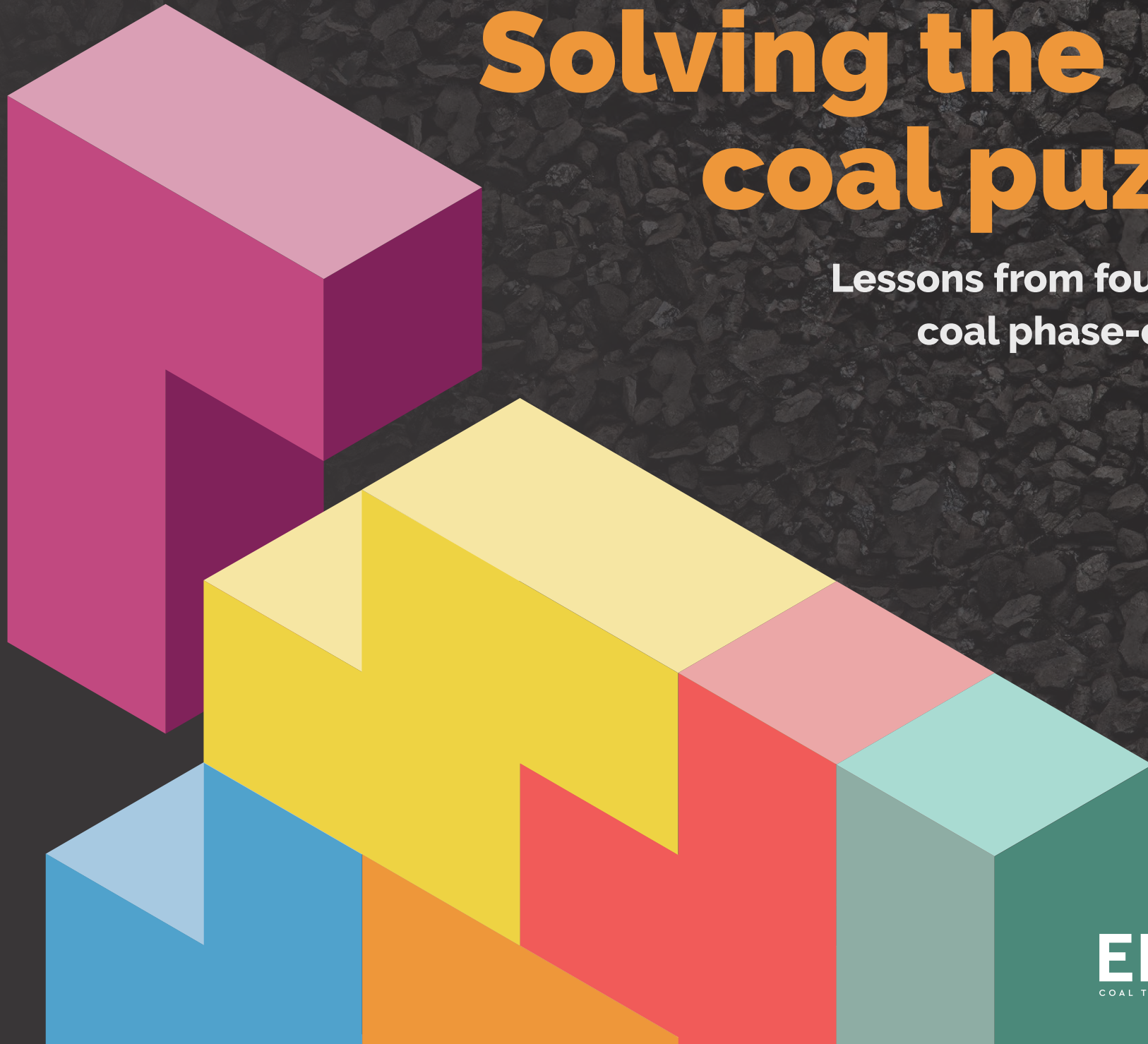


# Solving the coal puzzle

Lessons from four years of coal phase-out policy in Europe



# Solving the coal puzzle

## Lessons from four years of coal phase-out policy in Europe

Europe is on a journey to phase out coal. With 15 countries that have announced to end coal burning since 2015, we can reflect back on a wealth of policy experience gained in the last four years.

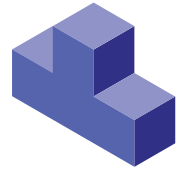
We worked with 20 experts across 10 countries. First, we defined nine qualities that are needed to make a successful coal phase-out. Then, we interviewed each country expert to see whether there are lessons to share. For each of these nine qualities, we have created a guide of all the “dos and don’ts” of what contributes to a good coal phase-out policy.

On this summary page, we identify the most telling example for each of the nine policy qualities.

We hope you find this interesting and inspiring to how a coal phase-out policy could be developed in your country.



## Ambitious



Plans need a phase-out date and pathway consistent with 1.5 degrees.

- ✓ Greece announced that it would phase out coal by 2028 - going from 33% of electricity from coal in 2018, to zero in just ten years.
- ✗ Germany's 2038 coal phase-out date is much later than the 2030 needed to be compliant with 1.5 degrees.

## Legislated



Plans should be written into law.

- ✓ Finland has imposed a law that makes it illegal to burn coal in energy production from mid-2029. This ban is clear-cut and without loopholes.
- ✗ Italy's phase-out is described only as a goal. There are no actions yet taken to legislate the Italian coal phase-out.

## Just



No one is left behind.

- ✓ The Spanish government achieved a historic €250 million agreement to close mines with the coal mining unions.
- ✗ The only evidence of just transition policy in the UK is either by the companies (e.g. redeployed workers), or local government (e.g. retraining schemes).

## Clean

Wind and solar explicitly replaces coal.

- ✓ The Dutch climate agreement sets a target to raise renewables generation from 15% to 75% in only 12 years and envisages an explicit coal to clean transition.
- ✗ Onshore wind deployment is coming to a halt in Germany, because of a proposed change in planning law. This may impact the speed of the coal phase-out.



## Economic

Coal should pay a carbon price.

- ✓ After the reform of the EU's Emissions Trading Scheme (ETS), the price of CO<sub>2</sub> rose to around €25/t in 2019, significantly worsening coal power plants economics.
- ✗ Prior to 2018, however, the EU-ETS - which was set up in 2005 - had a very slow start and was largely ineffective for over a decade.



## Direct

Avoids a bridge into fossil gas or unsustainable biomass.

- ✓ Renewables growth in the Netherlands seems to be strong enough to reduce gas generation by 2030, at the same time as phasing out coal.
- ✗ In the Netherlands, four (out of five) coal plants have been awarded €4 billion in subsidies to co-fire biomass with coal over 8 years.



## Healthy

Closes dirtiest plants first.

- ✓ The EU updates air pollution limits every seven years. In 2021, the SO<sub>2</sub> and NO<sub>x</sub> limits will tighten substantially which means utilities must choose: invest or close?
- ✗ Coal plants received free EU carbon permits, which funded upgrades to meet stricter pollution limits. This meant older coal plants stayed open longer, rather than close.



## Reliable

Keeps the lights on.

- ✓ The Netherlands is investing heavily in demand-side response, new interconnectors, hydrogen, and storage.
- ✗ Coal power plants will get payments until 2022 under the UK capacity mechanism, which are crowding out investments to help replace coal.



## Smart

Avoids pay-off for closure.

- ✓ The Finnish constitutional law committee, in a significant ruling, slammed hopes of energy companies to get compensated for having to phase out coal by law.
- ✗ Germany's 'coal commission' agreed utilities should be paid to close plants and mines, even though the public sees it increasingly as a waste of taxpayer money.

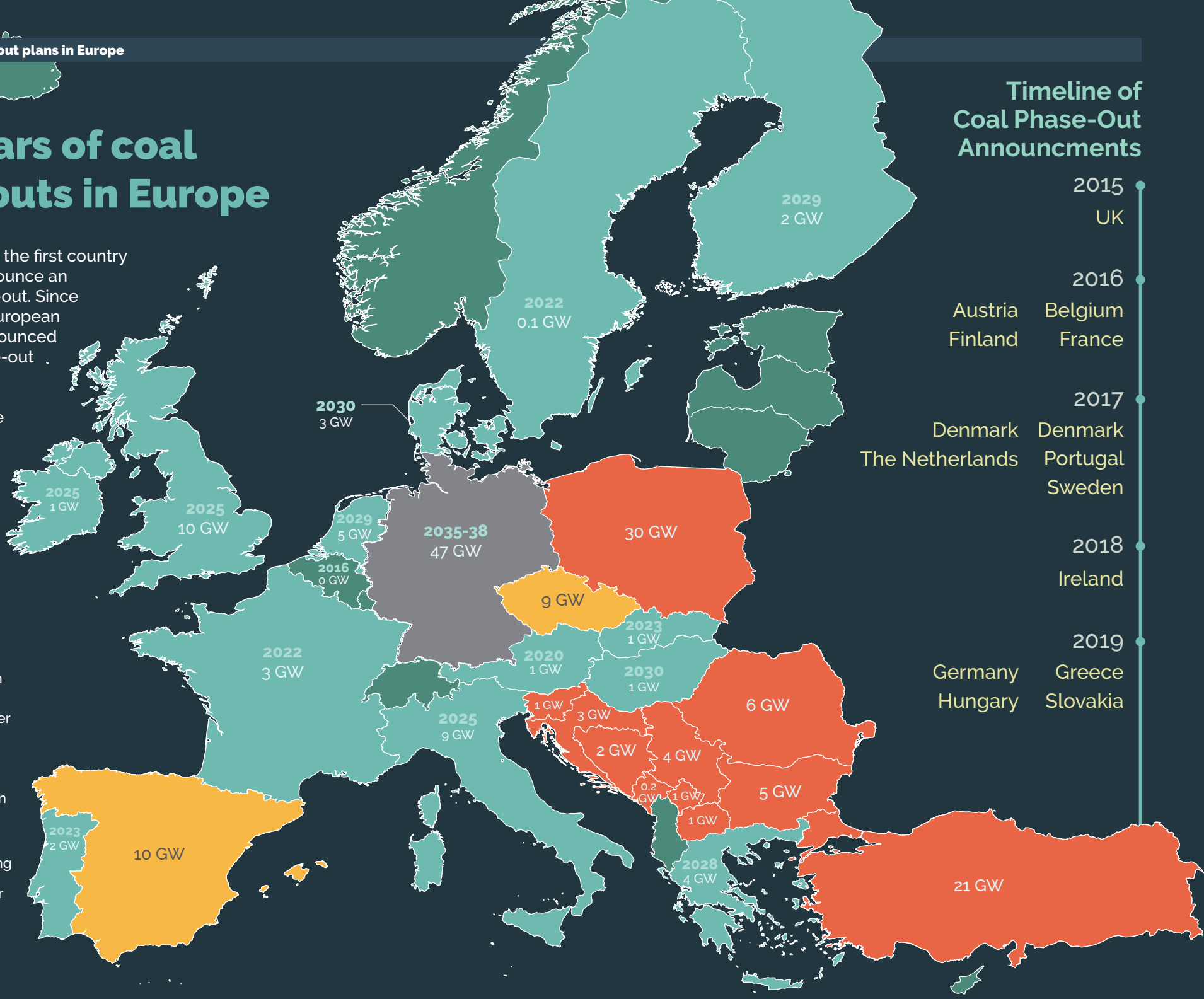


# Four years of coal phase-outs in Europe

In 2015, the UK was the first country in the world to announce an explicit coal phase-out. Since then, a further 14 European countries have announced that they will phase-out coal generation.

These countries are on a journey. One country, Belgium, has already phased out coal, but for most countries this journey will take a decade, or longer.

- No Coal Generation
  - Phase-out coal by 2030 or earlier
  - Phase-out coal only after 2030
  - Phase-out under discussion
  - No phase-out discussion
- GW Current operating capacity of coal-fired power plants in gigawatts (Oct 2019)



## Timeline of Coal Phase-Out Announcements





### Austria

The Austrian coal phase-out is not government driven. The companies operating the last two coal plants in Austria will close them by 2019 and 2020, respectively.

### Belgium

Belgium is the first, and so far only, formerly coal-burning EU country to become coal-power-free. The last coal plant closed in March 2016. The phase-out was not a policy objective but resulted from the progressive closure of aging power plants affected by EU pollution control regulations.

### Denmark

In November 2017, Denmark was among the first signatories to the Powering Past Coal Alliance set up by the UK and Canada, declaring it would work to phase out coal by 2030.

### Finland

Finland announced in 2016 that it would ban coal burning in power plants from 2029. This was set in law in February 2019.

### France

France's previous and current presidents, Hollande and Macron, both committed to phasing out coal, announcing it a few times. In the latest energy and climate law from June 2019, there is an emission cap, which will become effective on 1 January 2022.

### Germany

In January 2019, Germany's 'coal commission' published a detailed coal phase-out proposal. The commission brought together stakeholders from industry, trade unions, NGOs, academics and representatives of villages threatened by mining. A phase-out date of 2038 was agreed. Germany is the only country to agree a date later than the 2030 date that is needed to keep temperatures below 1.5 degrees.

### Greece

At the 2019 UN climate summit in New York, the Greek prime minister announced a complete phase-out of lignite by 2028. This has been re-iterated many times since.

### Hungary

At the 2019 UN climate summit in New York, the Hungarian president announced that Hungary will be coal-free by 2030.

### Ireland

In March 2018, the Irish minister for climate action announced that Ireland joined the Powering Past Coal Alliance and will end coal power use by 2025. It also banned using coal for domestic heating from 2019. In July 2018, the Irish parliament passed a bill to sell the country's shares in coal, peat, oil and gas, making Ireland the world's first country to divest from all fossil fuels.

### Italy

The Italian government announced a coal phase-out as part of its 2017 non-binding National Energy Strategy, but very little progress has been made since.

### Portugal

Portugal made an initial commitment to phase out coal before 2030 back in 2017 when it joined the Powering Past Coal Alliance. The re-elected prime minister announced in 2019 that the country's last coal plant will close by 2023, confirming a much earlier phase-out date.

### Slovakia

In a joint statement in June 2019 the newly inaugurated president and prime minister announced that Slovakia will stop burning coal to produce electricity by the end of 2023. Later in 2019, Slovakia joined the Powering Past Coal Alliance to show its commitment to phasing out coal.

## The Powering Past Coal Alliance: proud to be going coal-free

At the 2017 UN climate summit, the Canadian climate minister Catherine McKenna and British climate minister Claire Perry (pictured) launched the Powering Past Coal Alliance (PPCA). They wanted to acknowledge "the need to accelerate the international transition from burning coal to using cleaner power sources". The alliance of governments, businesses and organisations who have pledged to phase out coal by 2030 in OECD countries, has received wide acclaim and is counting 91 members. It is now a "badge of honour" to be part of the global leaders to transition to become coal-free.

Ministers Claire Perry (left) and Catherine McKenna (right)  
© Powering Past Coal Alliance



### Sweden

Sweden intends to be among the first fossil-free industrialised countries in the world. The last coal plant in Sweden will close by 2022.

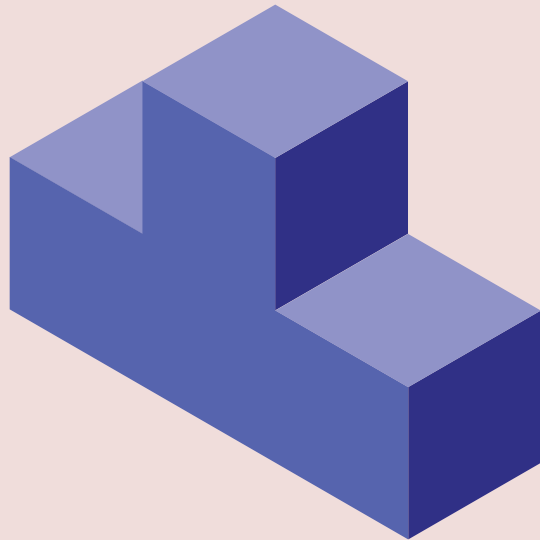
### The Netherlands

In 2017, the Netherlands proposed a comprehensive climate policy, pledging to phase out coal alongside a large build-up of renewable generation and a carbon price floor. The phase-out was legislated in December 2019. Phasing out coal is seen as essential in order to meet its legal greenhouse gas emission reduction targets.

### United Kingdom

The UK was the first country in the world to pledge to go coal-free power. The UK's business and energy minister made the announcement just prior to the 2015 Paris climate summit. Since then, the UK helped set up the "Powering Past Coal Alliance" to help countries show-off their coal phase-out pledges.


# Ambitious




## Plans need a phase-out date and pathway consistent with 1.5 degrees


To stay under 1.5 degrees, global coal generation must fall 80% by 2030, OECD nations should end coal use entirely by 2030, and all coal-fired power stations in the world must close by 2040. This is according to [Climate Analytics](#), who analysed the IPCC analysis in the context of coal generation.

## ✓ Policies that worked well

 The 2025 phase-out date announced back in 2015 initially seemed ambitious as 40% of UK electricity was generated from coal in 2012. But - with hindsight - an earlier date was possible, as most - if not all - coal plants will likely close by 2022. This has been helped by subsequent policies such as a large investment in offshore wind, and a high carbon price.

 The Netherlands will phase out coal by 2030. This will involve closing three new large coal plants, which were commissioned around 2015, after only 15 years in operation. There is a two-track approach, retiring older plants in the 2020s, and a stop-dead date for all coal plants in 2030. This gives a predictable pathway to phase out coal.

 Spain shows policies can lay the ground for an ambitious phase-out. In Spain, coal mine closures, tighter pollution limits, and a higher carbon price means that half of Spain's coal capacity may close in 2020. Spain's Balearic Islands have already legislated to phase out coal by 2025. When Spain does commit to a phase-out date, which is expected to be included in a new climate change and energy transition law, the government can be more ambitious than previously thought possible.

 Portugal made a provisional announcement initiating a discussion on coal, and then followed it up with a much more ambitious pledge. In 2017, Portugal joined the PPCA committing to close its coal plants "before 2030." After discussions over two years, the prime minister announced in 2019 that the country would be coal-free by 2023. Portugal is unlikely to be the last country to bring forward the phase-out date, as governments realise phasing out coal is more urgent - and easier - than they imagined.

## ✘ Policies that didn't work well



Greece announced that it would phase out coal by 2028, which is considered ambitious as coal still contributed 33% of total electricity supply in 2018 and was even higher historically. It is also considered ambitious because it's the first phase-out of a lignite-producing country in the EU.



Slovakia is planning to phase out coal by 2023. The power plants were unlikely to continue past 2023, due to their age and investment needed. However, a coal phase-out is still useful, meaning Slovakia can focus on planning to its future. Also, as the first eastern European country to explicitly pledge a phase-out, this helps neighbouring countries to focus on what they can do to phase out coal.



The Netherlands' 2030 phase-out date is the latest possible date to respect the 1.5-degree threshold. For an advanced country like the Netherlands, this feels quite weak. It is also a consequence of not blocking new coal power plants go online between 2014 and 2016, a period when it was already obvious that coal power plants were not compatible with climate ambition.



Germany's coal commission was formed only after years of inaction on coal, making the need for ambition even more pressing. The 2038 coal phase-out date is much later than 2030, which is what is needed to be compliant with keeping the global temperature increase below 1.5 degrees.



Italy's 2025 phase-out date is not particularly ambitious, given only 6% of Italy's electricity came from coal in the first half of 2019. The phase-out in Italy also comes with an expectation of needing to replace coal with new gas capacity. The 2017 announcement has not yet been followed up with any action.



Despite the bottom-up progress in Spain on coal, there is not yet an agreed phase-out date. Planning for investment in Spain's electricity system is made more difficult without knowing when the coal plants will close.



The 2029 coal phase-out date is not ambitious, considering Finland is committing to be carbon neutral by 2035, and as there is less than 2GW of quite old operational coal capacity in Finland. The 2029 coal ban does not include peat, which is also burnt in Finland.



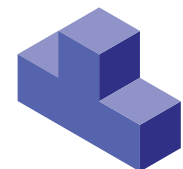
The 2030 coal phase-out date of Hungary is not ambitious. There is one plant in Hungary, and its permit expires at the end of 2025, so it's possible the plant closes as early as 2025. The plant is losing money, so no-one is likely to fund to keep it open after that date.



The French 2022 coal phase-out date is not ambitious as less than 2% of France's electricity is from coal. Only one of four coal power plants have announced a closure date, the fate of the others beyond 2022 remains unclear and they could possibly continue burning coal.



The EU has not tackled coal directly because it does not have the authority to decide the fuel mix of member state. However, EU policies have indirectly led to the decline of coal - through renewables targets, energy efficiency targets, total greenhouse gas emission targets, stricter pollution limits, carbon pricing, and workshops on regional transition.




# Legislated





## Plans should be written into law


An announcement to phase out coal is not enough. It should be written into law to prevent the risk of backtracking with the change of governments, and to avoid loopholes. It should give a clear planning horizon for closures.

## ✓ Policies that worked well

- 

The UK government is to legislate the phase-out using an "emissions performance standard" of 450g/KWh. There are two loopholes that coal plants can use to get under 450g, but these are considered low-risk - firstly biomass co-firing is unlikely as there are no new subsidies for it, and secondly carbon capture and storage is neither economically nor technically possible in the timescales required.
- 

Finland has imposed a law that makes it illegal to burn coal in energy production after 1 May 2029. It is the first phase-out decision enshrined in law.
- 

The French coal phase-out is legislated through the energy and climate law. An emissions performance standard of 550g/MWh will prevent the burning of coal from January 2022. A planned loophole will allow coal plants to generate up to around 700 hours a year after this date - although this is loophole exists, in part, to keep one coal plant online which is needed to ensure security of supply in the local network.
- 

Netherlands has two pieces of legislation. First, legislation based on efficiency will phase-out the two older plants: coal can only be burnt in plants with at least 44% efficiency by latest at the end of 2024. Second, a total ban on burning coal in power plants will impact the most efficient plants in 2030. The wording "burning coal" is used so that the plants are not forced to close, so the Dutch government says no compensation needs to be paid. Both mechanisms are already agreed in law.



## ✘ Policies that didn't work well



The legislation for Germany has not yet happened. It is complicated as it includes lignite phase-out contracts, hard coal closure auctions, regional transition plans and lots more. Despite the coal commission recommendations, there are still a lot of details to legislate on. The legislation was initially supposed to be adopted by the end of 2019, but this will likely be agreed in 2020, in danger of leading to an overall delay in getting vital early closures.



There are no actions yet taken to legislate the Italian coal phase-out. Rather it is only described as a "goal". Implementation currently relies on indirect measures such as the development of renewable capacity, gas capacity and adequate storage development.

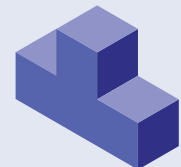
## UK coal phase-out unites political leaders

The leaders of the three main parties made a joint pledge to act on climate change in 2015. It was signed by the Conservative prime minister David Cameron, the Liberal Democrat coalition partner Nick Clegg, and the Labour party leader Ed Miliband. The [pledge](#) included the phrase "to end the use unabated coal for power generation".

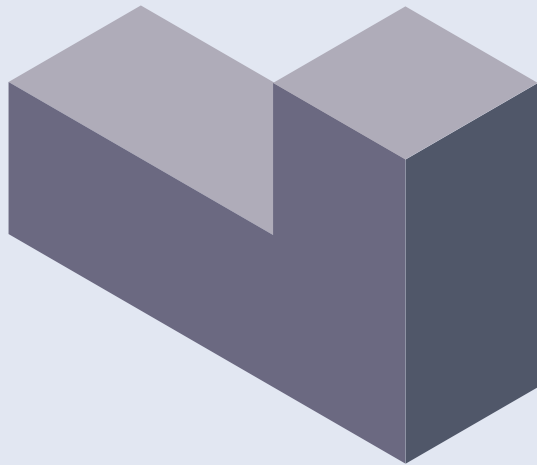
This meant the coal phase-out served to unite the parties, rather than divide them. It also meant there was always a strong enough commitment that the phase-out would never be reversed or watered down by future governments.



PM David Cameron (left), Nick Clegg (middle) and Ed Miliband (right) / Photo: PA



# Just



## No one is left behind

It should ensure participation of trade unions and communities, securing a just and fair transition for all. It should also boost the regional economy and include regeneration of coal mines.

## ✓ Policies that worked well



In the Netherlands there is a fund to assist workers affected by the shut-down of the coal power plants. It has a budget of €22 million and is aimed at workers of the five coal power plants who request assistance to find a new job or want to be retrained. A special unit composed by government officials and union representatives has been created to assist the 200 workers affected by the early phase-out of the Hemweg power plant, which is expected to close by the end of 2019.



In its draft structural transition law, the German government has committed to invest €40 billion in affected coal regions, including investments in infrastructure, education, innovation, economic restructuring and social safety nets for workers. The coal commission ensured the engagement of many relevant stakeholders including from civil society and trade unions to ensure sustainable development for regions and a high quality just transition for workers.



The Spanish government achieved a historic agreement to close mines with the coal mining unions. €250 million was pledged to support a just transition through a variety of instruments. Although coal mines were required to close by the end of 2018, this win-win agreement successfully broke the deadlock. In addition, the ministry for ecological transition is obliging operators who want to close a coal plant to present a just transition plan for their workers before it authorises the closure.



Hungary is seeking two sources of European money to help. First, funds from the European carbon pricing scheme will help replace lignite with renewable and sustainable energy technologies, keeping the workforce and supply chains in place. Second, Hungary has also submitted a proposal for the affected regions' transition, including planning, re-skilling and implementing pilot post-mining landscaping and renewable energy projects that are based on the pre-existing lignite workforce.

## ✘ Policies that didn't work well



Greece is the first EU member state to establish a national 'just transition fund' using part of the public revenue from auctioning carbon allowances. The fund was set up with public consultation, and it seems there are no hidden, backdoor subsidies for lignite. However, the plan is still rather vague and the available funds insufficient for addressing the huge challenge of transforming the local economies.



There is a just transition plan for Upper Nitra, Slovakia's largest lignite region which was elaborated in a participatory way including local perspectives. An initiative connecting the local, regional, national and EU authorities agreed on the "Transformation Action Plan".



As part of the new EU Green Deal it was announced in December 2019 that "a proposal for a Just Transition Mechanism, including a Just Transition Fund, and a Sustainable Europe Investment Plan" will be agreed in January 2020. Also, the EU has set up a platform called "Coal Regions in Transition" for sharing best practice on just transition in coal regions, which has been useful for convening local stakeholders.



A clear weak point in the UK's coal phase-out is that there is no overriding transition plan. The only evidence of just transition policy is either by the companies (e.g. redeployed workers), or local government (e.g. retraining schemes).



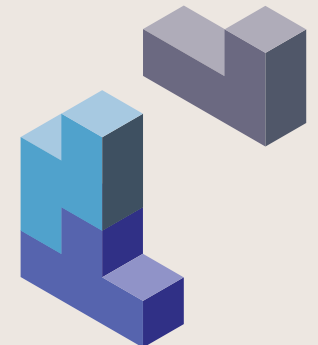
In France, some political will and public money is missing to transform the coal phase-out into an opportunity for region growth. The law also foresees a special support for workers and subcontractors. However, the budgetary transposition hasn't been decided yet.

## New hope for just transition in Romania's Jiu Valley

Six mayors from the historic mining region of Jiu Valley, Romania, [recently agreed](#) to work together on a transition from a coal-based economy to a diversified sustainable one. This commitment occurred during a meeting of the EU Commission's Platform for Coal Regions in Transition, for which the Jiu Valley is a priority region in 2019. [Decade-long efforts](#) precede this positive turn in the poverty-stricken recent history of the valley. Ion Barbu was one of the first to believe in its future. The local artist animated the community to stop the demolition of the local mine's buildings. He and his group put up exhibitions and theatre shows there. The documentary Planet Petrila (2016) shows the success and was screened at international film festivals.



Local artist Ion Barbu  
Photo: Adrian Catu



# Clean



## Wind and solar explicitly replaces coal

Wind and solar investment should be explicitly linked to closing coal plants. Only wind and solar give the full benefits of a coal phase-out in terms of jobs, investment, energy self-sufficiency, cheap energy, clean air, and reduced CO<sub>2</sub> emissions.

## ✓ Policies that worked well



The UK government is prioritising offshore wind. Policy stability has resulted in massive investment and collapsing prices. The latest offshore wind auction results were €50/MWh in 2019 prices. The Conservative government has pledged to increase offshore wind to 40GW by 2030. Even by 2025 when coal must be phased out, the UK will already be generating more from wind, solar and biomass than it ever did from coal. The UK's new nuclear plant will not help phase out coal: it will come online after coal is phased out.



The Dutch climate agreement sets a target to raise renewables electricity generation from 15% to 75% in only 12 years - from 2018 to 2030. The coal phase-out was announced at the same time that the renewables package was announced, envisioning an explicit coal to clean transition.



Germany has set a target to increase its renewable electricity from 35% in 2018 to 65% in 12 years - from 2018 to 2030. The target will be met primarily with onshore wind, offshore wind and solar. This share of renewables - if reached - would be enough to complement the current coal phase-out pathway, but not fast enough so that the phase-out could be accelerated.





The Spanish government approved the plan proposing an ambitious 74% of electricity is met from renewables in 2030, up from 38% in 2018. Because of this, the government envisages clean electricity replacing coal by 2030, forecasting near-zero coal capacity by 2030.





Portugal has an ambitious target of 80% from renewable electricity by 2030. This will easily enable the rapid phase out of coal by 2023 and lead to reduced gas power plant utilization by 2030. Solar is complementary to the reduced hydro generation during drought. The last solar energy auction yielded record low prices - bids averaged €20/MWh, with one bid as low as €15/MWh.

## ✘ Policies that didn't work well

 France's low coal generation will easily be met with new renewable capacity. Macron announced in 2018 that by 2030, the production of onshore wind farms will be tripled and the amount of solar photovoltaic multiplied by five.

 The EU has a target for 32% of all energy (not electricity) from renewables by 2030. This means almost doubling renewables in 13 years (in 2017, the EU achieved 17% of energy from renewables). This may need to be accelerated even further to respect the Paris Climate Agreement. The EU also requires every country to submit a "National Energy and Climate Plan" (NECP), which helps focus countries on speeding up their electricity transition from coal to clean.

 Onshore wind deployment is coming to a halt in Germany, threatening the coal phase-out. This is because a proposed change in planning law makes it very hard to approve any onshore wind farms. Even without this problem, a faster deployment would be needed if the coal trajectory is to be accelerated so that the phase-out comes earlier than the inadequate 2038 date.

 The Italian national energy strategy target is 55% of electricity from renewables by 2030, which includes building 30GW of solar. However, actions to build more wind and solar to displace coal generation, are so far lacking.

## One trillion dollars: The potential of offshore wind

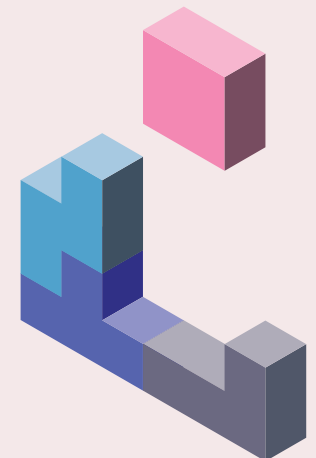
The International Energy Agency released a [report](#) in October 2019, saying global offshore wind investment could reach \$1 trillion to 2040. They project that EU capacity alone could rise from 20 GW today to 180 GW by 2040. The lobby group [WindEurope](#) say it could even reach 450 GW by 2050.

The latest auction prices in Europe continue to fall as the technology improves. General Electric [says](#) its latest turbine, the 12 MW Haliade-X (pictured), will achieve 63% utilisation in Europe's North Sea – higher than most fossil plants even achieve.

EU countries are counting on offshore wind not only to generate electricity to replace coal, but also to manufacture hydrogen to help decarbonise aviation, shipping and steel-making. The Danish company Ørsted is already planning a 5GW "offshore wind island," which includes the production of green hydrogen.



Haliade-X 12 MW prototype  
Photo: General Electric





# Direct



## Avoids a bridge into fossil gas or unsustainable biomass

It should avoid new gas or biomass plants - and especially the conversion of coal plants to gas, biomass or waste plants. The climate benefits are not what they promise: fossil gas production leaks methane, and biomass life-cycle emissions are far from zero.

## ✓ Policies that worked well



The gas bridge was initially a threat, but strong renewables growth means UK fossil gas generation will fall by 2025, even as coal is phased out. The UK's capacity market gives generous 15-year contracts to build new gas plants, but despite this, only 2 large gas plants have been announced to be built since 2014.



It seems a fossil gas bridge will be avoided in the Netherlands, as renewables growth should be strong enough to reduce gas generation by 2030, at the same time as phasing out coal.



The fossil gas bridge in Germany is expected to be small, although this is not certain. Some new gas peakers will be built, but the total volume of gas generation is not expected to increase. The gas peakers are being built both to cover gaps in wind and solar, and to ensure stability on local parts of the network.



The increase in fossil gas burn in 2019 from coal-gas switching in Spain should be temporary. It is not foreseen that new gas plants will be built or that old coal plants will be converted to gas.



The rate of renewables growth in Portugal should mean that the share of gas generation will reduce from 27% to near-zero by 2030.



The problem of coal in Finland is more with heat than electricity. 19% of district heating is from coal, compared to 7% of electricity. There is a risk, because of heat, that Finland walks into a biomass trap: in a business-as-usual scenario coal for heating would be covered mostly with biomass or fossil gas. Progress has started though: there is state funding available for "beyond burning" technologies to replace coal, and the government is revising energy taxation in order to make beyond burning technologies such as industrial-scale heat pumps, a more lucrative option.

## ✘ Policies that didn't work well



The UK government decided early to subsidise biomass - the Drax power plant alone will get €12 billion in subsidies over a decade, mostly for burning imported US wood pellets. But the costs of wind and solar have fallen so much since the contracts were signed that it's clear burning biomass is an expensive mistake.



Biomass is a large - and possibly growing - problem in the Netherlands. Four coal plants have been awarded €3.6 billion in subsidies to co-fire biomass with coal over 8 years. Co-firing under these contracts started in 2019. While the current government coalition agreement includes an end to new subsidies for coal to biomass projects, coal operators still propose to convert three of these same coal plants to fire only biomass.



Coal also plays a role in heating in Germany, and conversions of district heating systems from coal to gas are increasing gas consumption. However, there is an increasing focus on how these will be converted to burn non-fossil gas in the future - either hydrogen or biogas.



There is a big risk of a gas bridge in Italy: the phase out of coal so far has resulted in new authorisation requests for gas power plants, also supported by a lucrative capacity market which excludes renewable and storage technologies.



Coal plant owners in France - like in many countries across Europe - are pushing the government to pay them to convert their plants to biomass. Although the government is less keen, this lobbying pressure still means there is a considerable threat of a biomass bridge. EDF claims to work on a biomass conversion plan for the Cordemais coal plant; it is unclear what EPH plans with the two coal plants it recently acquired from Uniper.



There is a big threat of a fossil gas bridge in Greece. One new 826 MW plant has been inaugurated and is expected to come online in 2021; there are plans for at least 1-2 more plants. There are several interests pushing for the conversion of Ptolemaida 5 (PPC's new lignite power plant expected to come online in 2022) to a biomass plant using imported fuel.

## What's with the gas?

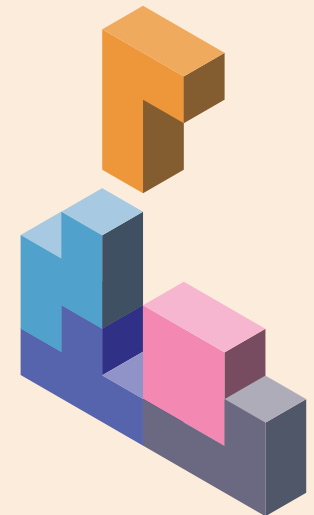
One could be mistaken for thinking Europe is in a gas boom. Russia is building a new pipeline, Nordstream 2 (pictured), whilst the US is boasting about stepping up LNG exports.

But this extra won't be burnt in the power sector, because Europe is building very few new gas power plants. In the 5 years from 2016 to 2020, 8GW will have been built, compared to 20GW in the US in 2018 alone.

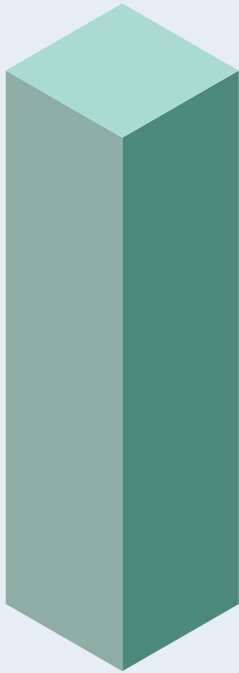
The economics for new gas plants just don't stack up. First, the future utilisation will be too low, as more wind and solar come online. Second, the requirement to completely decarbonise means even low-utilisation gas plants may be prevented from running in the future. Third, financing is harder; for example, the European Investment Bank (EIB) has just changed its rules that prevent any investment into fossil infrastructure.



Installation of Nord Stream 2 pipeline  
Photo: Bernd Wuestneck/dpa (AP)



# Reliable



## Keeps the lights on

It should maximise investment into electricity storage, interconnectors and demand response. Gas peakers should be built only by exception and only if there is a larger plan underway to build enough renewables that their utilisation is minimised.

## ✓ Policies that worked well



The UK has a capacity market, so there have been few concerns about “keeping the lights on” as coal plants have closed. The capacity market has funded over 10GW of new capacity - some fossil (two big gas plants and lots of small gas plants), but mostly interconnectors, demand response and storage. These investments have enabled coal plants to quickly close without risking the lights going out.



The Netherlands are investing heavily in new forms of flexibility, like demand-side response, a wind offshore strategy for the North Sea, new interconnectors with UK, Germany, Belgium and Denmark, hydrogen, and storage.



German network companies are proactively engaged in the transition. Hydrogen is increasingly seen as a preferable solution to fossil gas.



Spain has an overcapacity of about 40%, so there are no concerns currently on keeping the lights on as coal closes. Indeed, the grid operator showed that 5GW of coal capacity could easily be retired from the system today, out of the 10GW operational.



The Portuguese grid operator has started the procedures to build two new high voltage lines, anticipating the closure of one of the coal plants. These lines will keep the lights on when the coal plant closes.



The EU has prevented countries paying “capacity contracts” to subsidise uneconomic coal plants. In the UK, coal plants were paid to keep the lights on, slowing the closure of coal plants, and in Poland 15-year contracts are even planned to encourage new coal plants. The EU therefore brought in a law that - using an emissions performance standard of 550 gCO<sub>2</sub>/kWh - will prevent capacity contracts being paid to coal plants from 2025.

## ✘ Policies that didn't work well



The major flaw of the UK capacity mechanism is that coal power plants will get payments until 2022. These will total €600 million from 2017 to 2021. These crowd out capacity investments to help replace coal. The problem is eventually being addressed: an emissions performance standard will eventually be introduced to avoid payments to coal after 2022.



In Spain, there seems to be no coherent plan to maximise the deployment of storage, interconnection, and demand response. These will be needed to complete the coal phase-out.



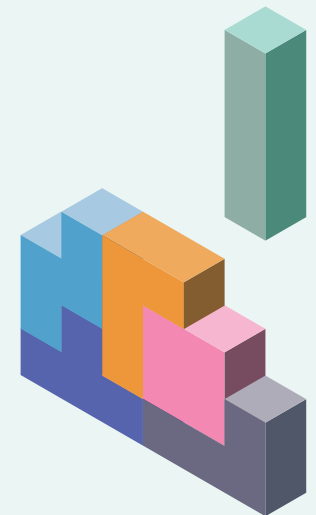
Although Italy's capacity market is designed to keep the lights on but could create a dash for gas. It is designed in a way to encourage new fossil gas plants and does not give enough opportunities to storage and other technologies.

## Retired coal plants could become the home of next generation energy storage.

Siemens Gamesa recently inaugurated the first storage facility using [volcanic rocks](#) (cold lava) as a medium. The 1,000 tons of rock are capable of storing heat, which is injected via hot air generated from renewable energy. When electricity demand peaks, the rocks can back-stream the stored energy using a steam turbine. With this, many parts of old thermal power stations, like turbines, can be put to new use, saving jobs at the same time. Other institutions are doing research on similar post-lithium storage materials, e.g. the German Aerospace Center is testing [liquid salt](#) as energy storage in a test facility.



Thermal energy storage TESIS  
Photo: DLR (CC-BY 3.0)



# Economic



## Coal should pay a carbon price

Carbon pricing is a useful policy to help phase out coal but should never be the only policy. A higher carbon price will accelerate closures, but by itself will not guarantee all coal plants will close. Carbon tax revenues can help finance the transition and reduce fuel poverty. This necessitates a full “polluter pays” approach, so coal plants should not get free allocations.

## ✓ Policies that worked well

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There is a single carbon market across the whole of Europe (EU-ETS), where every coal power plant - and other big emitter - must purchase an allocation for every tonne of CO<sub>2</sub> they emit. The market was reformed in 2017, and only following this did price rise to a reasonable level of €15-€30 per tonne. The price in 2019 of around €25/tonne impacted coal power plants in three ways. First, it meant coal was more expensive to burn than gas throughout 2019. Second, it has stripped away profitability, making an estimated 4 out of 5 coal plants uneconomic in Europe in 2019. Third, it means wind and solar can often compete without subsidies, encouraging governments to substantially scale-up wind and solar ambitions.
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Additional to the EU-ETS, the UK implemented a carbon tax on power generation. The tax was £5/t in 2013, rising to £18/t by 2015 (around €6/MWh rising to €20/MWh). With the EU-ETS price, this means a total carbon price for power plants of over €40/tonne. This accelerated the electricity transition by speeding up the closure of coal plants and making new offshore wind policies cheaper.
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The German coal commission has recommended cancelling permits from the EU carbon market, as coal is phased out. This should prevent the situation that the German phase-out causes oversupply and reduces carbon price.
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The Dutch coalition agreement includes a minimum carbon price of €18/tCO<sub>2</sub> in 2020 €43/tCO<sub>2</sub> by 2030. This means even if the EU-ETS price collapses, the Dutch carbon price will not collapse. This was announced alongside the coal phase-out and renewables plan, providing a solid 3-point plan for the electricity transition.
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In 2018, Portugal introduced a levy on the use of coal for electricity production, which will be gradually phased in. This single-fuel tax isolates coal and means a faster coal phase-out is inevitable.



## ✘ Policies that didn't work well



The EU-ETS, which was set up in 2005, had a very slow start and was largely ineffective for over a decade. Until 2017, carbon price was mostly well below €10/tonne, doing little to reduce emissions. Policy makers have struggled to set a framework to give a meaningful carbon price. Until 2013, coal power plants were given free allocations for most of their needs, which encouraged them to stay open; and even from 2013 to 2020 there is a fund (Article 10C) where carbon allocations were perversely given for free and could be even be used for investments in coal plant upgrades.



A minimum carbon price was promised in the Dutch coalition agreement. The level being implemented now is much lower than what was announced and is even lower than the ETS price: €12/tCO<sub>2</sub> in 2020 €32/tCO<sub>2</sub> by 2030. The Dutch government determined this was the level necessary to hit 2030 electricity sector targets.



The German coal commission did not provide a definitive recommendation for carbon pricing, so the German government decided to rely only on the EU-ETS. If the EU carbon price collapses, then the coal phase-out in Germany may be harder than expected.

## Collapsing coal economics

In October 2019, Carbon Tracker Initiative released research showing 79% of EU coal generators were loss-making in 2019, in a report entitled "[Apocoalypse Now](#)". They said, "owing to relentless competition from ever lower cost wind, solar, batteries and demand response, coupled with a preponderance of inexpensive gas, these losses could be sustained for the foreseeable future".

They continue to say "we now believe that EU policymakers should actively prepare for no hard coal or lignite power generation by 2030. This situation, and the political response to it, will have implications for investors. If some governments remain pro-coal over the long-term, they will be forced to choose between destroying shareholder value, depleting fiscal resources or undermining economic competitiveness".



Matthew Gray, lead author of the "Apocoalypse Now" report  
Photo: Carbon Tracker



# Healthy



## Closes dirtiest plants first

Dirtiest coal plants should close first, to realise immediate health benefits. This could be done through tightening pollution limits, although those should encourage closure, rather than further investment into dirty coal plants.

## ✓ Policies that worked well



The EU has a process of tightening air pollution standards, which forces the dirtiest coal plants to invest or close. The EU's Industrial Emissions Directive has a "best reference" (BREF) policy, where standards are updated every seven years. In 2021, SO<sub>2</sub> and NO<sub>x</sub> limits will tighten substantially, with which many plants across Europe will not be able to comply. This means utilities must choose: do they invest more money into old coal plants, or do they close them?



Many UK coal plants had to make an "invest or close" decision in 2015 and 2016. But because the government had already signalled a coal phase-out for 2025, and other measures like a high carbon price were in force, no new investment was made by the utilities, and the existing dirty coal plants were closed.

## ✘ Policies that didn't work well



The German coal commission did not provide a recommendation to tighten the pollution limits. In 2009, German coal plants had some of the tightest pollution limits in the world. But as technology developed, pollution limits have remained unchanged. Germany is dragging its feet with even transposing the basic EU standards into law. The dirtiest two coal companies in Europe are RWE and EPH, which is due to their lignite plants in Germany. RWE's plants are in a particularly densely populated region, with 46 million people living within 200 km of their main mine.



The EU allowed coal plant investment "subsidies" through their emissions trading scheme (EU-ETS). Poland and Czech Republic transferred "free permits" from the EU-ETS to coal plant operators, conditional on investment upgrades, especially relating to meeting tightening pollution limits. This subsidy changed the economics of "invest or close", and undoubtedly led to old coal plants deciding to invest, rather than closing.



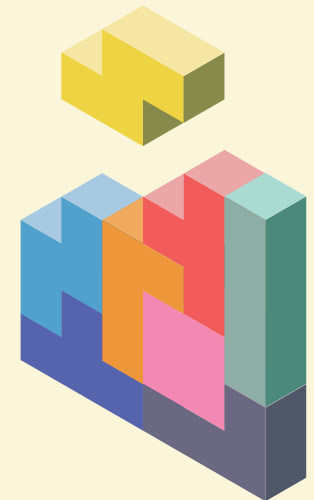
Decision-makers in Greece had a very "creative" way of interpreting EU limits and granted a derogation to Amyntaio – one of the dirtiest coal plants in the EU. The decision was to extend an existing hours derogation from 17,500 hours to 32,000, against the intention of the EU law.

## No life-extension for Mallorca's dirty coal plant

[Josep Vich](#) grew up in Alcudia, Mallorca, and believes the sinus and asthma problems he has suffered throughout his life relate to air pollution from the one power plant on the island and dust from the coal that feeds it. The coal is shipped in and brought with trucks to the plant. "When I was a child, I remember people repeatedly complained that when someone sneezed in a tissue, black matter came out." In 2019, the operator of the power plant and the local and central governments struck a deal to reduce operating time and close the last units by 2025. This comes after intentions had been voiced to upgrade the plant to meet new EU pollution standards which would have significantly prolonged the lifetime of the plant.



Local resident Josep Vich  
Photo: Greg McNevin / Europe Beyond Coal



# Smart



## Avoids pay-off for closure

It should not use tax-payers money to pay polluting assets to close. This would reward fossil companies for bad decisions and create perverse incentives, slowing the transition and making a phase-out unnecessarily expensive. Governments should also be careful not to subsidise coal through capacity mechanisms or expensive balancing contracts.

## ✓ Policies that worked well



The UK has avoided a pay-out for utilities because coal plants are uneconomic and are likely to close well before the 2025 deadline. Three key policies helped to influence the economics of coal plants in the UK: a significant carbon price, the fall in electricity prices and coal plant utilisation because of renewables growth and tightening pollution limits.



The Dutch phase-out law will "prevent coal being burnt" from 2030, so coal plants are not explicitly forced to close. The Dutch government says this means no compensation needs to be paid. Although two of the three coal operators are already signalling they will take the government to court to demand compensation, it is doubtful that they will be successful.



No compensation is to be paid in Finland. The energy companies wanted to have compensation but the Finnish constitutional law committee, in a significant ruling, decided that "companies and other traders cannot reasonably expect the legislation governing their business to remain unchanged".

## ✘ Policies that didn't work well



The German coal commission agreed utilities should be paid to close plants and mines, even though the public sees it increasingly as a waste of taxpayer money. Lignite operators will agree a package with the Federal government. Hard coal plants will enter an auction to close in the mid-2020s. Given the poor economics of both lignite and hard coal, offering compensation might be incompatible with EU state aid law.



It seems the bad policy precedent from Germany is spreading to other countries: the owner of the Hungarian lignite power plant that will have to close is demanding compensation, referring to the German coal phase-out.

## Germany: the public pays to close coal?

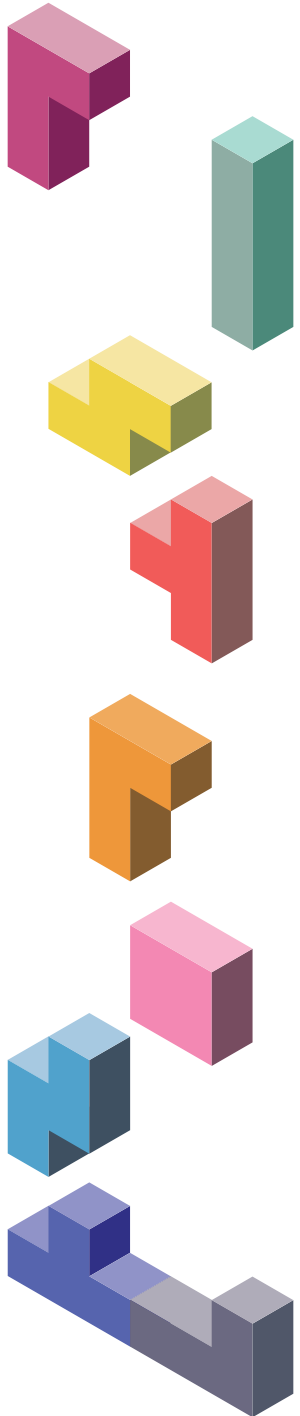
In 2015, the German economy and energy minister Sigmar Gabriel agreed to make big payments to coal plants in return for them stopping to burn lignite, to cut CO<sub>2</sub> emissions to meet climate obligations. From 2016 to 2022 €1.6 billion will be paid to keep 8 lignite power plants in a reserve. They so far have not been required to run once. The "lignite reserve", as it was known, was always seen as a backdoor to pay compensation to coal plants, funded from electricity consumers.



German minister Sigmar Gabriel  
Photo: Imago/Marius Schwarz







# Solving the coal puzzle

Lessons from four years of coal phase-out policy in Europe

December 2019

**Written and researched by:** Over 20 experts on coal phase-out policy across 10 European countries helped to input into this report. We'd like to give a huge thanks to all these individuals. Their inputs were collated and edited by Elena Bixel at Europe Beyond Coal and Dave Jones at Sandbag.

**Graphic design by:** Designers for Climate



Sandbag is a London-based climate think tank specialising in using data and policy to show how countries can swiftly transition from coal to clean energy.

[www.sandbag.org.uk](http://www.sandbag.org.uk)



Europe Beyond Coal is an alliance of civil society groups working to catalyse the closures of coal mines and power plants, prevent the building of any new coal projects and hasten the just transition to clean, renewable energy and energy efficiency. Our groups are devoting their time, energy and resources to this independent campaign to make Europe coal free by 2030 or sooner.

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