that have significant electricity production and independent power producers. Coal power is defined as electric power generated by coal plants. Renewable power is electric power generated by wind, solar, hydro, biomass, etc.

Criteria to define an approach for electric power utilities

[Asset owner] will address all electric power utilities across its entire investment portfolio, and screen each electric power utilities according to three criteria:

- Coal plant expansion plans: electric power utilities that have capital expenditure in their books for new coal plants and/or the purchase or the refurbishment of existing coal plants face growing risks of stranded assets in a context of stricter carbon regulations following the Paris Agreement.
- Business model's dependency on coal: the share of coal in the electric power utility's total annual power production will be used as a metric for the degree to which an electric power utility is entrenched in coal. Alternatively, the coal share in the utility fleet's total capacity will be used.

- Business model's exposure to renewables: on the opportunity side, the same criteria will be applied – capital expenditure for renewables and related sectors/assets that will benefit from to the low-carbon transition (including smart grids, electricity storage, demand response) and share of power production/capacity from those sectors.

On the basis of above-mentioned screening, [asset owner] will identify an approach for electric power utilities:

- Engage with electric power utilities with low coal dependency and no or limited coal expansion plans, as these are well placed to adapt to the low-carbon transition.
- Divest from electric power utilities with both high dependency on coal and large coal expansion plans, as they are in no position to shift their business model within the necessary timeframe. This implies that we will sell our equity and bonds in the company, and no longer purchase equity and bond until further notice.
- Undertake an in-depth assessment of electric power utilities with significant coal dependency and limited coal expansion plans, and electric power utilities with limited coal dependency and large coal expansion plans. Engagement with these companies will be made strictly conditional on the positive outcome of the assessment – i.e. if the company shows a tangible change of course by cancelling coal expansion plans, planning the closure of existing coal plants, and developing capital expenditure plans for renewables (renewable energy screen). If the assessment is negative or the engagement unsuccessful, we will divest from the electric power utility.

Requests and criteria for forceful engagement with electric power utility companies

[Asset owner] commits to prioritise sustained and meaningful engagement with the selected companies. Such engagement is critical to ensure a meaningful low-carbon transition within the relevant timeframe, and thus maintain or enhance shareholder value while complying with well below 2°C pathways.

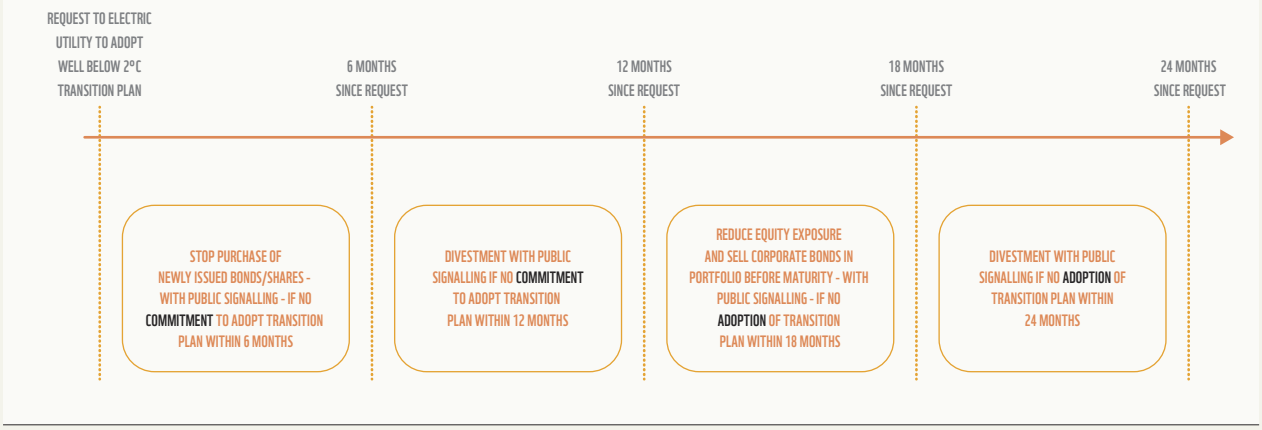
[Asset owner] will request the electric power utility to adopt and publish a time-bound well below 2°C transition plans composed of the six following elements:

- **Long term goal:** a commitment to align business models with the Paris Agreement and, more concretely, a time-bound climate science-based target built on forward looking climate-scenario analysis.
- **'No new coal' commitment:** an immediate end to capital expenditure for new coal plants and/or the purchase or the retrofitting of existing coal plants.
- **Coal exit strategy:** a clearly articulated roadmap for the gradual closure of existing coal plants, ending at the latest in 2030 in EU/OECD and in 2050 globally.
- **TCFD-aligned disclosure:** the disclosure of the target and transition plan and alignment with the TCFD recommendations. Such information should be published in mainstream financial reports (integrated reporting).
- **Regular review:** a commitment to review and ratchet up targets and transition plans in the light of evolving climate science, in particular the development of 1.5°C scenarios driven by the Paris Agreement.
- **No counterproductive lobbying:** a public commitment to not oppose policies that aim to reduce emissions in line with the Paris Agreement, be transparent about lobbying activities and related expenditures, and leave third party organisations (e.g. business and trade associations) that promote policies that risk to derail the Paris Agreement.

In addition to the requests for a well below 2°C transition plan, [asset owner] will increase the effectiveness of its engagement in four ways:

- Ensure tight implementation of the coal and renewable electric power utility policy by investment managers and other service providers, and update the proxy voting policy accordingly.
- Make the engagement time-bound and gradually decrease exposure to the electric power utility if the engagement does not bear fruit (see Figure below).
- Undertake collective action through investor coalitions, in order to reach the critical mass to generate a change of course from the electric power utility.
- Publicly signal electric power related decisions and activities. This notably includes the publication of this policy, the integration of the policy in mandates to investment managers and proxy voting policy, the engagement with targeted electric power utilities in the portfolio and requests to such companies, the filing or support of coal-related shareholder resolutions, and the exposure reduction/divestment if engagement is not deemed relevant or does not deliver within set timeframes.

ROADMAP FOR EXPOSURE MANAGEMENT IN CASE OF UNSUCCESSFUL ENGAGEMENT



ANNEX 3. SUSTAINABILITY REQUIREMENTS FOR HYDROPOWER AND BIOMASS POWER

Hydropower

Negative impacts of hydropower are well documented.[101] The World Commission on Dams, one of the most comprehensive evaluation of large dams, concluded that while 'dams have made an important and significant contribution to human development,' in 'too many cases an unacceptable and often unnecessary price has been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities downstream, by taxpayers and by the natural environment'. Nearly 60,000 large dams globally have caused considerable environmental and social damage and freshwater ecosystems are showing devastating declines in biodiversity that cannot be reduced by mitigation measures.[102] WWF has exposed the main seven flaws of dam building.[103]

WWF has decades of experience on freshwater ecosystems, dams and hydropower; and has developed several tools – amongst which an Investor Guide to Dams.[104] The WWF body of work recommends the following approach:

- **Full consideration of sustainable alternatives (wind, solar, power grids, demand reduction, etc.) before decisions are made to build new hydropower infrastructure.**[105] Emphasis should be given to strategic system-scale planning (i.e. looking at power demand and possible power sources at systemic level) and the identification of areas where hydropower development cannot be permitted due to its impacts.
- **No hydropower infrastructure to be built in, or affecting, high conservation value areas as an absolute minimum.** Such areas should be identified at the basin scale level and include river stretches that are important for connectivity and species representation. WWF has developed the SIGHT tool: this is an online mapping platform that integrates key development (e.g. infrastructure) and environmental datasets, and that can serve to assist in strategic planning for hydropower.[106]
- **The application of principles, tools and inclusive/transparent processes in order to make the best possible choices regarding the management of existing hydropower infrastructure and development of new hydropower infrastructure where justified:**
  - Improvement of strategic decision making processes on hydropower planning (i.e. location and associated infrastructure), which can only be considered if the strategic system-scale planning (see above) has offered no alternative options. Decision making processes on hydropower infrastructure should consider the full array of available options (including alternative sustainable renewable sources); be responsible, accountable and follow principles of good governance; follow a precautionary approach; be based on sound strategic environmental and social assessments; and include assessments of important environmental assets.
  - Improvement of planning, finance, building and operations of individual projects and developments. Individual projects and developments should follow the mitigation hierarchy for dealing with impacts and risks at basin level; be assessed on a cumulative impact scale with other existing and

101 World Commission on Dams (2000), Dams and Development: A New Framework for Decision-Making.
102 WWF (2016), Living Planet Report.
103 WWF (2013), Seven sins of dam building.
104 WWF (2003), An Investor's Guide to Dams. WWF (2014), Dams position.
105 Within the EU, in general WWF does not welcome new hydropower infrastructure as there are renewable power alternatives with lower negative ecosystem impacts.
106 http://wwf-sight.org/.

proposed developments; be scrutinized against a long-term horizon; prioritize environmental flows and biodiversity considerations; and be managed for continuous improvement.

WWF supports concrete tools like water stewardship approaches and standards[107] and water risks assessments.[108]

Bioenergy

Bioenergy – biomass used for producing energy – has been the subject of fierce debate for over a decade, with much of the controversy stemming from a failure to distinguish between whether something is sustainable in an ecological or commercial sense and whether it is low carbon (i.e. delivers greenhouse gas (GHG) savings over the short to medium term, in pursuit of the 1.5°C goal). The below provides an overview of sustainability considerations regarding biomass for electric power. It does not cover other sectors – most notably biofuels for transport. WWF does provide recommendations on this in a bioenergy specific EU position paper.[109]

A recent WWF briefing paper reviews main recent scientific evidence on GHG emissions associated with bioenergy.[110] Some types of bioenergy, for example those produced from agricultural wastes and residues, municipal organic waste, industry residues (e.g. from saw mills and paper mills) and smaller forest harvest residues such as tops and branches, can be significantly lower carbon than fossil fuels, *provided the feedstocks have no other use* – meaning that they are exploited in line with the EU waste hierarchy and the principle of cascading use. However bioenergy from purpose grown agricultural crops, stemwood (i.e. tree trunks) and coarse forest harvest residues such as stumps is unlikely to be 'lower carbon' than conventional fossil fuels in the sense described above and in many cases will be counterproductive in climate terms.

WWF believes that support for bioenergy globally should depend on **GHG emission criteria based on a comprehensive lifecycle assessment** that includes all relevant factors and involves a climate-relevant timeframe (the next 10-20 years).[112] In the absence of such an approach, within the EU at least, those types of bioenergy unlikely in most circumstances to comply with such emission requirements should not be incentivised. Within the EU this means:

- No support for the use of stemwood and stumps for bioenergy. Less coarse harvest residues such as tops and branches should remain eligible for support but only if used in installations employing high efficiency cogeneration (i.e. combined heat and power);
- Ensuring that wastes and residues only benefit from support if they have no significant alternative uses, whether for food, animal feed or bio-based materials (the cascading use principle);
- In addition to the above, strict efficiency requirements should be required to all users of biomass fuels over 1 megawatt in size.

107 For example Alliance for Water Stewardship Standard.
108 WWF developed the Water Risk Filter that can help both companies and investors to assess water-related risks.
109 WWF (2017), EU bioenergy policy.
110 Ibid.
111 The Guardian, EU must not burn the world's forests for 'renewable' energy (15 December 2017).
112 Including combustion emissions, changes in above and below ground carbon stocks, forgone sequestration, emissions from indirect land use change, methane emissions from stored wood fuel and emissions resulting from any displacement effects. LULUCF accounting, at least as foreseen in the EU, is inadequate, for reasons explained in the WWF briefing paper.

ANNEX 4.

THE 'GLOBAL COAL EXIT LIST' DATABASE

The 'Global Coal Exit List' (GCEL) is the world's largest coal company database, identifying almost 2000 companies - **775 parent companies** and 1178 subsidiaries or joint ventures. The database is open-source, free and can be consulted on https://coalexit.org/. It has been developed by Urgewald with the support of WWF European Policy Office, CoalSwarm and other organisations.[113]

The GCEL includes three categories of coal companies: miners, utilities and service companies (i.e. companies that provide various services throughout the coal value chain like dedicated trade, infrastructure, port terminals, finance, etc).[114] It provides data, key statistics and identifiers (ISIN codes, if available) for each company.

The GCEL includes all companies that qualify for one or more of the **3 following criteria**: companies that have a coal share of revenue/power generation above 30%; companies that produce over 20 million tons of coal annually; and companies that operate more than 10 gigawatt of coal capacity.[115] As a result, the companies listed in the GCEL represent over 88% of world coal production and 86% of the world's coal capacity.

In addition, the GCEL is forward-looking: it identifies 225 companies that are planning to expand coal mining and 282 companies that are planning new coal plants.

The GCEL also contains three priority sub-lists: the world's 120 largest coal utilities (see **table 1** below), 120 largest coal plant developers (see **table 2** below), and 120 largest coal miners.[116]

The database will be updated regularly and specifically at least once a year for coal plant developers, given the rapid developments in this field.

TABLE 1 THE 120 LARGEST UTILITIES IN TERMS OF INSTALLED COAL POWER CAPACITY[117]

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
China Huaneng Group	Private	China	117,873	71%
China Guodian Corporation	Private	China	100,029	77%
China Datang Corporation	Private	China	90,728	69%
China Huadian Corporation	Private	China	84,790	63%
State Power Investment Corporation (SPIC)	Private	China	64,440	60%
Shenhua Group Corp Ltd	Private	China	61,270	90%
NTPC Limited	INE733E01010	India	44,004	94%
Eskom Holdings SOC Ltd	Private	South Africa	38,548	91%
China Resources Power Holdings Co Ltd	HK0836012952	China	29,746	86%
Korea Electric Power Corporation (KEPCO)	KR7015760002	South Korea	27,327	39%

113 The Global Coal Exit List primary source is the CoalSwarm Global Coal Plant Tracker database that provides information on all existing coal plants of 30 MW or larger globally, as well as every plant proposed since January 1, 2010.
114 Out of the 775 companies 218 mine coal, 214 operate coal plants, 110 operate both coal mines and coal plants, and the remaining 233 provide services.
115 20 million tons is the entire annual coal consumption of a country like Italy.
116 Employing a larger threshold (3 gigawatt of installed capacity) and geographical filters.
117 Urgewald (2017), Global Coal Exit List.

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
Guangdong Yudean Group Co Ltd	Private	China	24,141	83%
Shaanxi Coal and Chemical Industry Group Co Ltd	Private	China	23,840	100%
Zhejiang Provincial Energy Group Co Ltd	Private	China	23,010	84%
RWE AG	DE0007037129	Germany	20,163	54%
Southern Company	US8425871071	USA	19,141	31%
Duke Energy Corporation	US26441C2044	USA	17,958	35%
DTEK BV Group		Ukraine	17,523	98%
Enel SpA	IT0003128367	Italy	16,103	28%
Datong Coal Mine Group Co Ltd	Private	China	15,460	96%
PT PLN (Persero)	Private	Indonesia	14,996	68%
Shandong Weiqiao Pioneering Group Co Ltd		China	14,380	100%
American Electric Power Co Inc (AEP)	US0255371017	USA	14,318	61%
NRG Energy Inc	US6293775085	USA	13,184	46%
Hebei Construction & Investment Group Co Ltd	Private	China	13,100	36%
PPL Corporation	US69351T1060	USA	11,682	81%
CLP Holdings Ltd	HK0002007356	China (Hong Kong)	11,397	61%
Dynegy Inc	US26817R1086	USA	11,200	48%
Huainan Mining Industry Group	Private	China	11,197	100%
Formosa Plastics Group		China (Taiwan)	10,611	
Électricité de France SA (EDF Group)	FR0010242511	France	10,600	<4%
Adani Group		India	10,440	
SDIC (State Development and Investment Corporation)	Private	China	10,416	94%
Tennessee Valley Authority	Private	USA	10,285	34%
PGE SA (Polska Grupa Energetyczna SA)	PLPGER000010	Poland	9,651	91%
Berkshire Hathaway Energy	Private	USA	9,480	46%
J-POWER (Electric Power Development Co., Ltd.)	JP3551200003	Japan	9,400	37%
FirstEnergy Corp	US3379321074	USA	9,249	56%
Uniper SE	DE000UNSE018	Germany	9,132	32%
AES Corporation	US00130H1059	USA	9,056	34%
Jiangsu Guoxin Investment Group Ltd	Private	China	9,032	82%
XCEL Energy Inc	US98389B1008	USA	8,487	35%
Beijing Energy Investment Holding	Private	China	8,360	55%
Maharashtra State Power Generation Co (MAHAGENCO)	Private	India	8,220	70%
Vistra Energy Corp (former Energy Future Holdings)	US92840M1027	USA	8,017	56%
Inter RAO UES	RU000A0JPNM1	Russia	7,960	13%
Energetický a průmyslový holding, a.s. (EPH)		Czech Republic	7,783	59%
Engie SA	FR0010208488	France	7,645	17%
Damodar Valley Corporation (DVC)	Private	India	7,638	99%
Taiwan Power Company (TAIPOWER)	TW0009963009	China (Taiwan)	7,600	38%
Shanxi International Energy Group		China	7,390	96%
Henan Investment Group	Private	China	7,183	100%

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
Talen Energy	US87422J1051	USA	6,624	37%
CEZ Group	CZ0005112300	Czech Republic	6,462	47%
Tata Power Co Ltd	INE245A01021	India	6,422	79%
DTE Energy Co.	US2333311072	USA	6,259	54%
Vietnam Electricity Corporation (EVN)	Private	Vietnam	6,119	30%
Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd (UPRVUNL)	Private	India	5,938	100%
Reliance Power Ltd	INE614G01033	India	5,760	99%
RusHydro	RU000A0JPKH7	Russia	5,607	15%
Anhui Province Energy Group Co Ltd (Wenergy Group)		China	5,550	100%
Jiuquan Iron & Steel (Group) Co Ltd	Private	China	5,500	100%
STEAG GmbH		Germany	5,437	60%
Tamil Nadu Generation and Distribution Corp Ltd (TANGEDCO)	INE340M08038	India	5,270	35%
AGL Energy Ltd	AU000000AGL7	Australia	5,194	85%
Rajasthan Rajya Vidyut Utpadan Nigam Limited	Private	India	5,190	87%
Ameren Corporation	US0236081024	USA	5,109	71%
WEC Energy Group Inc	US92939U1060	USA	5,044	53%
TransAlta Corporation	CA89346D1078	Canada	4,931	74%
Israel Electric Corporation Ltd		Israel	4,840	58%
EnBW Energie Baden-Württemberg AG	DE0005220008	Germany	4,831	35%
Tenaga Nasional Berhad (TNB)	MYL5347OO009	Malaysia	4,780	51%
Enea SA	PLENEA000013	Poland	4,652	94%
TAURON Polska Energia S.A	PLTAURN00011	Poland	4,506	>90%
Andhra Pradesh Power Generation Corporation (APGENCO)	Private	India	4,440	62%
Posco Energy Co Ltd	US6934831099 KR7005490008	South Korea	4,409	8%
Public Power Corporation SA (PPC)	GRS434003000	Greece	4,337	57%
Aluminum Corporation of China (CHALCO)	SHA: 601600	China	4,301	87%
Elektroprivreda Srbije (EPS)	Private	Serbia	4,296	70%
Sembcorp Industries Ltd	SG1R50925390	Singapore	4,260	39%
Sumitomo Corporation	JP3404600003	Japan	4,248	<30%
NLC India Ltd (former Neyveli Lignite Corp Ltd)	INE589A01014	India	4,240	99%
Gujarat State Electricity Corp Ltd (GSECL)	Private	India	4,220	72%
Chubu Electric Power	JP3526600006	Japan	4,133	24%
Madhya Pradesh Power Generating Co. Ltd. (MPPGCL)	Private	India	4,080	81,60%
CITIC Group Corp	Private	China	4,070	>30%
Samruk Energy JSC	Private	Kazakhstan	4,030	>58%
West Bengal Power Development Corporation Limited (WBPDCL)	Private	India	3,860	100%

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
Heilongjiang Longmay Mining Holding Group Co Ltd		China	3,750	97%
Inner Mongolia Energy Generation & Investment Group		China	3,680	96%
Basin Electric Power Coop	Private	USA	3,661	50%
Xinjiang Nongliushi Coal Electricity Co Ltd		China	3,640	100%
Xinjiang Production and Construction Corps (XPCC)	Private	China	3,570	
Santee Cooper	Private	USA	3,500	60%
Great Plains Energy Inc	US3911641005	USA	3,474	79%
Shanxi Coking Coal Group Co Ltd	Private	China	3,468	94%
Guangzhou Development Group Co Ltd (GDG)		China	3,403	84%
Jindal Steel & Power Ltd	INE749A01030	India	3,400	67%
Guangxi Investment Group Co Ltd	Private	China	3,380	88%
Jinneng Group Co Ltd	Private	China	3,303	70%
Stanwell Corporation Limited	Private	Australia	3,303	80%
Alliant Energy Corp.	US0188021085	USA	3,285	67%
Jaiprakash Associates Ltd. (Jaypee Group)	INE455F01025	India	3,273	
Complexul Energetic Oltenia S.A	Private	Romania	3,240	99%
Tohoku Electric Power Co Inc	JP3605400005	Japan	3,200	40%
Tokyo Electric Power Co Inc (TEPCO)	JP3585800000	Japan	3,200	6%
Vedanta Resouces		UK	3,180	96%
Haryana Power Generation Corporation Ltd (HPGCL)	Private	India	3,168	98%
Elektrik Üretim A.Ş. Genel Müdürlüğü (EÜAŞ)	niBB	Turkey	3,159	12%
JSW Energy Ltd	INE121E01018	India	3,140	69%
Malakoff Corporation Berhad	MYL5264OO006	Malaysia	3,100	>38%
Inner Mongolia Erdos Investment Holding Group Co Ltd / Ordos Share Holding Group		China	3,020	>30%
Reliance Infrastructure Ltd	INE036A01016	India	2,988	99%
CGN New Energy Holdings Co Ltd		China	2,962	59%
Essar Energy Ltd	Private	Mauritius	2,910	55%
Hokuriku Electric Power Company	JP3845400005	Japan	2,900	64%
Telangana State Power Generation Corp (TSGENCO)		India	2,882	52%
Origin Energy Limited	AU000000ORG5	Australia	2,880	67%
Eren Holding		Turkey	2,790	96%
Energoinvest Holding		Ukraine	2,772	55%
Karnataka Power Corporation Limited (KPCL)	Private	India	2,720	42%

TABLE 2 THE 120 LARGEST COAL PLANT DEVELOPERS IN TERMS OF COAL EXPANSION PLANS (GEOGRAPHICALLY WEIGHTED)[118]

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
NTPC Limited	INE733E01010	India	44,945	94%
State Power Investment Corporation (SPIC)	Private	China	36,040	60%
China Datang Corporation	Private	China	30,790	69%
Shenhua Group Corp Ltd	Private	China	29,924	90%
China Huadian Corporation	Private	China	27,550	63%
China Huaneng Group	Private	China	24,450	71%
China Guodian Corporation	Private	China	19,570	77%
Power Finance Corporation Ltd.	INE134E01011	India	16,000	0%
Power Construction Corp of China / PowerChina	CNE1000017G1	China	15,598	<13%
Korea Electric Power Corporation (KEPCO)	KR7015760002	South Korea	14,327	39%
Marubeni Corporation	JP3877600001	Japan	13,620	11%
China Resources Power Holdings Co Ltd	HK0836012952	China	13340	86%
ACWA Power	OM0000003141	Saudi Arabia	12,700	0%
Shannxi Energy Group Co Ltd (Shaanxi Provincial Investment Group)	Private	China	12,000	80%
PT PLN (Persero)	Private	Indonesia	11,780	68%
Shaanxi Coal and Chemical Industry Group Co Ltd	Private	China	10,620	100%
Andhra Pradesh Power Generation Corporation (APGENCO)	Private	India	10,200	62%
Electricity Generating Authority of Thailand (EGAT)	Private	Thailand	10,050	8%
Eskom Holdings SOC Ltd	Private	South Africa	9,440	91%
Vietnam Electricity Corporation (EVN)	Private	Vietnam	9,262	30%
SGCC (State Grid Corporation of China)	Private	China	9,050	>50%
Shandong Weiqiao Pioneering Group Co Ltd		China	8,720	100%
SDIC (State Development and Investment Corporation)	Private	China	8,700	94%
Inter RAO UES	RU000A0JPNM1	Russia	8,500	13%
Tamil Nadu Generation and Distribution Corp Ltd (TANGEDCO)	INE340M08038	India	8,340	35%
Bihar State Power Holding Co Ltd (BSPHCL)	Private	India	7,995	92%
Shanghai Electric Group Corp	CNE100000D55	China	7,930	0%
NLC India Ltd (former Neyveli Lignite Corp Ltd)	INE589A01014	India	7,800	99%
Adani Group		India	6,940	
Bangladesh Power Development Board	Private	Bangladesh	6,875	2%
Shanxi International Energy Group		China	6,000	96%
CLP Holdings Ltd	HK0002007356	China (Hong Kong)	6,000	61%
Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd (UPRVUNL)	Private	India	5,940	100%

118 Urgewald (2017), Global Coal Exit List.

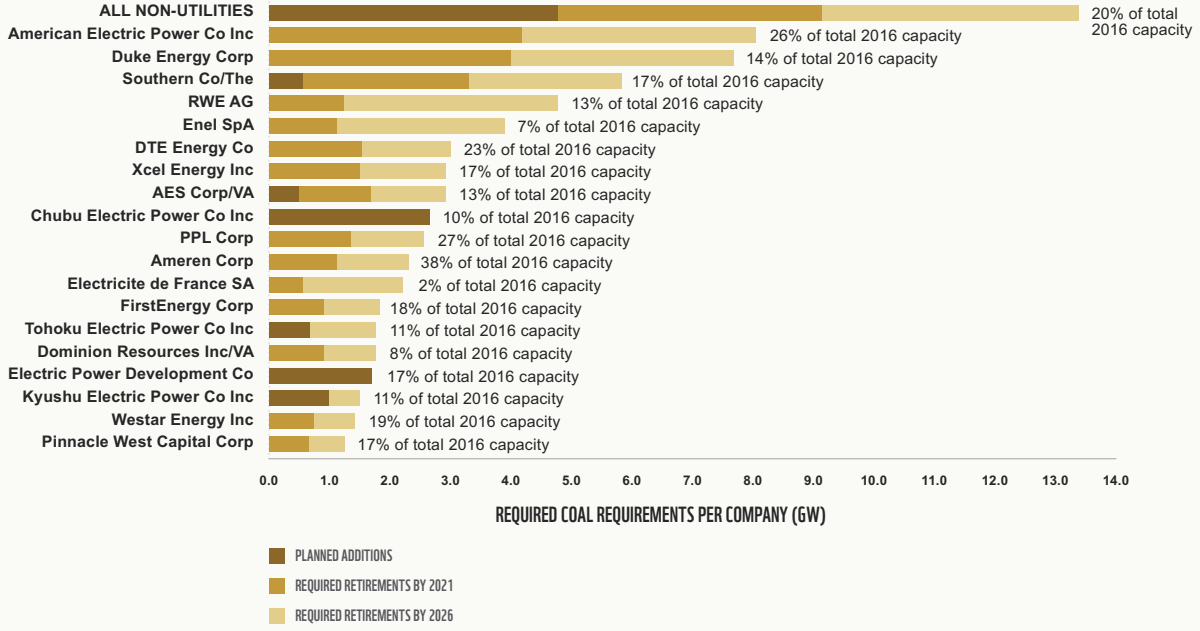
PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
Elektrik Üretim A.Ş. Genel Müdürlüğü (EÜAŞ)	niBB	Turkey	5,800	12%
Shaanxi Yulin Energy Group Co Ltd		China	5,400	100%
PGE SA (Polska Grupa Energetyczna SA)	PLPGER000010	Poland	5,260	91%
Chongqing Energy Investment Group	Private	China	5,220	58%
Tenaga Nasional Berhad (TNB)	MYL5347OO009	Malaysia	4,920	51%
Vietnam National Coal Mineral Industries Holding Corporation Limited (Vinacomin)	VN000000KSV1	Vietnam	4,910	NA
Taiwan Power Company (TAIPOWER)	TW0009963009	China (Taiwan)	4,800	38%
Telangana State Power Generation Corp (TSGENCO)		India	4,800	52%
Daewoo Engineering and Construction (E&C)	KR7047040001	South Korea	4,620	0%
J-POWER (Electric Power Development Co., Ltd.)	JP3551200003	Japan	4,550	37%
Tokyo Electric Power Co Inc (TEPCO)	JP3585800000	Japan	4,450	6%
Anhui Province Energy Group Co Ltd (Wenergy Group)		China	4,340	100%
Chugoku Electric Power Company, inc.	JP3522200009	Japan	4,224	36%
JSW Energy Ltd	INE121E01018	India	4,140	69%
Jinneng Group Co Ltd	Private	China	4,120	70%
Dongfang Electric Corporation	CNE100000304	China	4,110	0%
Posco Energy Co Ltd	US6934831099 KR7005490008	South Korea	4,050	8%
Chubu Electric Power	JP3526600006	Japan	4,020	24%
IL&FS Energy Development Company Limited (IEDCL)		India	3,960	NA
Rajasthan Rajya Vidyut Utpadan Nigam Limited	Private	India	3,960	87%
Orascom Construction	EGS95001C011	United Arab Emirates	3,960	0%
Harbin Electric Corp		China	3,950	0%
Odisha Power Generation Corp (OPGC)	Private	India	3,720	99%
Vietnam Oil and Gas Group (PetroVietnam)	Private	Vietnam	3,600	31%
Maharashtra State Power Generation Co (MAHAGENCO)	Private	India	3,550	70%
Kansai Electric Power Co (KEPCO)	JP3228600007	Japan	3,522	25%
Hattat Holding	Private	Turkey	3,500	0%
Beijing Energy Investment Holding	Private	China	3,420	55%
Tata Power Co Ltd	INE245A01021	India	3,320	79%
China Energy Engineering Corporation	CNE1000023C8	China	3,310	0%
PT Bukit Asam	ID1000094006	Indonesia	3,220	NA
Manila Electric Co (MERALCO)	PHY5764J1483	Philippines	2,955	NA
Yildirim Energy Holding Inc		Turkey	2840	0%
24 Hour Company Limited		Myanmar	2,800	0%
Riozim	ZW0009011959	Zimbabwe	2,800	0%
PT Adaro Energy Tbk	ID1000111305	Indonesia	2,700	NA
Aboitiz Power Corporation	PHY0005M1090	Philippines	2,696	52%

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
Al Nowais Investments LLC		United Arab Emirates	2,640	0%
Lanco Infratech Limited (Lanco Group)	INE785C01048	India	2,640	81%
Essar Energy Ltd	Private	Mauritius	2,580	55%
Jindal Steel & Power Ltd	INE749A01030	India	2,570	67%
PER Lusulu Power		Zimbabwe	2,100	0%
Enea SA	PLENEA000013	Poland	2,075	94%
African Energy Resources	AU000000AFR6	Guernsey	2,050	0%
Toyo Ink Group	MYL7173OO007	Malaysia	2,000	0%
LYP Group		Cambodia	2,000	0%
Bhimasena Power Indo (BPI) (joint venture)	Private	Indonesia	1,900	0%
Ayala Corporation	PHY0486V1154	Philippines	1,876	73%
SMC Global Power Holdings	Private	Philippines	1,678	39%
Rural Power Company Limited (RPCL)		Bangladesh	1,670	0%
AES Corporation	US00130H1059	USA	1,655	34%
Elektroprivreda BIH (EPBIH)	BAJPESR00008	Bosnia-Herzegovina	1,650	80%
Jiuquan Iron & Steel (Group) Co Ltd	Private	China	1,600	100%
RWE AG	DE0007037129	Germany	1,600	54%
Elektroprivreda Srbije (EPS)	Private	Serbia	1,450	70%
CEZ Group	CZ0005112300	Czech Republic	1,410	47%
Safi Energy Company (joint venture)	Private	Morocco	1,368	0%
Jamshoro Power Company		Pakistan	13,20	0%
S Alam Group		Bangladesh	1,320	0%
MCM Energy (Myanmar Chemical & Machinery)		Myanmar	1,320	0%
Coal Power Generation Company Bangladesh		Bangladesh	1,200	0%
Eta-Zuma Group		Nigeria	1,200	0%
TTCL Public Company Limited (TTCL)	TH1002010Y06	Thailand	1,200	0%
Public Power Corporation SA (PPC)	GRS434003000	Greece	1,110	57%
Uniper SE	DE000UNSE018	Germany	1,100	32%
Centum Investment	KE0000000265	Kenya	1,050	0%
Colenso Power		South Africa	1,050	0%
Energa SA	PLENERG00022	Poland	1,000	57%
First Quantum Minerals	CA3359341052	Canada	920	0%
TAURON Polska Energia S.A	PLTAURN00011	Poland	910	>90%
Shumba Energy (former Shumba Coal)	MU0397S00002	Botswana	900	0%
Sunflower Electric Cooperative	Private	USA	895	54%

PARENT COMPANY	ISIN CODE	COUNTRY OF HEADQUARTERS	INSTALLED COAL POWER CAPACITY (MW)	COAL SHARE OF POWER PRODUCTION (RED: FOR CAPACITY)
CDEEE		Dominican Republic	770	0%
Eren Holding		Turkey	700	96%
Engro Powergen Limited	PK0102701015	Pakistan	660	0%
Namane Group	Private	South Africa	660	0%
China Africa Sunlight Energy (joint venture)	Private	Zimbabwe	600	0%
EMCO		India	600	0%
Kuyasa Mining Pty Ltd	Private	South Africa	600	0%
Resource Generation Ltd (Resgen)	AU000000RES1	Australia	600	0%
Prophecy Development Corp	CA74347D2077	Canada	600	0%
Kosovo Energy Corporation J. S. C. (KEK)		Kosovo	500	100%
Intra Energy Corporation (IEC)	AU000000IEC4	Australia	470	0%
Termotasajero SAESP	Private	Colombia	450	NA
Kibo Mining plc	IE00B97C0C31	Irish Republic	350	0%

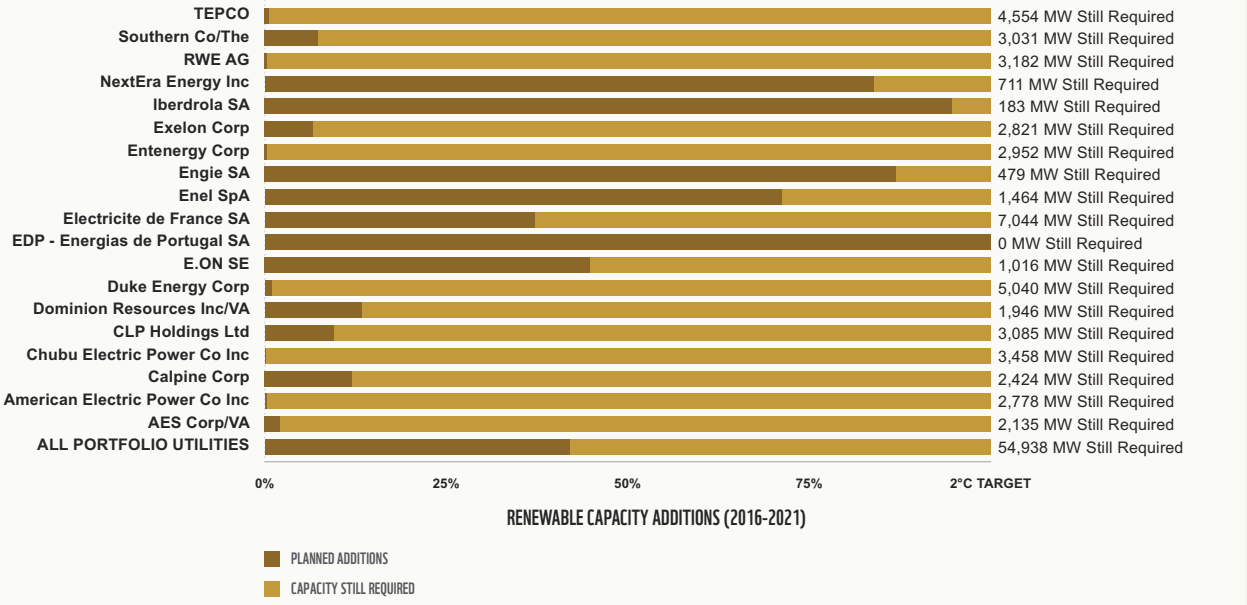
ANNEX 5. ELECTRIC POWER UTILITY ANALYSIS PROVIDED BY THE SUSTAINABLE ENERGY INVESTMENT METRIC (SEIM) TOOL FOR A SAMPLE PUBLIC EQUITY PORTFOLIO[119]

FIGURE 10 SAMPLE FROM SEIM ASSESSMENT ON COAL POWER CAPACITY RETIREMENTS REQUIRED BY UTILITIES IN A SAMPLE PORTFOLIO FOR A 2°C PATHWAY (SOURCE: 2 DEGREES INVESTING INITIATIVE)[120]



119 Sustainable Energy Investment Metrics (2017), http://seimetrics.org/.
120 2° Investing Initiative (2017), Testing the sample portfolio alignment with the 2°C climate goal – Energy portfolio diversification to a IEA 2°C scenario (July 2017).

FIGURE 11 SAMPLE FROM SEIM ASSESSMENT ON COAL POWER CAPACITY ADDITIONS REQUIRED BY UTILITIES IN A SAMPLE PORTFOLIO FOR A 2°C PATHWAY (SOURCE: 2 DEGREES INVESTING INITIATIVE)[121]



121 2° Investing Initiative (2017), Testing the sample portfolio alignment with the 2°C climate goal – Energy portfolio diversification to a IEA 2°C scenario (July 2017).

WWF ASSET OWNER GUIDE ON COAL AND RENEWABLE POWER UTILITIES

100% RECYCLED

OPPORTUNITIES

According to Mercer, renewable energy will be the sub-sector benefitting the most from the low carbon transition.

RISKS

Coal power is one of the sectors that will be most negatively affected by the low carbon transition.

JOURNEY

Asset owners' engagement with portfolio electric utilities owning coal assets should not stop before the latter have a coal exit strategy.

LEADERSHIP

Leading asset owners should adopt a coal and renewable electric power utility policy ensuring alignment with the Paris Agreement.

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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