



E3G

**SCORECARD REPORT** MAY 2017

**G7 COAL SCORECARD – THIRD EDITION**  
RHETORIC VS REALITY IN THE USA

**CHRIS LITTLECOTT & TAYLOR DIMSDALE**

## About E3G

E3G is an independent climate change think tank operating to accelerate the global transition to a low carbon economy. E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere. In 2016, E3G was ranked the number one environmental think tank in the UK. [www.e3g.org](http://www.e3g.org)

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# CONTENTS

About E3G.....	2
Copyright .....	2
SUMMARY.....	5
ABOUT THE G7 COAL SCORECARD.....	8
INTRODUCTION TO G7 COAL USE.....	9
Capacity .....	9
Generation.....	10
G7 coal dynamics – cancellations and retirements dominate .....	11
IN DEPTH: COAL IN THE USA RHETORIC VS REALITY .....	13
Summary.....	13
Context: coal use in the electricity sector .....	14
‘Trump digs Coal’ – rhetoric and intent.....	14
New coal power plants are very unlikely.....	15
Existing coal plants will continue to retire.....	15
States lead the way on coal phase out.....	16
Structural trends still point away from coal.....	17
International Impact: will the USA push for CCS? .....	18
‘Trump digs Coal’ – the reality.....	19
2017 G7 COAL SCORECARD ASSESSMENT .....	20
Beyond the USA: coal scorecard highlights and implications.....	21
United Kingdom .....	21
France.....	22
Canada.....	22
Italy.....	23
Germany.....	23
Japan .....	24
CONCLUSIONS AND RECOMMENDATIONS .....	25
ENDNOTES .....	27

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## SUMMARY

The E3G G7 coal scorecard assesses how G7 countries are addressing the challenge of reducing coal-fired power generation. It analyses the market and policy contexts of their domestic use of coal and their international influence.

This third edition of the G7 coal scorecard updates the overall ranking based on developments over the past 12 months. It also provides an assessment of the situation in the USA and the initial impact of the new Trump Administration.

Our analysis has found that the underlying structural transition away from coal remains strong, with increased political commitments by national and regional governments. Canada, France, the UK, Alberta, New York State, Oregon and Berlin are all now introducing policy frameworks to ensure the complete phase out of coal-fired power generation. Italy is currently considering a similar policy as part of its new national energy strategy.

Investment trends across the G7 over the past 12 months confirm the continuing transition away from coal. Our data analysis finds that:

- > **Cancelled:** An additional 7 gigawatt (GW) of proposed new coal plant capacity has been cancelled, now totaling 76GW since 2010. Japan remains the only G7 country pursuing investment in new coal-fired electricity generation, but even it has now seen its first cancellations of proposed new coal plants, totaling 2.2GW.
- > **Already retired:** Overall, 107GW of coal capacity has already closed since 2010. Coal power plant retirements are the dominant structural dynamic in the electricity sector, a trend shared by the rest of the G7 beyond Japan.
- > **Planned retirements:** A further 25GW of existing coal plants have been added to the retirement pipeline for the coming years, which now totals 84GW. 54GW of coal capacity has closure dates announced, while 30GW is now set to close as a result of political commitments by national and regional governments.

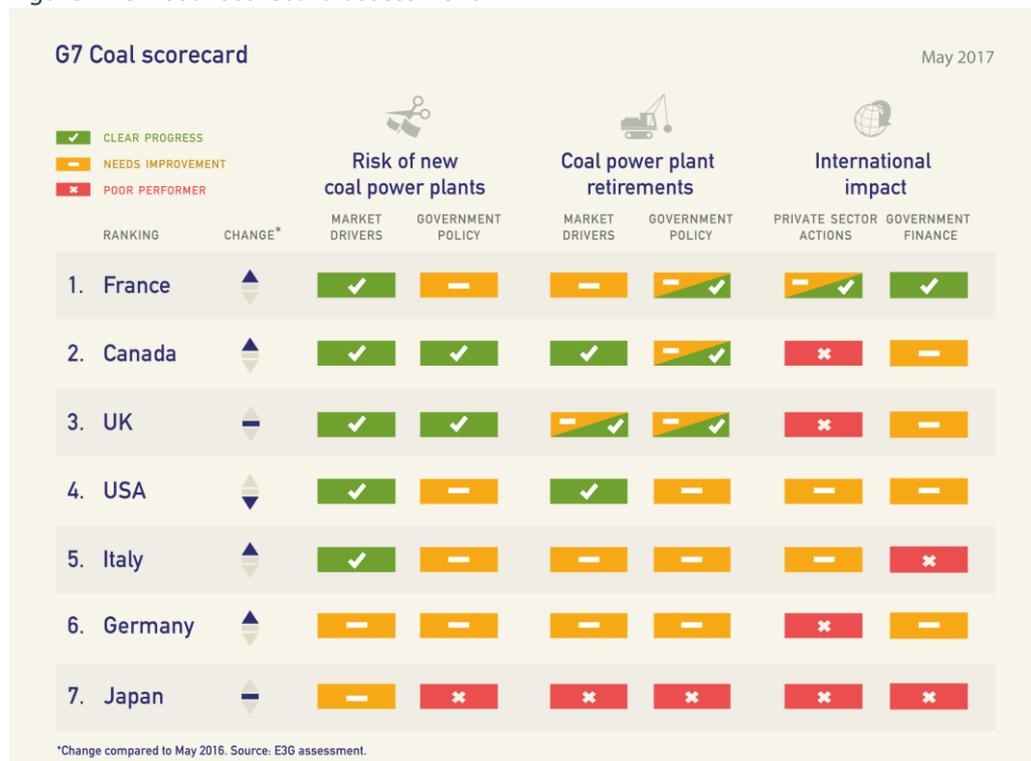
These trends will continue to provide a positive foundation for the development of domestic policy frameworks across the G7 that confirm and assist the phase out of coal power generation. The similarities of the policy challenges being faced will also be a motivating force for deepened international cooperation on coal.

The recent 'pro-coal' policy moves by the Trump Administration are at odds with this progress. Furthermore they do not align with the underlying structural shifts underway in the electricity sector in the USA. As a result, the Trump Administration appears to be trying to turn back the tide in its efforts to create a 'pro-coal' agenda.

For this update of the G7 coal scorecard ranking, we again reviewed the status of market drivers and government policies in each country to provide comparable

assessments of performance. We considered whether there is a risk of new coal power plants being constructed; whether existing coal power plants are being retired; and whether a country's actions have a positive international impact. These performance assessments are then aggregated to provide a composite scorecard ranking, as shown in Figure 1 below.

Figure 1: G7 Coal scorecard assessment



Source: E3G analysis

Compared to May 2016, there has been a change in the G7 coal scorecard ranking:

- > The **USA** drops from first to fourth position in the G7 scorecard ranking. This reflects the recent federal government actions of the new Trump Administration that seek to support coal both domestically and internationally.
  - > Contrary to this 'pro-coal' policy agenda, the USA continues to score the highest of all the G7 countries in respect to the alignment of market drivers. The ageing US coal fleet is faced with continued competition from gas and renewables. These point to a continued transition away from coal in the electricity sector despite attempted policy interventions.
  - > Market dynamics and policy efforts are now visibly pulling in different directions in the USA. If this continues it is likely to increase the risk of a disorderly transition rather than a managed pathway. These risks are already being amplified by some of the Trump Administration's initial social policy and budgetary proposals. Changes proposed to pensions, healthcare and regional economic development are projected to impact negatively on workers and communities in coal regions.

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- > Despite the intense ‘pro-coal’ political rhetoric of the Trump Administration, we have assessed that the status of intended policy changes does not yet meet the threshold for the USA to be ranked as a ‘poor performer’ in the relevant scorecard categories. The majority of the proposed policy changes are currently still only statements of intent which will be subject to lengthy implementation timelines and legal challenge.
  - > As a consequence, the USA drops to a mid-table position in the G7 coal scorecard ranking. Its positive market dynamics continue to provide a foundation for proactive management of the transition away from coal, a challenge which is increasingly being taken on by individual states.
  - > Despite maintaining its positive scores from 2016, the **UK** has been overtaken in the ranking by **France** and **Canada** as they also take forward domestic commitments to phase out coal. All three countries are taking similar positive steps and are well placed to lead wider international cooperation on coal. France and Canada now take first and second place in the ranking.
  - > **Italy** and **Germany** have both also improved their performance in the scorecard over the past 12 months. Italy is considering a national coal phase out policy, while the city-region of Berlin has already implemented one.
  - > **Japan** remains in last place with no change in score, in an unwelcome position as the sole G7 country actively seeking to build new coal power plants.

In considering these trends and next steps for G7 members, we highlight that:

- > Despite the current ‘pro-coal’ approach of the new Trump Administration, G7 members will continue to face a shared transition challenge over the coming decades. Together with other OECD partners, the G7 can seek to provide a more orderly pathway through sharing best practice in power sector policy and the delivery of a just transition for affected regions and workers.
- > Internationally, G7 members can act to limit public finance to coal power generation. Canada, France, Germany, Italy, and the UK are all now members of the Asian Infrastructure Investment Bank (AIIB) and should prioritise cooperation with China to ensure that the AIIB effectively restricts finance to unabated coal.
- > There is an undoubted risk that the ‘pro-coal’ positioning of the new Trump Administration could give political cover to Japan’s promotion of coal technology exports (and similarly encourage other ‘pro-coal’ interests and countries seeking to secure demand for coal). However, we would caution other countries to take a long hard look at the underlying structural trends at play in the USA. There are strong reasons to pay more attention to the reality of electricity sector shifts away from coal rather than getting caught up in the political rhetoric.
- > The next two years will see the G7 Presidency held by Canada and France. Prime Minister Trudeau and President Macron have both made strong commitments to delivering a domestic coal phase out. They should seek to use their forthcoming G7 roles to leverage this influence internationally.

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## ABOUT THE G7 COAL SCORECARD

E3G developed the G7 coal scorecard format in 2015 to provide a framework for tracking how G7 countries are meeting the challenge of phasing out coal use for electricity generation.<sup>1 2</sup>

On 8<sup>th</sup> June 2015, G7 members agreed that the decarbonisation of the global economy should be completed by the end of this century; that this requires deep cuts in CO<sub>2</sub> emissions; and that it must include a transformation of their own energy sectors by 2050.

Subsequently, all G7 members participated in the negotiation of the Paris Agreement in December 2015, and the New York signing ceremony in March 2016.<sup>3</sup>

The Paris Agreement and the 2015 G7 communiqué do not mention any particular fossil fuel, but the implication is clear: there is no future for unabated<sup>4</sup> coal power generation in a world that is acting to avoid dangerous climate change. Indeed, analyses point to the need for all OECD countries to have completed a coal phase out by 2030 if emissions reductions are to be on track.<sup>5</sup>

The G7 coal scorecard assesses country performance across three categories of action:

1. Is there a risk of new coal power plants being constructed?
2. Are existing coal power plants being retired?
3. Do country actions have a positive international impact?

The first two domestic issues are analysed in respect to market drivers and government policies. The international impact of each country is then assessed by considering how private sector investments and government finance impact on coal power plants abroad.

There are significant differences between the G7 countries in respect to the scale and relative importance of coal-fired electricity generation. This reflects the overall size of each economy and historical investment trends. The G7 coal scorecard tracks country performance across the three categories of action outlined above to enable meaningful comparisons of market dynamics and government policies irrespective of the significant differences in the scale of coal use in each country.

In May 2016, the second edition of the scorecard reviewed the overall trends and looked at each country in detail. This third edition again updates the overall ranking while also providing an assessment of the situation in the USA and the initial impact of the new Trump Administration.

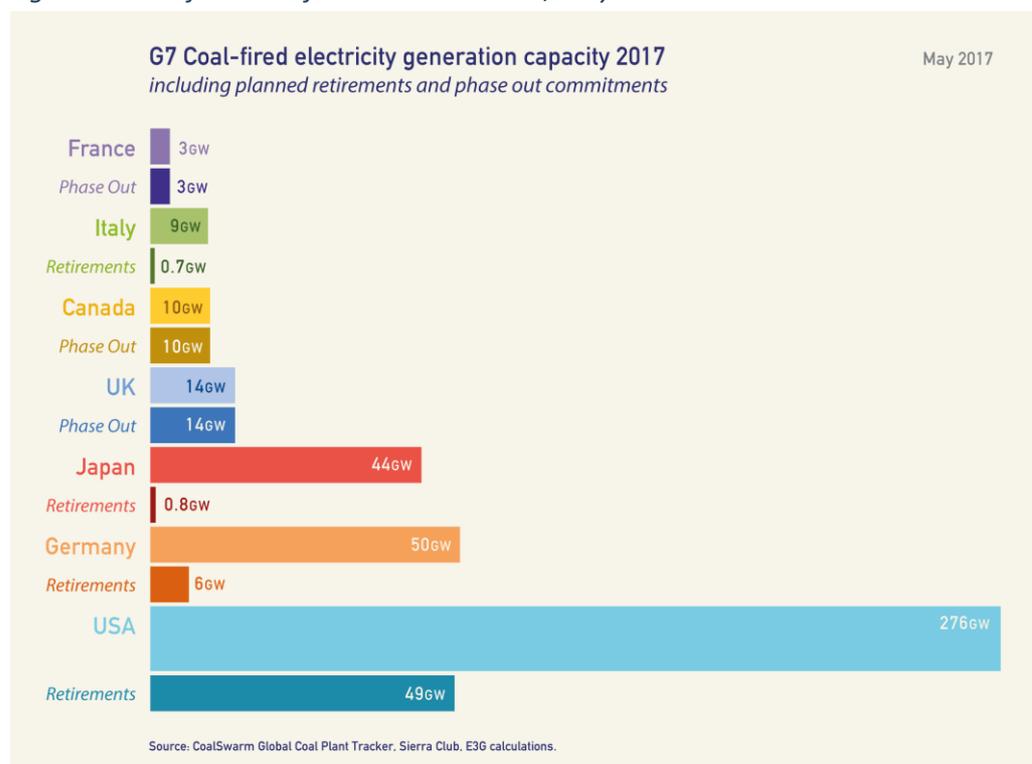
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# INTRODUCTION TO G7 COAL USE

## Capacity

The differences in the scale of coal power plant capacity across G7 countries are illustrated in Figure 2. Four countries have relatively small amounts of coal capacity: France (3GW), Italy (9GW), Canada (10GW) and UK (14GW). Japan (44GW) and Germany (50GW) each have a power plant coal fleet larger than the sum of the four preceding countries. The USA has by far the largest coal power plant capacity, with its 276GW currently more than twice the size of the rest of the G7 combined.

Figure 2: Size of the coal fleet in G7 countries, May 2017



Source: CoalSwarm Global Coal Plant Tracker, Sierra Club, E3G calculations

Figure 2 also highlights the extent to which the current coal-fired capacity in each country is already scheduled for closure. As we discuss further below, France, the UK, and Canada have all made national political commitments to phase out all remaining coal power plants (by 2023, 2025, and 2030 respectively). This approach is also now being considered by Italy as part of the new national energy strategy. Currently 7% of existing capacity in Italy is scheduled to close in the coming years.

In the remaining G7 countries, policy makers have yet to fully grasp the coal phase out challenge, although individual states and regions are starting to take the lead as market trends gather pace. In Germany, 12% of current capacity is already scheduled for closure, mainly in the period prior to 2023. The Federal government has

acknowledged that Germany’s climate plan implies that half of current coal capacity will need to have closed by 2030, although this is not yet a firm policy commitment. The city-region of Berlin has introduced its own coal phase out policy by 2030, with the Klingenberg lignite power plant being the first plant to close, in May 2017.<sup>6</sup>

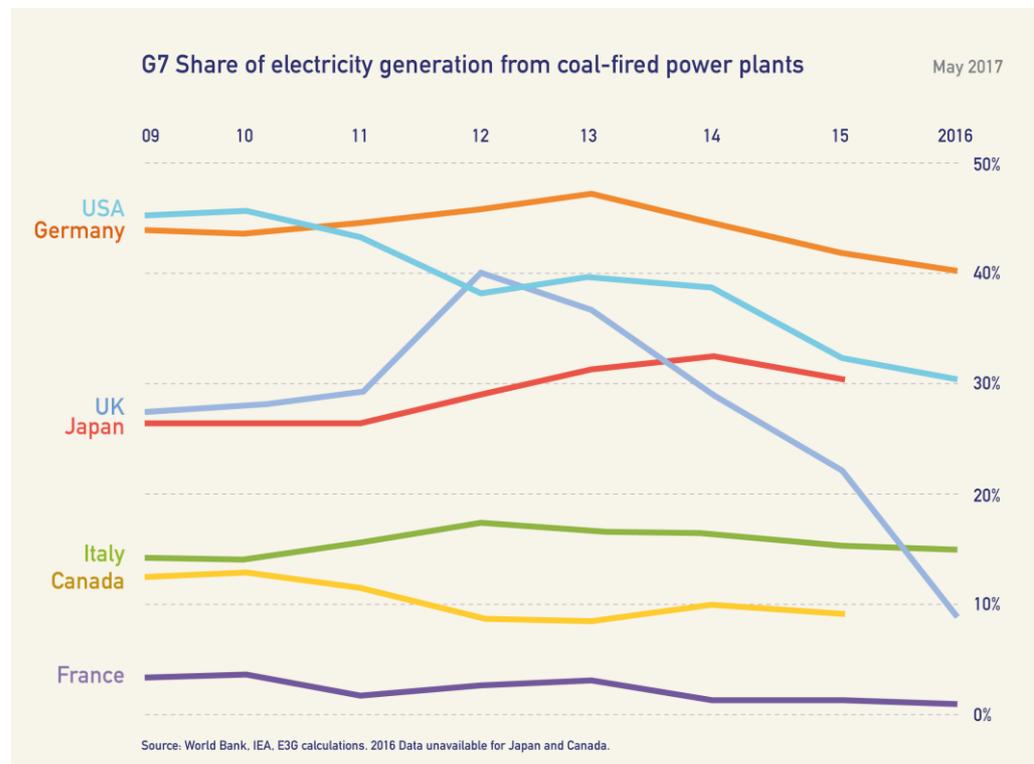
The USA has already seen 67GW of coal-fired capacity close since 2010, while a further 49GW is scheduled to retire, equivalent to 18% of current capacity. These coming retirements alone are comparable in scale to the total coal fleet in Japan or Germany. The state of New York has moved to phase out its remaining coal plants by 2020, while Western States such as California and Oregon are acting to limit consumption of electricity from coal power plants from out-of-state.

In Japan, just 0.8GW of capacity is set to close in the next decade. The debate in Japan lags behind the other G7 countries and is currently still focused on whether to build new coal, and does not yet consider the timescale for coal plant retirement.

## Generation

During 2016, the UK saw a record low of just 9% of total electricity production from coal, contributing to an overall reduction of total UK CO<sub>2</sub> emissions of 6%.<sup>7</sup> Just five years ago, coal contributed 40% of UK electricity, as shown in Figure 3. The USA also saw a continued fall in coal use in 2016, when it was overtaken by gas-fired generation for the first time. The trend in other countries remained flat year-on-year.

Figure 3: Share of electricity generation from coal-fired power plants, 2009-17



Source: World Bank, IEA, E3G Calculations.

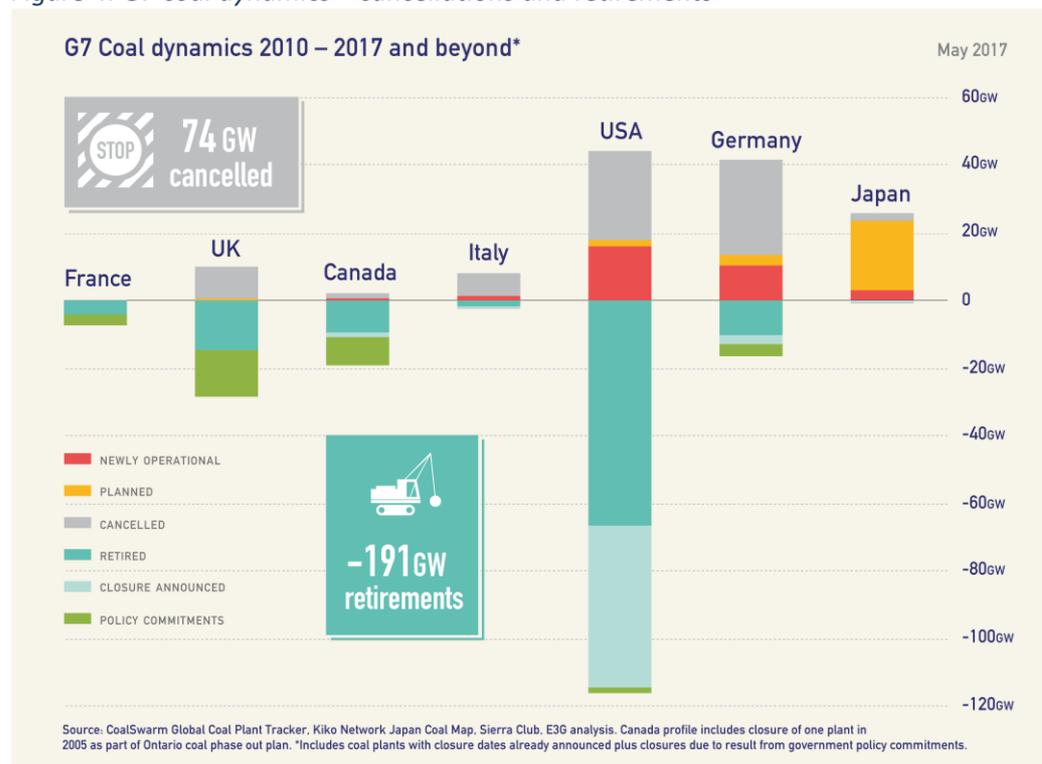
## G7 coal dynamics – cancellations and retirements dominate

Figure 4 below illustrates the swing away from coal power plants in G7 countries since 2010. During this period 132GW of new coal plants have been proposed, mainly at the beginning of the decade. To date, however, just 32GW of new coal capacity has entered operation across the G7.<sup>8</sup> More than double this amount of capacity has been cancelled by project developers, totaling 74GW (+7GW since May 2016).

In Japan, there is currently 5.5GW of coal plant capacity currently under construction (+2.5GW since May 2016). Japan also has a substantial pipeline of new projects still under development, totaling 15GW. But even Japan has seen the significant cancellation of 2.2GW of proposed new capacity in the past 12 months, representing the first realization from market actors that coal is a bad bet.<sup>9</sup> We can therefore reiterate our assessment from 2016: it is not too late for Japan to avoid locking itself into expensive stranded assets from new unabated coal power plants.

In Germany, a 1.1GW coal plant is under construction which marks the last of an ill-fated wave of investments initiated prior to 2010. In the USA, three power plants with a combined capacity of 1.2GW nominally remain under development. We discuss the new coal development pipeline further below.

Figure 4: G7 coal dynamics – cancellations and retirements



Source: CoalSwarm Global Coal Plant Tracker, Kiko Network Japan Coal Map, Sierra Club, E3G analysis.

As Figure 4 shows, the dominant trend across the G7 continues to be the retirement of existing coal plants. The retirement pipeline now totals 191GW, an increase of

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26GW since May 2016. Individual coal plants that already have a date for retirement over the coming years are captured under the category 'Closure announced'.<sup>10</sup> Most notably, the USA has now surpassed a total of 116GW of coal plant retirements (66.5GW already closed plus 49.4GW with a scheduled closure date announced).

The 'Policy commitments' category incorporates coal plant retirements that will result from the implementation of intended policy measures by national and regional governments. This category has now grown to total 30GW, encompassing policy commitments by the UK, Canada, France, Alberta, New York state, Berlin and power plants subject to Germany's national lignite reserve policy. All but the last of these policies are aimed at delivering a full national or regional phase out, and account for 100% of the remaining coal plants in each respective jurisdiction.<sup>11</sup>

Overall, 107GW of coal capacity has already closed across the G7 since 2010. 54GW of coal capacity has closure dates announced, while 30GW is now set to close as a result of policy commitments.<sup>12</sup> As additional countries and regions also attend to the challenge of defining a managed transition out of coal power generation in the face of strong market trends we expect that the retirement pipeline will continue to grow over the coming years.

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# IN DEPTH: COAL IN THE USA

## RHETORIC VS REALITY

### Summary

- > There are only three coal plants currently in the development pipeline in the USA accounting for just 1.2GW. Only one of these is under construction ('Kemper Country') and integrates carbon capture and storage (CCS) technology, but is massively over budget and behind schedule. There is no commercial investment case for new unabated coal power plants to be built in the USA.
- > Since 2010, 66.5GW of coal capacity has been retired, while a further 49.4GW of coal power has confirmed its intention to close. As of May 2017, 253 coal power plants have announced closures since 2010. The coal power plant fleet in the USA is ageing and continued retirements are expected.
- > The political context in the USA changed significantly with the election of President Trump, who repeatedly proclaimed his support for coal miners and 'clean coal' technology in his election campaign.
- > The new Trump Administration has declared that the 'war on coal is over'. It is attempting to overturn several key regulations that would limit pollution and CO<sub>2</sub> emissions from coal power plants and acting to reduce costs for coal miners by reducing environmental protections. Most of these policies face legal challenges however, and it is unclear if or when they will take effect.
- > While President Trump has highlighted the need to ensure economic opportunities for coal communities, his proposed budget actually cuts funding for economic development in coal regions and the retraining of unemployed coal miners. Federal government funding for CCS technology would also be slashed.
- > Trends in the real economy are likely to prevent a coal renaissance in the USA despite the new government's priorities. Net generation from coal has fallen by 25% since 2001, and 2016 was the first year that natural gas overtook coal as the largest source of electricity generation.
- > Multiple analyses and industry survey research suggests that there is relatively little the federal government can do to significantly change the fortunes of the coal industry given the reality of competition from gas, renewables and lower demand. Tellingly, most utilities have not changed their planning assumptions on coal. Even coal industry leaders are dampening expectations of investment in new coal power plants or any substantial increase in coal mining jobs.
- > The Trump Administration is seeking to slow international progress on climate change and associated cooperation on clean energy technology. In light of continued progress on coal by its G7 counterparts, the USA is likely to face pressure to come up with credible proposals in support of CCS instead of continued rhetorical pronouncements in favour of 'clean coal'.

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## Context: coal use in the electricity sector

The share of coal in the electricity mix has fallen significantly in recent years, a trend that continued in 2016. Net electricity generation from coal is down by a quarter since December 2001. As noted in Figure 2 above, 2016 saw just 30.4% of electricity generated by coal. This was the first year that electricity generated from natural gas accounted for a larger share (33.8%) of total generation.<sup>13</sup> Meanwhile more than half of new electricity generation capacity added to the grid came from renewable resources with the highest share coming from wind and solar installations.

Employment in coal mining and the market value of coal companies have also fallen dramatically over the past decade. Even when coal production increased by over 10% from 1994 to 2008, employment in coal mining still fell by over 40% due largely to improvements in automation and shifts in the location of mining from mountainous Appalachia to the Powder River Basin.<sup>14</sup> Between 2011 and March 2016, the 13 largest coal producers combined market capitalization fell from \$62.5 billion to \$4.59 billion – a decline of over 90%.<sup>15</sup>

As coal's share of electricity generation has fallen there is growing evidence that renewable energy is more than capable of meeting new demand. Solar and wind are increasingly the most cost competitive sources of energy in parts of the USA; prices for wind and solar have dropped 66% and 85%, respectively over the past seven years.<sup>16</sup> Renewables also enjoy strong bipartisan support, as evidenced by the fact that Congress has passed multiyear extensions for tax credits for wind and solar technologies.

## 'Trump digs Coal' – rhetoric and intent

The political context in the US changed significantly in November 2016 with the election of President Trump. During his campaign, Trump pledged to bring back coal mining jobs and revive the coal industry through support for 'clean coal' technology.<sup>17</sup>

Since taking office President Trump has signed an 'Executive Order on Energy Independence' to roll back many of the regulations proposed under Obama's Climate Action Plan. This sets out to review all regulations and policies that could "potentially burden the development of domestically produced energy resources, with particular attention to oil, natural gas, coal, and nuclear energy resources".<sup>18</sup> This includes a review and possible repeal of the Clean Power Plan, which had aimed to lower power sector emissions by 32% below 2005 levels by 2030.<sup>19</sup>

The new Administrator of the US Environmental Protection Agency (EPA), Scott Pruitt, has declared that "the war on coal is over".<sup>20</sup> The EPA has moved to review and postpone environmental regulations including the Steam Electric Power Generating Effluent guidelines introduced in 2015. The guidelines aim to protect water resources from multiple sources of pollution from coal power plant wastewater streams and process byproducts.<sup>21</sup> The Trump Administration has also taken actions that avoid the rulemaking process, including lifting a ban on new coal leasing on Federal land and

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repealing the stream protection rule that aimed to prevent damage to waterways from coal mining debris.

### **New coal power plants are very unlikely**

During 2016, no new coal power plant capacity was added to the US grid, following just a tiny 50MW in 2015. The last substantial coal capacity was added in 2013 (1.8GW) drawing to a close the last impulse of investment in new coal generation.

At present, 1.2GW of coal capacity nominally remains under development, incorporating just three plants: the massively delayed and over-budget 582MW Kemper County lignite gasification CCS project, the seemingly stalled 400MW Texas Clean Energy Project (which would also incorporate CCS), and an unabated 895MW power plant at Holcombe, Kansas that was first proposed back in 2006.<sup>22</sup> The Holcombe project has recently received a favourable legal judgement regarding its original permitting process.<sup>23</sup>

There is currently no commercial investment case for new unabated coal power generation in the USA in light of continued low prices for natural gas and falling costs for renewables. Furthermore, the timescales for project development are such that any new projects would not come close to entering construction within this current presidential term of office.<sup>24</sup>

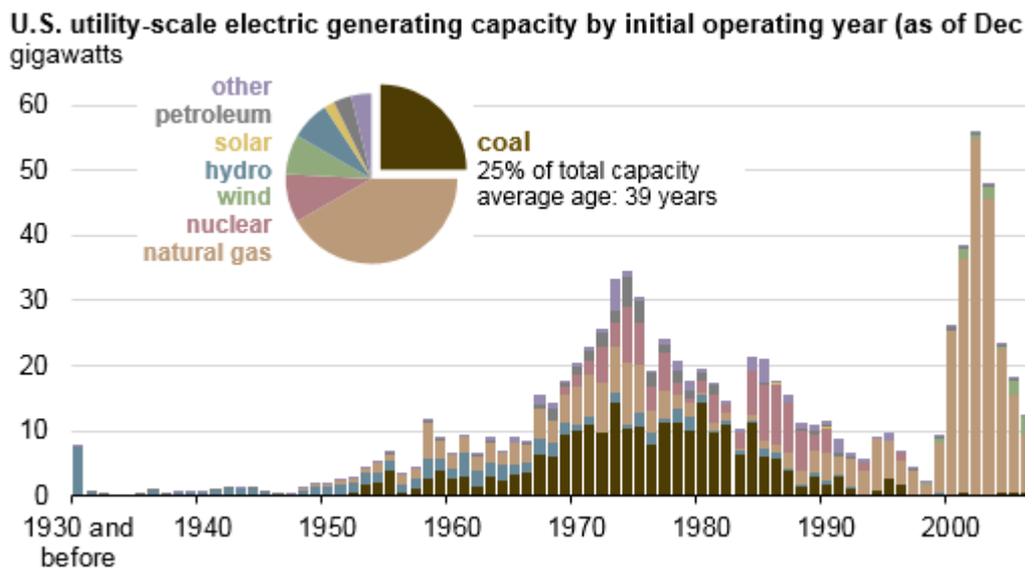
In respect to government policy, most of the actions proposed in the Executive Order will not have any immediate impact on the regulatory requirements for new coal power plants. They may not even be implemented for some time given the slow-moving rulemaking process and likely legal challenges. For example, the EPA's New Source Rule which sets greenhouse gas performance standards for new, modified, and reconstructed stationary sources is being reviewed but has not been rescinded<sup>25</sup> which means that at present any new coal power plants cannot be built without CCS.

### **Existing coal plants will continue to retire**

Figure 4 above has highlighted that since 2010 66.5GW of coal capacity has already retired, while a further 49.4GW of coal power has confirmed its intention to close. As of May 2017, 253 coal power plants have announced closures with seven since January 2017 including the massive 2.3GW Stuart Station in Ohio.<sup>26</sup> Coal closures made up 80% of the 18GW of retired generating capacity in 2015 alone.<sup>27</sup> Proposed government policy changes may attempt to slow the pace of coal power plant retirements but market drivers will continue to push coal off the system.

Meanwhile the coal fleet continues to age. According to the US Energy Information Administration (EIA), close to 90% of coal plants in the US were built between 1950 and 1990 and the average age of coal facilities is 39 years, as shown in Figure 5. The average age of the coal units retired in 2015 was 54 years, showing that the average age of coal power plants is decreasing as older plants close.

Figure 5: utility-scale electric generating capacity by initial operating year



Source: EIA 2017<sup>28</sup>

Many of the remaining power plants in operation lack effective air pollution controls.<sup>29</sup> The Trump Administration has indicated that it intends to loosen air pollution regulations to aid these plants, but this is expected to face concerted legal challenge and public opposition given the negative impacts on human health.

More broadly, the Clean Power Plan's legal status remains unchanged as it had already been put on hold by the Supreme Court in 2016.<sup>30</sup> The Mercury and Air Toxics Standards (MATS) for Power Plants has already gone through the rule-making process and has taken effect, but faces a challenge in the D.C. Circuit Court in the coming months.

The Department of Energy has also initiated an unannounced analysis<sup>31</sup> to consider the need for baseload coal generation, a process that has been roundly criticized for lacking integrity and being a transparent attempt to push back on the continued growth in renewables.<sup>32</sup> It is, however, also being seen as an admission that the Federal government cannot make an effective argument in favour of coal on cost grounds – instead it has had to resort to spurious claims of grid security as a last-gasp justification for continued use of coal generation.<sup>33</sup>

### States lead the way on coal phase out

While the proposed changes in federal policy attempt to slow the decline of the coal industry, state level efforts and policies aimed at phasing out coal will continue. The New York state government has pledged to shut down all coal power plant by 2020, while Oregon recently reached an agreement with utilities to phase out coal by 2030, including from out-of-state generators.<sup>34</sup> Several states have already stopped using coal power, while Massachusetts and Washington plan to shut their coal plants by

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2017 and 2025, respectively. California's climate policies, which include a target of reducing emissions by 40% from 1990 levels by 2030, were already more stringent than those set by the Clean Power Plan. The state consumes less than 10% of its electricity from coal-fired power plants, almost all of which is imported, and would likely meet its Clean Power Plan targets 10 years early.<sup>35</sup>

### **Structural trends still point away from coal**

Recent academic and industry analyses have found that the decline in domestic coal consumption has mostly been the result of cheap natural gas combined with lower than expected demand for electricity and growth in renewable energy. Furthermore, more than half of the decline in coal company revenue between 2011-2015 has been due to international factors, including the slowdown in growth in China, rather than domestic environmental regulation. These trends are likely to continue and to prove resistant to changes in Federal government policy.

A recent study by the Columbia University Center on Global Energy Policy asked 'Can coal make a comeback?' but concluded that *"If natural gas prices remain at or near current levels or renewable costs fall more quickly than expected, US coal consumption will continue its decline despite Trump's aggressive rollback of Obama-era regulations."* In respect to the intended aim of assisting coal miners, it also noted that *"President Trump's efforts to roll back environmental regulations will not materially improve economic conditions in America's coal communities."*<sup>36</sup>

Recent industry surveys also show that energy utilities believe that demand for coal will continue to fall despite any action the Federal government takes. According to Reuters, most of the 32 utilities surveyed, which have operations in the 26 states that sued former President Barack Obama's administration to block its Clean Power Plan, have no plans to alter their shift away from coal. The main reasons given include cheap and abundant natural gas, falling cost of renewables, legal challenges to Trump's agenda and the existence of state environmental laws.<sup>37</sup> DTE Energy, which is Michigan's largest utility, plans to retire eight of its nine remaining coal plants by 2030, regardless of whether President Trump tries to repeal President Obama's climate policies.<sup>38</sup> Indeed, Robert Murray, founder and chief executive of Murray Energy, the largest privately held coal company in the US has stated that he suggested to President Trump that he should temper his expectations about bringing back coal jobs.<sup>39</sup>

A separate survey of over 600 utilities indicated that while the Trump Administration's approach might allow some existing coal plants to operate longer than they would have under a Clinton Administration, utilities expect to source more power from renewables, distributed resources and natural gas in the coming years, while coal continues to decline. In no region did more than 10% of respondents indicate an expectation of any coal growth in the fuel mix.<sup>40</sup>

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## International Impact: will the USA push for CCS?

President Trump has repeatedly signalled his intention to invest in ‘clean coal’ technology, stating *“My administration is putting an end to the war on coal, we’re going to have clean coal, really clean coal.”*<sup>41</sup> As a consequence, some analysts, coal executives and policymakers have highlighted that they see renewed potential for investment in CCS technology in the new political environment.

This push for ‘clean coal’ has an international dimension. Several large coal companies including Cloud Peak Energy, Peabody and Arch Coal have either lobbied the administration to remain a party to the Paris Agreement or at least made clear they would not oppose such a decision, claiming that the USA’s international influence could help ensure a continued place for fossil fuels. A letter was also circulated in Congress recommending that the USA remain in Paris only if allies agree to support ‘highly efficient’ coal and CCS technologies.<sup>42</sup>

While the proposed Kemper County project has still not yet been completed and has suffered from multi-billion cost escalation,<sup>43</sup> the Petra Nova CCS retrofit project is seen as offering a more positive example that CCS technology could still be pursued. Petra Nova is the first large-scale retrofit of CCS plant to an existing coal-fired power generation unit in the USA, entering operation in January 2017. Compared with other CCS projects it was notably completed on schedule and on budget.<sup>44</sup>

Petra Nova is a joint project between US energy company NRG and Japanese company JX Nippon Oil & Gas Exploration Corp, and incorporates Japanese technology, financing and expertise. Considering Japan’s ambitions with respect to promoting Japanese coal technology overseas this could be a potential angle for international cooperation between the two countries. Petra Nova received substantial support from the Department of Energy, including \$190m in grants out of a total cost of roughly \$1bn.<sup>45</sup> The use of the captured CO<sub>2</sub> for enhanced oil recovery (CO<sub>2</sub>-EOR) is critical to the economic viability of the project which depends on oil price of \$50 a barrel or higher, meaning that NRG currently has no plans to repeat the project in the absence of alternative policy incentives.<sup>46</sup>

Over recent months, the USA has attempted to change the international dynamic on climate action in venues like the G7 and G20.<sup>47 48</sup> Its promotion of ‘pro-coal’ language has raised questions as to whether it will actively invest in CCS and be willing to introduce additional policy measures to help provide a business case for investment in CCS. At present, this seems unlikely as President Trump’s budget proposal for the Department of Energy also includes cuts of 56% to the Fossil Energy Research and Development program. This includes the office that conducts research on CCS technology which would see its share of the budget fall by 85% from \$206m to \$31m.<sup>49</sup> Across the Department of Energy, the Trump Administration has signalled that it will only support basic energy research. This would be a barrier to the proactive demonstration and deployment of commercial scale CO<sub>2</sub> technologies that are dependent on broader policy incentives if they are to be applied at scale. In light of continued progress on coal by its G7 counterparts, the USA is likely to face pressure to

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come up with credible proposals in support of CCS instead of continued rhetorical pronouncements in favour of ‘clean coal’.

### ‘Trump digs Coal’ – the reality

President Trump has raised legitimate concerns both during his campaign and since taking office about the need to help coal workers who are struggling with economic upheaval. However, in contrast to this, the Trump Administration’s proposed 2018 budget would cut funding for economic development programs supporting unemployed coal miners and others in Appalachia by eliminating the Appalachian Regional Commission.<sup>50</sup> This suggests that there is a significant disconnect between President Trump’s personal campaign rhetoric and the policy priorities of his Administration. Policy efforts initiated to date have concentrated on assisting coal mining companies rather than coal miners who are confronting crises in healthcare and pensions.<sup>51 52</sup>

As discussed above, there is likely to be a lengthy time delay before the proposed policy changes can be fully implemented (if they can be at all, following legal challenge). Their impact on the underlying trends at play in the US electricity system is currently limited. In respect to new coal plants there is as yet no clear incentive for investment in new projects, and with the development pipeline at a standstill there is no prospect of substantial new coal plant capacity being built in the coming years.

For existing coal power plants the outlook is that the Trump Administration’s efforts may slow but not stop the continued retirement of ageing and uncompetitive units. Initial estimates suggest that President Trump’s Executive Order would likely have a negative impact on greenhouse gas emissions. The Rhodium Group estimates that emissions would stabilize at around 14% below 2005 levels in 2025, compared to the 21% reduction under President Obama’s Climate Action Plan.<sup>53</sup>

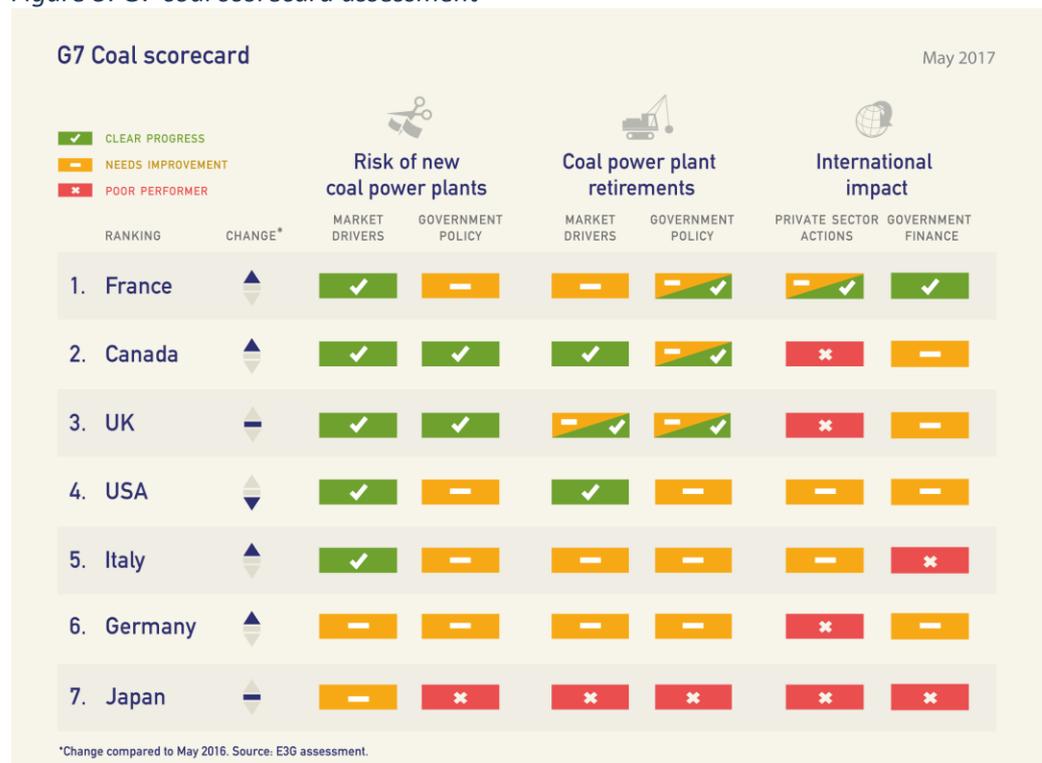
The retirement of coal power plants and their replacement with renewable energy will continue to be critical if the USA is to achieve substantial emissions reductions in line with its Paris targets, regardless of the politics. Analysis by the Sierra Club shows that 15% of the US coal fleet has been retired over the past five years while an additional 15% has announced plans to retire before 2025. If half the US coal fleet were to be retired and replaced by 2025 it would amount to a reduction in annual CO<sub>2</sub> by roughly 437 million metric tons which accounts for 60% of the gap between the US Paris pledge and projections for economy wide emissions.<sup>54</sup> The continued transition away from coal is therefore a key real world indicator of whether the USA remains on track for the climate commitments made by the Obama Administration.

## 2017 G7 COAL SCORECARD ASSESSMENT

Figure 5 sets out the performance ranking of G7 countries in this May 2017 edition of the G7 coal scorecard. It highlights how:

- > most progress has been made in respect to the risk of new coal power plants, with positive market drivers leading the way ahead of government policy, even in Japan.
- > the majority of countries are now seeing a move towards the retirement of existing coal plants, with governments increasingly making commitments to coal phase out to shape the timelines for closure and encourage investment in alternatives. Policies to deliver these commitments are currently under development in the leading countries.
- > the international impact of G7 country actions on coal continues to be the most difficult category for action, reflecting the more disparate actors and processes through which countries can influence investment in coal power plants. Only France can claim a leading position in this regard at present, following the shift away from Obama Administration positions by the Trump Administration.

Figure 5: G7 coal scorecard assessment



Source: E3G analysis

The overall ranking reflects the performance of each country across the scorecard categories. In the following section we highlight key developments over the past 12 months together with commentary on the implications identified through this third edition of the G7 coal scorecard assessment.

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Compared to May 2016, there has been a significant change to country performance:

- > The **USA** drops from first to fourth position in the G7 scorecard ranking. This reflects the recent federal government actions of the Trump Administration that seek to support coal both domestically and internationally, as discussed above.
  - > Contrary to this ‘pro-coal’ policy agenda, the USA continues to score the highest of all the G7 countries in respect to the alignment of market drivers. The ageing US coal fleet is faced with continued competition from gas and renewables. These point to a continued transition away from coal in the electricity sector despite attempted policy interventions.
  - > As a result, the Trump Administration appears to be trying to turn back the tide in its efforts to create a ‘pro-coal’ agenda. While it may be able to reduce costs for coal extraction, it is unlikely to be able to stimulate the construction of new coal power plants or secure large-scale job creation in coal mining.
  - > Despite the intense ‘pro-coal’ political rhetoric of the Trump Administration, we have assessed that the status of intended policy changes does not yet meet the threshold for the USA to be ranked as a ‘poor performer’ in the relevant scorecard categories. The majority of the proposed policy changes are currently still only statements of intent which will be subject to lengthy implementation timelines and legal challenge.
  - > As a consequence, the USA drops to a mid-table position in the G7 coal scorecard ranking. Its positive market dynamics continue to provide a foundation for proactive management of the transition away from coal, a challenge which is increasingly being taken on by individual states.
- > Despite maintaining its positive scores from 2016, the **UK** has been overtaken in the ranking by **France** and **Canada** as they also take forward domestic commitments to phase out coal. All three countries are taking similar positive steps and are well placed to lead wider international cooperation on coal. France and Canada now take first and second place in the ranking respectively following the slide in US performance.
- > **Italy** and **Germany** have both also improved their performance in the scorecard over the past 12 months. Italy is considering a national coal phase out policy, while the city-region of Berlin has already implemented one.
- > **Japan** remains in last place with no change in score, in an unwelcome position as the sole G7 country actively seeking to build new coal power plants.

## Beyond the USA: coal scorecard highlights and implications

### United Kingdom

- > The UK renewed its commitment to phase out coal in November 2016 and began the policy making process for implementation,<sup>55</sup> despite the disruption resulting

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from the referendum on European Union (EU) membership and subsequent changes to political leadership.

- > The UK also saw a further record drop in coal-fired electricity generation in 2016 to just 9% of total generation, and has now experienced the first ever 24 hour period without coal.<sup>56</sup>
- > The Rugeley coal power plant closed in June 2016, but other plants that had been considering closure instead secured contracts in the capacity market auction. The presence of capacity market contracts and further annual auctions to come is now a limiting factor on the coal phase out pathway. This will require attention in the final form of UK government policy measures.
- > The UK had previously carved out a leading position as the first country to commit to phase out coal. This remains an attractive area for UK climate leadership in the context of the UK's exit from the EU. The UK will however need to regain momentum on its delayed domestic delivery following the 2017 general election, if it is to fully grasp these opportunities.

## France

- > France is now in first position in the scorecard ranking following incremental improvements in its own performance and the slide down the rankings by the USA.
- > Incoming President Macron has committed to delivering on the coal phase out aim previously announced by President Hollande.<sup>57</sup> This will be an important early delivery challenge for the newly created Ministry of Ecology and Solidarity. The previous Hollande administration had proposed to introduce a carbon price floor as a means of reducing the coal power generation,<sup>58</sup> however this measure was withdrawn from the national budget leaving a policy implementation gap.<sup>59</sup>
- > France has also seen improved international impact through moves away from coal by utilities and finance sector players. Engie closed its massive Hazelwood lignite power plant in Australia as part of its shift away from coal.<sup>60</sup> EDF sold its coal trading business, however this has negative implications as it was sold to Japan's JERA group.<sup>61</sup> More positively, Crédit Agricole and Société Générale banks confirmed that they will not finance new coal power plants,<sup>62</sup> and Crédit Agricole subsequently confirmed it will not provide finance to a controversial coal power plant in Indonesia that was already under consideration.<sup>63</sup>
- > While there is still more to do, these shifts offer a positive platform for President Macron to exert international and domestic influence on the transition away from coal, including through France's G7 Presidency in 2019.

## Canada

- > Canada has also improved its performance and now sits in second place in the ranking.

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- > In November 2016, the Trudeau government made a Federal commitment to phase out coal by 2030.<sup>64</sup> This matches the similar commitment previously made by the Province of Alberta. Implementing policies are now under development.
  - > At the provincial level, utility companies in Alberta are now bringing forward retirement dates for coal plants well ahead of 2030 due to favourable market conditions. ATCO<sup>65</sup> and Transalta<sup>66</sup> both intend to close and / or convert existing coal power plants to gas by the early 2020s. This reflects the end of existing power purchase agreements and the introduction of electricity market reforms by the provincial government.<sup>67</sup>
  - > Ahead of its Presidency of the G7 in 2018, Canada's next steps will be to introduce its Federal policy framework and advance its approach to a just transition for coal workers and communities. These approaches could offer significant value if shared internationally.

## Italy

- > Italy has recently initiated a consultation on its new national energy strategy which incorporates explicit consideration of coal phase out options, including a scenario proposing the full phase out of coal in the period 2025-2030.<sup>68</sup> This step would enable Italy to regain a leadership position alongside its peers in Canada, France and the UK.
- > Market conditions have further improved and there is now no prospect of new coal projects in Italy. There remains a need for further clarity on the retirement pathway for existing power plants, as recent actions by Enel have prioritized gas plant closures. The small and old Genova coal plant was given permission to close in April 2017.

## Germany

- > Germany is continuing to improve from its original poor performance in the first edition of the G7 coal scorecard in 2015, although substantial challenges still remain.
- > On a negative note, the proposed power plant at Datteln recommenced construction following a court decision in July 2016.<sup>69</sup> This plant is the last in an ill-fated set of investment decisions taken at the turn of the decade.
- > Similarly, lignite mines and power plants belonging to the Swedish state utility Vattenfall were sold to EPH in September 2016.<sup>70</sup> This was a missed opportunity for a managed phase out and just transition for workers and communities, and increases the risk of future liabilities for taxpayers.<sup>71</sup>
- > More positively, LEAG decided that it would not extend currently operating lignite mines which would cease operations in 2023. It also dropped plans for a new lignite power plant.<sup>72</sup>

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- > In respect to policy developments, the city-region of Berlin has committed to phase out coal by 2030 and is now introducing a policy framework.<sup>73</sup> Berlin has already seen the first coal plant close in May 2017.<sup>74 75</sup>
  - > More broadly, some 3GW of coal power plants have retired in the past 12 months including the 2.2GW STEAG power plants at Voerde.<sup>76</sup> Other coal plants are seeking to close in the near future once regulatory approval is granted.<sup>77</sup>
  - > At a national level, Germany’s climate action plan failed to include a firm coal phase out pathway but did set out emissions reductions that will require that half of current coal capacity will need to have closed by 2030.<sup>78</sup> The Federal government has acknowledged that Germany’s climate plan implies this, but it is not yet a firm policy commitment. Any decision on this will be made following the Federal elections in September 2017.
  - > The Climate Action plan also includes a commitment to establish a Commission on “Growth, Structural Change and Regional Development”. It is widely expected that this will become a forum where, starting in early 2018, a socially acceptable coal phase-out can be negotiated. This is similar to the approach taken by the “Ethics Commission for a Secure Energy Supply” in respect to Germany’s nuclear phase-out. However, the composition and eventual mandate of this body are unclear and will only be confirmed after the election.
  - > Internationally, Germany has used its G20 Presidency in 2017 to promote continued action on climate change, while it has improved its performance in respect to international finance for coal, including through its efforts to secure a strong framework for coal within the Asian Infrastructure Investment Bank. In the private sector, Deutsche Bank has improved its lending policy to begin a move away from coal.<sup>79</sup>

## Japan

- > Japan remains in last place with no change in score, and an unwelcome position as the sole G7 country actively seeking to build new coal power plants. But even Japan has seen its first cancellations of proposed new coal plants, in January and March 2017, totaling 2.2GW of capacity.<sup>80</sup>
- > Internationally, Japan continues to play a negative role by pushing for the inclusion of funding for unabated ‘clean coal’ power plants within the lending frameworks of international financial institutions. This approach is matched by the continued push for overseas contracts by Japanese technology companies and utilities. The one positive example is the USA-Japan cooperation on the Petra Nova CCS project, discussed in detail above.

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## CONCLUSIONS AND RECOMMENDATIONS

Our analysis for this third edition of the G7 coal scorecard has found that the underlying structural transition away from coal remains strong, with increased political commitments by national and regional governments.

The recent policy moves by the Trump Administration are at odds with the broader direction of travel internationally and are not aligned with the underlying structural shifts underway in the domestic US electricity sector. This provides a continued positive foundation for the further development of domestic policy frameworks by other members of the G7.

Japan remains the outlier in respect to its combination of political support for coal technology and the presence of an active coal power plant development pipeline. Nevertheless, the cancellation of two large power plant projects is a sign that private sector players have increasing concerns in respect to the risks faced by new investments in coal.

In looking across these trends and considering potential collective next steps for G7 members, we highlight that G7 members will face a shared transition challenge over the coming decades, despite the current 'pro coal' approach of the new Trump Administration. Together with other OECD partners, the G7 can seek to provide a more orderly pathway through sharing best practice in power sector policy and the delivery of a just transition for regions and workers.

Such an approach will also have direct relevance and value for ongoing policy debates and actions in the USA at both federal and state level. Our analysis has highlighted that market dynamics and policy efforts in the USA are now visibly pulling in different directions. If this continues it is likely to increase the risk of a disorderly transition rather than a managed pathway, by making the regional transition away from coal more difficult for workers and communities. These risks are already being amplified by some of the Trump Administration's initial social policy and budgetary proposals. Changes proposed to pensions, healthcare and regional economic development are projected to impact negatively on workers and communities in coal regions. It is in the interests of all G7 countries that this transition is managed in an orderly way, so they should actively consider opportunities to share insights and approaches.

Internationally, G7 members must continue to act to limit public finance to coal power generation. The five countries of Canada, France, Germany, Italy, and the UK are all now members of the Asian Infrastructure Investment Bank (AIIB) and should prioritise their cooperation with China to ensure that the AIIB effectively restricts finance to unabated coal.

There is an undoubted risk that the pro-coal positioning of the Trump Administration could give political cover to Japan's promotion of coal technology exports (and similarly encourage other pro-coal interests and countries seeking to secure demand for coal). However, we would caution other countries to take a long hard look at the

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underlying structural trends at play in the USA. There are strong reasons to engage with the reality of energy sector shifts rather than getting caught up in the political rhetoric.

The next two years will see the G7 Presidency held by Canada and France. Prime Minister Trudeau and President Macron have both made strong commitments to delivering a domestic coal phase out. They should seek to use their forthcoming G7 roles to leverage this influence internationally.

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## ENDNOTES

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<sup>1</sup> Our G7 Scorecard analysis draws on E3G reviews of each of the G7 countries' domestic performance on coal undertaken during 2015, and incorporates additional data and assessments of countries' international impact. Detailed reviews of G7 countries were undertaken in advance of the 2015 G7 summit, as an analytical input to Oxfam's report **'Let them eat coal'**. Updated versions of these papers are available on the E3G website at <http://www.e3g.org/showcase/coal-phase-out>

<sup>2</sup> Coal use is currently the source of significant emissions from industrial sectors such as steel production. Those industries are now on notice that they will need to reduce their CO<sub>2</sub> emissions over the coming decades. But a transition out of fossil fuels needs to start with where emissions can be reduced most quickly. The electricity sector is now firmly in the spotlight as the arrowhead of a coal phase out effort.

<sup>3</sup> The Paris Agreement commits countries to: *"Holding 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 above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;"* (Article 2). Together with the commitment to reach a *'balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'* the Paris Agreement sets a new baseline for national actions to address climate change. (Article 4).  
<https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>

The forward process under the UNFCCC intends that countries will further reduce their intended national emissions reductions for the coming years, in particular under the review process scheduled for the period 2018-19. A central focus will be on the development of decarbonisation strategies for the period to 2050.

<sup>4</sup> 'Unabated' coal refers to coal-fired electricity generation without the application of carbon capture and storage technology to directly 'abate' (reduce) CO<sub>2</sub> emissions.

<sup>5</sup> For example, analysis by Climate Analytics finds that EU and OECD countries should phase out coal by 2030 in order to deliver emissions reductions compatible with the commitments made in the Paris Agreement. See <http://climateanalytics.org/publications/2016/implications-of-the-paris-agreement-for-coal-use-in-the-power-sector.html>

<sup>6</sup> <http://www.caneurope.org/publications/press-releases/1383-berlin-coal-plant-is-europe-s-12th-to-close-in-18-months>

<sup>7</sup> <http://uk.reuters.com/article/uk-britain-emissions-data-idUKKBN17111C>

<sup>8</sup> This is an increase of 3GW since the 2016 scorecard, however just 1GW of this is in-year operation of new plants in Germany and Japan, with 2GW relating to historical plant additions in the USA that have been identified by updated data sources.

<sup>9</sup> <http://www.kiconet.org/eng/press-release/2017-01-31/Ako-cancel> and <http://www.kiconet.org/eng/press-release-en/2017-03-23/Ichihara-cancel>

<sup>10</sup> The 'Closure Announced' category is a renaming of the 'Confirmed Retirement' category in the October 2015 G7 Coal Scorecard. Terminology has been updated to provide greater clarity following introduction of the 'Policy Commitments' category and to align with similar tracking exercises by Sierra Club and Global Coal Plant Tracker.

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<sup>11</sup> The UK's coal phase out policy does not apply to the sole remaining coal plant in Northern Ireland, as energy is a devolved matter to the Northern Ireland Assembly.

<sup>12</sup> This figure includes 900MW of coal capacity in the German region of Saxony-Anholt, which has announced its intention that there will be no operational coal by 2035. We note, however, that a 19-year timeframe is of limited value in defining a phase out plan for a single plant, and expect that this closure date will need to be brought forward. As further policy commitments are made by national and regional governments we will return to this topic with an assessment of how phase out timetables are helping to drive accelerated plant closures (or are alternatively providing cover for business as usual).

<sup>13</sup> <https://www.eia.gov/electricity/monthly/update/archive/april2017/>

<sup>14</sup> <https://fivethirtyeight.com/features/trumps-plan-wont-reverse-coals-decline/>

<sup>15</sup> <http://ieefa.org/market-cap-u-s-coal-companies-continues-fall/>

<sup>16</sup> <https://www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf>

<sup>17</sup> [https://www.washingtonpost.com/news/energy-environment/wp/2017/03/29/trump-promised-to-bring-back-coal-jobs-that-promise-will-not-be-kept-experts-say/?utm\\_term=.107bf4c3502d](https://www.washingtonpost.com/news/energy-environment/wp/2017/03/29/trump-promised-to-bring-back-coal-jobs-that-promise-will-not-be-kept-experts-say/?utm_term=.107bf4c3502d)

<sup>18</sup> <https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economi-1>

<sup>19</sup> <https://www.epa.gov/energy-independence>

<sup>20</sup> <https://www.worldcoal.com/coal/24052017/epa-the-war-on-coal-is-over/>

<sup>21</sup> <https://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-2015-final-rule#documents>

<sup>22</sup> [http://www.sourcewatch.org/index.php/Holcomb\\_Expansion](http://www.sourcewatch.org/index.php/Holcomb_Expansion)

<sup>23</sup> <https://www.usnews.com/news/best-states/kansas/articles/2017-03-17/top-kansas-court-clears-way-for-new-coal-fired-power-plant>

<sup>24</sup> <http://www.reuters.com/article/us-usa-trump-coal-kemp-idUSKBN1772JO>

<sup>25</sup> <https://www.federalregister.gov/documents/2017/04/04/2017-06519/review-of-the-standards-of-performance-for-greenhouse-gas-emissions-from-new-modified-and>

<sup>26</sup> <http://www.reuters.com/article/us-usa-coal-closures-idUSKBN16R2D4>

<sup>27</sup> <https://www.eia.gov/todayinenergy/detail.php?id=25272>

<sup>28</sup> <https://www.eia.gov/electricity/monthly/update/archive/april2017/>

<sup>29</sup> <http://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/coal-air-pollution#.WSeXy2jys2w>

<sup>30</sup> <https://www.nrdc.org/experts/david-doniger/clean-power-plan-litigations-latest-turn> and <https://insideclimatenews.org/news/16052017/clean-power-plan-epa-lawsuit-trump-obama-climate-change>

<sup>31</sup> <https://www.bloomberg.com/politics/articles/2017-04-15/electric-grid-study-ordered-by-u-s-energy-chief-to-boost-coal>

<sup>32</sup> <http://blogs.edf.org/energyexchange/2017/05/22/what-we-know-so-far-about-rick-perrys-power-grid-study>

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- <sup>33</sup> <https://www.vox.com/energy-and-environment/2017/5/24/15671436/rick-perry-grid-review>
- <sup>34</sup> <https://www.bloomberg.com/news/articles/2016-01-15/new-york-is-the-latest-state-to-join-worldwide-war-against-coal>
- <sup>35</sup> <http://www.latimes.com/science/la-me-climate-change-20150804-story.html>
- <sup>36</sup> <http://energypolicy.columbia.edu/publications/report/can-coal-make-comeback>
- <sup>37</sup> <http://www.reuters.com/article/us-usa-trump-climate-power-idUSKBN1770D8>
- <sup>38</sup> [http://www.mlive.com/news/index.ssf/2016/11/michigans\\_biggest\\_electric\\_pro.html](http://www.mlive.com/news/index.ssf/2016/11/michigans_biggest_electric_pro.html)
- <sup>39</sup> <https://www.theguardian.com/environment/2017/mar/27/us-coal-industry-clean-power-plan-donald-trump>
- <sup>40</sup> Utility Dive 2017. State of the Electric Utility Survey.
- <sup>41</sup> President Trump statement whilst signing his executive order rolling back coal mining regulation. [http://www.huffingtonpost.com/entry/trump-clean-coal\\_us\\_58dad105e4b054637062e61d](http://www.huffingtonpost.com/entry/trump-clean-coal_us_58dad105e4b054637062e61d)
- <sup>42</sup> <https://www.eenews.net/eenewspm/stories/1060051995/>
- <sup>43</sup> <http://spectrum.ieee.org/energywise/energy/fossil-fuels/kemper-county-and-the-perils-of-clean-coal-technology>
- <sup>44</sup> <http://investors.nrg.com/phoenix.zhtml?c=121544&p=irol-newsArticle&ID=2236424>
- <sup>45</sup> [https://www.washingtonpost.com/news/energy-environment/wp/2017/01/10/americas-first-clean-coal-plant-is-now-operational-and-another-is-on-the-way/?utm\\_term=.786bd0fb89a3](https://www.washingtonpost.com/news/energy-environment/wp/2017/01/10/americas-first-clean-coal-plant-is-now-operational-and-another-is-on-the-way/?utm_term=.786bd0fb89a3)
- <sup>46</sup> [http://www.ibew.org/media-center/Articles/17daily/1701/170130\\_BillionDollar](http://www.ibew.org/media-center/Articles/17daily/1701/170130_BillionDollar)
- <sup>47</sup> <http://www.reuters.com/article/us-g7-energy-u-s-idUSKBN17C1F3>
- <sup>48</sup> <http://www.reuters.com/article/us-g20-germany-climatechange-idUSKBN16O1S1>
- <sup>49</sup> [https://www.washingtonpost.com/news/energy-environment/wp/2017/05/23/trump-plans-a-69-percent-budget-cut-large-staff-reductions-at-clean-energy-office/?utm\\_term=.ffa6ea891ece](https://www.washingtonpost.com/news/energy-environment/wp/2017/05/23/trump-plans-a-69-percent-budget-cut-large-staff-reductions-at-clean-energy-office/?utm_term=.ffa6ea891ece)
- <sup>50</sup> [http://mobile.reuters.com/article/idUSKBN16N2VF?il=0&utm\\_content=bufferf01ea&utm\\_medium=social&utm\\_source=twitter.com&utm\\_campaign=buffer](http://mobile.reuters.com/article/idUSKBN16N2VF?il=0&utm_content=bufferf01ea&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer)
- <sup>51</sup> <https://www.vox.com/energy-and-environment/2017/3/28/14905546/trump-executive-order-climate-coal>
- <sup>52</sup> <https://www.theatlantic.com/business/archive/2017/04/miners-pensions/523980/>
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- <sup>58</sup> <http://www.gouvernement.fr/en/the-implementation-of-the-paris-agreement-and-the-conference-on-climate-change>
- <sup>59</sup> <http://www.reuters.com/article/us-france-carbon-idUSKCN12K2OG>
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