

# Aberthaw Power Station

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"It cannot be satisfactory for an advanced economy like the UK to be relying on polluting, carbon intensive 50-year-old coal-fired power stations"

Amber Rudd, Secretary of State for Energy





## Executive Summary

Aberthaw power station is an environmentally catastrophic coal-fired power station. Now 45 years old, its pollution likewise belongs in a different era. Aberthaw is a profoundly polluting power plant that emits enormous amounts of toxic pollution and vast quantities of greenhouse gases.

It is the third-largest point source of toxic nitrogen oxides (NO<sub>x</sub>) in Europe<sup>1</sup>, with emissions well in excess of EU Directives. NO<sub>x</sub> are a group of toxic gases that are harmful to ecosystems and human health. As a result of these emissions – exceeding legal limits since at least 2008<sup>2</sup> – it is currently the subject of legal proceedings lodged by the European Commission with the European Court of Justice<sup>3</sup>.



Ffos-y-fran opencast coal mine, Merthyr Tydfil, Wales

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1 [http://www.airclim.org/sites/default/files/acidnews\\_pdf/AN2-14.pdf](http://www.airclim.org/sites/default/files/acidnews_pdf/AN2-14.pdf) p.23

2 <http://www.bbc.co.uk/news/uk-wales-south-east-wales-32077196>

3 [http://europa.eu/rapid/press-release\\_IP-15-4670\\_en.htm](http://europa.eu/rapid/press-release_IP-15-4670_en.htm)

Aberthaw pumps out up to 8.5 million tonnes of carbon dioxide (CO<sub>2</sub>) annually, making it responsible for 17% of Wales' greenhouse gas emissions. Its continued operation would mean Wales will almost certainly fail to meet the Welsh Government target of a 40% reduction in emissions by 2020.

Aberthaw is a major emitter of mercury (Hg), with a 0.6% share of UK emissions. The Water Framework Directive requires the cessation of discharges of priority hazardous substances (of which mercury is one) into water<sup>4</sup> by 20 November 2021. It is difficult to see how Aberthaw will comply with this requirement.

Aberthaw is almost always the main reason cited by developers to justify opencast coal mine planning applications across southern Wales. These mines supply 60-65% of the coal burned at Aberthaw. Opencast coal mining is itself environmentally destructive and universally opposed by local communities on account of the visual impact, disruption, dust, noise and light pollution.

The Welsh Government keeps no record of the amount of fossil fuels extracted in Wales, nor the associated climate impact. This should be corrected immediately to help inform the Welsh public.

Aberthaw power station will close in less than 9 years' time as a result of UK Government energy policy. However the Welsh Government has had no discussions with the operator of Aberthaw power station as to its closure, nor has any discussion taken place at Cabinet about the closure of Aberthaw or retraining or other assistance to the power station workers to find alternative work.

Weighing up the costs and benefits of Aberthaw shows that it places a net annual cost to society in the UK of £80 million. For Wales, the net annual cost to society of the existence of Aberthaw power station is a shade over £400 million.

On no account does Aberthaw benefit society: the pollution load far exceeds any benefit of electricity generation and employment. For Wales, the costs are overwhelming.

Aberthaw has lost its social licence to operate. The Welsh Government should petition the UK Government to regulate for its closure at the earliest possible opportunity.

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<sup>4</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001D2455&from=EN>

## Aberthaw power station overview



Aberthaw Power Station & Cooling Water Shaft - CC Ben Salter

Aberthaw is a coal-fired power station situated in the Vale of Glamorgan, near Barry Island, on the north bank of the Bristol Channel. The station is 45 years old. Built to a 1960s design, it began full operation in 1971. It has 3 boilers and 3 electrical generators which have a generation capacity of 1,690 MW (1.69 GW).

The plant was designed to burn low volatility, semi-anthracite coal and has boilers adapted for this task. A high proportion of this coal is sourced locally, mined in South Wales and transported to the plant by rail. The remainder is imported by ship into Avonmouth docks and transported to Aberthaw by rail.

The plant is currently owned and operated by RWE Npower, a UK energy company that is a subsidiary of the RWE Group, one of Europe's largest power companies. It provides employment for approximately 290 permanent employees<sup>5</sup>.

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<sup>5</sup> <https://www.rwe.com/web/cms/mediablob/en/1575016/data/97770/1/rwe-npower/about-us/RWE-in-Wales.pdf>



# Environmental and health impacts

## 1. Nitrogen oxides

Aberthaw power station emits huge quantities of nitrogen oxides.  $\text{NO}_x$  is a generic term for the mono-nitrogen oxides NO (Nitric Oxide/Nitrogen Monoxide), and  $\text{NO}_2$  (Nitrogen Dioxide).

Many chemical varieties of nitrogen oxides ( $\text{NO}_x$ ) exist, but the air pollutant of most interest from the point of view of risk to human health is nitrogen dioxide. Emissions of oxides of nitrogen are a key cause of  $\text{NO}_2$  concentrations<sup>6</sup>.

Nitrogen dioxide is toxic to humans when inhaled. Short-term exposure to  $\text{NO}_2$  has direct effects on respiratory morbidity<sup>7</sup>. Inhalation of higher than average environmental levels of nitrogen dioxide or nitrogen monoxide can cause respiratory problems and exacerbate existing respiratory illnesses such as asthma. Studies have shown associations of  $\text{NO}_2$  in outdoor air with adverse effects on health, including reduced life expectancy. Long-term exposure to  $\text{NO}_2$  is associated with respiratory and cardiovascular mortality, children's respiratory symptoms and impaired lung function<sup>8</sup>.



$\text{NO}_x$  causes acid rain

<sup>6</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460401/air-quality-econanalysis-nitrogen-interim-guidance.pdf) p.1

<sup>7</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/411756/COMEAP\\_The\\_evidence\\_for\\_the\\_effects\\_of\\_nitrogen\\_dioxide.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411756/COMEAP_The_evidence_for_the_effects_of_nitrogen_dioxide.pdf)

<sup>8</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/411756/COMEAP\\_The\\_evidence\\_for\\_the\\_effects\\_of\\_nitrogen\\_dioxide.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411756/COMEAP_The_evidence_for_the_effects_of_nitrogen_dioxide.pdf)

NO<sub>2</sub> also contributes to the formation of secondary particulate aerosols and ozone (O<sub>3</sub>) in the atmosphere, both of which are important air pollutants due to their adverse impacts on human health<sup>9</sup>.

Aberthaw power station pumps out very large volumes of NO<sub>x</sub>; in the first 6 months of 2015 it emitted 15,728 tonnes<sup>10</sup>. The annual emissions of NO<sub>x</sub> from Aberthaw run at around 32,000 tonnes.

For the purposes of monitoring and compliance, regulations apply to the concentration of NO<sub>x</sub> emissions rather than the absolute mass. Aberthaw power station is currently emitting NO<sub>x</sub> at around 900 mg/Nm<sup>3</sup> (its legal limit under UK regulations is 1,200 mg/Nm<sup>3</sup>, although this limit is itself not compliant with European Directives). As from 1 January 2016 the limit on NO<sub>x</sub> emissions set by the Industrial Emissions Directive is 150mg/Nm<sup>3</sup>.

It is this failure to comply with European limits on NO<sub>x</sub> pollution that has seen the UK Government summonsed to the European Court of Justice where it is defending its decision to allow extraordinary pollution from Aberthaw power station.

In order to comply with the new NO<sub>x</sub> limit, the power station would probably need to be retrofitted with Selective Catalytic Reduction, at a cost in the region of \$200 million<sup>11</sup>. Clearly for a power station with a maximum life expectancy of less than 9 years, investment of this scale is unattractive to the operators. At a seminar on the Industrial Emissions Directive, RWE maintained that Selective Catalytic Reduction, which could bring Aberthaw within compliance, is “not considered economic”<sup>12</sup>.

Environmental concerns with nitrogen oxides include direct effects and the formation of daughter products. NO<sub>x</sub> in the atmosphere is captured by moisture to form acid rain<sup>13</sup>. Acid rain has adverse effects on aquatic ecosystems and damages forests, crops and other vegetation<sup>14</sup>. It is also detrimental to built structures.

Daughter products include various nitrates, which are a known factor in eutrophication of bodies of water<sup>15</sup>. Eutrophication can lead to algal blooms, causing the death of other plants and ultimately hypoxia of lower strata of water bodies. This can render water uninhabitable for both animals and plants. Between 12% and 44% of nitrogen loading of coastal water bodies comes from the air<sup>16</sup>.

9 <http://www.eea.europa.eu/data-and-maps/indicators/eea-32-nitrogen-oxides-nox-emissions-1>

10 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/454017/2015\\_SO2\\_NOx\\_return\\_jun15.xlsx](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454017/2015_SO2_NOx_return_jun15.xlsx)

11 [http://www3.epa.gov/ttnecas1/models/SCRCostManualchapter\\_Draftforpubliccomment6-5-2015.pdf](http://www3.epa.gov/ttnecas1/models/SCRCostManualchapter_Draftforpubliccomment6-5-2015.pdf) p.62

12 [http://www.coalresearchforum.org/presentations/sep11/14%2010%20-%2014%2040%20Ian%20Rodgers\\_The%20implications%20of%20the%20IED%20for%20a%20Power%20Generator%20circulated%20-%20updated%20\[Compatibility%20Mode\].pdf](http://www.coalresearchforum.org/presentations/sep11/14%2010%20-%2014%2040%20Ian%20Rodgers_The%20implications%20of%20the%20IED%20for%20a%20Power%20Generator%20circulated%20-%20updated%20[Compatibility%20Mode].pdf)

13 <http://www3.epa.gov/ttnecat1/dir1/fnoxdoc.pdf>

14 <http://www.eea.europa.eu/data-and-maps/indicators/eea-32-nitrogen-oxides-nox-emissions-1>

15 <http://www3.epa.gov/ttnecat1/dir1/fnoxdoc.pdf>

16 Nitrogen Oxides: Impacts on Public Health and the Environment, EPA 452/R-97-002

## 2. Carbon dioxide

Carbon dioxide (CO<sub>2</sub>) is the greenhouse gas (GHG) that makes the biggest contribution to global warming and climate change. Coal fired power stations are massive emitters of CO<sub>2</sub> and Aberthaw is no exception, with emissions of 8.5 million tonnes in 2013<sup>17</sup>. Although carbon reduction programs in the EU and the UK are helping to reduce CO<sub>2</sub>, there are currently no ceiling level constraints on CO<sub>2</sub> production for existing power plants. The Emissions Performance Standard has been introduced for new plants only.

Utilities must pay a fee for CO<sub>2</sub> emissions via the Carbon Floor Price. This tax almost doubled in the latest increase (April 2015)<sup>18</sup> to £18.08 per tonne, still considerably lower than the social cost of carbon.

If Aberthaw is allowed to continue to operate for the full term indicated by the UK Government's statement on the future of coal-fired power stations it would emit CO<sub>2</sub> unabated for the next 7-9 years. That would be anywhere between 59.5 million tonnes and 76.5 million tonnes of CO<sub>2</sub>. This would have a severe impact on the emissions profile of Wales, and would mean almost certain failure to meet the 2020 target of a 40% reduction in CO<sub>2</sub>. In 2013, Aberthaw was responsible for 17% of Wales' greenhouse gas emissions<sup>19</sup>.

The UK Government's announced coal phase-out by 2025 is itself a response to the need to meet legally-binding carbon targets under the Climate Change Act 2008. The Committee on Climate Change has recommended that to meet carbon budgets, unabated coal must be phased out by the early 2020s.

Although carbon capture and storage (CCS) is a technically possible method of curtailing the CO<sub>2</sub> emissions from coal-fired power stations, the current solutions are exorbitantly expensive. Indeed there is no obvious location of storage for carbon dioxide captured at Aberthaw. Were CCS to be installed, pipeline transfer of the captured gas would need to take place to suitable geological storage, rendering the whole process economically and energetically ludicrous. In any case, the UK Government has recently closed the £1 billion CCS fund<sup>20</sup>, rendering the prospect of CCS at Aberthaw obsolete.

A small, trial Carbon Capture system was fitted to the Aberthaw plant in 2010. It operated for a year and captured just 1 tonne of CO<sub>2</sub><sup>21</sup>. The equipment was dismantled immediately afterwards. The initial cost of the proposed 1MWe Carbon Capture pilot plant with no storage/sequestration overheads was £8.4 million<sup>22</sup>. A slightly larger 3 MWe facility was eventually fitted<sup>23</sup>, designed to capture just 0.2% of the power station's CO<sub>2</sub> emissions.

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17 [http://awsassets.panda.org/downloads/dirty\\_30\\_report\\_finale.pdf](http://awsassets.panda.org/downloads/dirty_30_report_finale.pdf)

18 <http://www.theguardian.com/environment/2015/apr/02/carbon-floor-price-hike-will-trigger-uk-coal-slowdown-say-analysts>

19 8.5 million tonnes from the total of 50.76 million tonnes [http://uk-air.defra.gov.uk/assets/documents/reports/cat07/DA\\_GHGI\\_1990-2013\\_Report\\_v1.pdf](http://uk-air.defra.gov.uk/assets/documents/reports/cat07/DA_GHGI_1990-2013_Report_v1.pdf)

20 <http://www.theguardian.com/environment/2015/nov/25/uk-cancels-pioneering-1bn-carbon-capture-and-storage-competition>

21 <http://www.businessgreen.com/bg/news/2237192/rwe-npower-hails-first-tonne-of-carbon-captured-at-wales-plant>

22 <http://www.rwe.com/web/cms/en/110504/rwe/investor-relations/news/news-ad-hoc-statements/?pmid=4001863>

23 <http://www.rwe.com/web/cms/en/97594/rwe-npower/about-us/our-businesses/power-generation/aberthaw/>

### 3. Mercury

Aberthaw is one of the UK's biggest emitters of mercury, with around 36kg emanating from the power station in 2014<sup>24</sup>. This is 0.6% of the entire mercury emissions of the UK<sup>25</sup>. Mercury and mercury compounds are discharged to the Channel and also end up in the post combustion ash (coal ash and fly ash) that is stored onsite.

There is a European and global focus on reducing mercury emissions through the Minamata Convention and the Water Framework Directive requirement to cease discharges of priority hazardous substances (of which mercury is one) into water<sup>26</sup> within 20 years of their adoption at Community level<sup>27</sup>. In the case of mercury, this means by 20 November 2021.

Coal combustion is responsible for 46% of total global atmospheric emissions of mercury and compounds of mercury from human activities<sup>28</sup>, with over half of this contribution arising from coal combustion in thermal power plants and industrial boilers<sup>29</sup>. Although coal contains only small concentrations of mercury, it is burnt in very large volumes.

The industry's best available technology for suppressing mercury emissions is Activated Carbon Injection (ACI), which reduces emissions by as much as 95%. Aberthaw has been required to fit ACI to deal with its mercury emissions<sup>30</sup>, if Selective Catalytic Reduction is fitted.

Aberthaw power station discharges mercury into the Bristol Channel. The discharge figures are currently below the emission value maximum, but no discharge is permitted into water beyond November 2021.

Mercury is considered by the World Health Organisation (WHO) as one of the top ten chemicals or groups of chemicals of major public health concern. Mercury is an accumulative toxin, both in elemental and compound form. Once in the environment, mercury can be transformed by bacteria into methylmercury ( $\text{CH}_3\text{Hg}^+$ ). Methylmercury then bioaccumulates in fish and shellfish – which is to say, the substance accumulates faster than the organism can eliminate it, such as through excretion. Methylmercury also 'biomagnifies': large predatory fish, for example, are more likely to have high levels of mercury as a result of eating many smaller fish that have acquired mercury through ingestion of plankton.

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24 Jacobs, *Evaluation of metal levels in the sediment, flora and fauna in the vicinity of the outfalls at Aberthaw*, August 2015

25 36kg of 6,119kg [http://naei.defra.gov.uk/overview/pollutants?view=summary-data&pollutant\\_id=15](http://naei.defra.gov.uk/overview/pollutants?view=summary-data&pollutant_id=15)

26 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001D2455&from=EN>

27 [http://ec.europa.eu/environment/water/water-dangersub/pri\\_substances.htm#list](http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm#list)

28 IEA, Legislation, standards and methods for mercury emissions control, April 2012, <http://www.iea-coal.org.uk/documents/82897/8418/Legislation,-standards-and-methods-for-mercury-emission-control,-CCC/195>

29 IEA, Legislation, standards and methods for mercury emissions control, April 2012, <http://www.iea-coal.org.uk/documents/82897/8418/Legislation,-standards-and-methods-for-mercury-emission-control,-CCC/195>

30 Lesley James, pers. Comm. October 2015



Particulate and methylmercury are toxic to the central and peripheral nervous systems. Exposure to mercury – even small amounts – may cause serious health problems, and is a threat to the development of the child in utero and early in life<sup>31</sup>. People are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain the compound. Cooking does not reduce or eliminate mercury from food.

Generally, two groups are more sensitive to the effects of mercury. Foetuses are most susceptible: consumption by an expectant mother of contaminated fish and shellfish can adversely affect a baby's growing brain and nervous system. The primary health effect of methylmercury is impaired neurological development. Therefore, cognitive thinking, memory, attention, language, and fine motor and visual spatial skills may be affected in children who were exposed to methylmercury as foetuses. The second group is people who are regularly exposed (chronic exposure) to high levels of mercury, such as populations that rely on subsistence fishing or people who are occupationally exposed<sup>32</sup>.

## 4. Ash

Coal ash, also referred to as coal combustion residuals, is produced primarily from the burning of coal in coal-fired power plants. Coal ash includes a number of by-products produced from burning coal, including:

- Fly Ash, a very fine, powdery material composed mostly of silica made from the burning of finely ground coal in a boiler.
- Bottom Ash, a coarse, angular ash particle that is too large to be carried up into the smoke stacks so it forms in the bottom of the coal furnace.
- Flue Gas Desulphurisation Material, a material leftover from the process of reducing sulphur dioxide emissions from a coal-fired boiler that can be a wet sludge consisting of calcium sulphite or calcium sulphate or a dry powdered material that is a mixture of sulphites and sulphates.
- The coal ash that remains after burning the coal is contaminated with toxic heavy metals, including mercury and cadmium, as well as Polycyclic Aromatic Hydrocarbons (PAHs)<sup>33</sup> and dioxins. The on-site ash dump area used by Aberthaw will remain so contaminated that the land could be sterile for many years into the future. Disposal of the mounds of coal ash creates serious risks to human health.

31 WHO, 'Mercury and health' factsheet, September 2013, <http://www.who.int/mediacentre/factsheets/fs361/en/>

32 <http://www.who.int/mediacentre/factsheets/fs361/en/>

33 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/297003/geho0209bpin-e-e.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297003/geho0209bpin-e-e.pdf) p.26

Opencast mining operations are always contentious and almost universally unpopular with local communities on account of the significant impacts, including dust, noise, lighting and visual impact. To add insult to injury, several opencast sites have not been filled-in or restored in southern Wales, leading in some cases to hazardous voids or water-filled pits<sup>34</sup>.

Opencast, or surface, coalmines are a very different breed of coalmine from the typical mines historically associated with Wales. These were deep mines where a shaft was sunk down to the coal seams and all the work was carried out below ground. Opencast or surface mining entails removing all the earth covering the coal seams, storing it in huge spoil tips, and extracting the coal from above with massive machinery.

With deep mines, the people who were at risk and suffered the noise and dust of mining were the workers themselves; the local community were only indirectly affected. With opencast mining, this has been turned on its head. The local communities are impacted directly by the mining operation, with massive earth moving machinery working in close proximity to the community.

Aberthaw power station is the key driver of opencast coal mining in Wales. The main market for coal in southern Wales is power generation at Aberthaw<sup>35</sup>. It is almost always the main reason cited by developers to justify opencast mine planning applications<sup>36,37,38,39</sup>.

39 Bwlch Ffos: "The coal sourced from Bwlch Ffos is high volatile material that is used solely at the Unity Mine site to the north of Bwlch Ffos. The high volatile material is required to be mixed with the lower volatile anthracite coal that is currently won from Unity Mine. This blending is important to achieve the required specification for the Aberthaw Power station which provides a significant proportion of South Wales with its energy. The lower volatile coal would not be suitable specification for Aberthaw without the Bwlch Ffos material" Final Planning Statement for application P2012/0333, available from [planning.npt.gov.uk](http://planning.npt.gov.uk)



Wagons loaded from Tower Colliery for Aberthaw Power Station - CC Train Photos

The converse is used to justify the continuance of the power station<sup>40,41</sup>. Aberthaw's operators have publicly stated that:

*“The power station was specifically designed and built to burn low volatile Welsh coal, using technology specific to Aberthaw. Welsh coal is therefore the preferred option over imported coal and is necessary for the long term future of Aberthaw power station as it offers a secure, reliable and competitively priced fuel source. The future of the Welsh coal mining industry and Aberthaw power station are therefore dependent upon this symbiotic relationship”<sup>42</sup>.*

And the Planning Inspector recommending approval for the leviathan Ffos-y-Fran opencast mine stated:

*“[Aberthaw Power Station’s] continued success is inextricably linked to that of the South Wales coal industry and vice versa”<sup>43</sup>.*

40 For Tower opencast: "Letters of support have been received from Aberthaw Power Station and from the Coal Authority" <http://www2.rctcbc.gov.uk/en/councildemocracy/democracyelections/councillorscommittees/meetings/developmentcontrolcommittee/2011/06/30/reports/applicationno10-0292-10-towercolliery,rhigosroad,hirwaun.pdf>

<sup>41</sup> For Ffos-y-Fran: “It is of ideal quality for the Aberthaw Power Station, its intended market, and the owners of that power station have written to support the scheme” [http://www.assembly.wales/committee%20documents/pdc\(2\)%202005-2%20-%20ffos%20y%20fran%20-%20inspector's%20report-03022005-11518/n0000000000000000000000000028288-cymraeg.pdf](http://www.assembly.wales/committee%20documents/pdc(2)%202005-2%20-%20ffos%20y%20fran%20-%20inspector's%20report-03022005-11518/n0000000000000000000000000028288-cymraeg.pdf)

42 <https://democracy.npt.gov.uk/documents/s14254/28%204%2015%20-%20SECTION%20A%20-%20P2012%201073%20East%20Pit.pdf>

[illegible]





Two further opencast coal mines seeking to supply coal to Aberthaw are currently at various stages of the planning process. The 6-million tonne Nant Llesg proposal was rejected by Caerphilly Council in August 2015, but the applicant, Miller Argent, is appealing the decision. The Varteg proposed surface mine near Torfaen was rejected by both Torfaen Council and the Welsh Government upon appeal, but the applicant has recently re-applied.

It should also be noted that the Welsh Government keeps no record of the amount of fossil fuels extracted in Wales, nor the associated climate impact<sup>54</sup>. This should be corrected to help inform the Welsh public of the carbon impact of fossil fuel industries in Wales.



Proposed site for the Nant Llesg opencast coal mine, rejected by Caerphilly Council

54 <https://www.foe.co.uk/sites/default/files/downloads/fossil-fuels-ghg-76881.pdf>

## 2. Employment

One of the principal arguments used to justify the continued existence of Aberthaw power station is the employment it generates. According to the operators, there are 290 employees at Aberthaw<sup>55</sup>, which equates to just under 0.5% of employment in the Vale of Glamorgan<sup>56</sup>.

Inevitably there will be unemployment for a proportion of these employees when the power station eventually shuts down, although with training and re-deployment this can be minimised. However the Welsh Government has had no discussions with the operator of Aberthaw power station as to its closure, nor has any discussion taken place at Cabinet about the closure of Aberthaw or retraining or other assistance to the power station workers to find alternative work<sup>57</sup>.

Additional jobs that could be impacted by the closure of Aberthaw include those in the opencast mining industry and other sectors. These could total around 700<sup>58</sup>, although the impact on each will vary from loss of the job to minimal impact.

It is now certain that Aberthaw will be forced into closure no later than 2025; the European court case on excessive NO<sub>x</sub> emissions may bring forward this date appreciably. The Welsh Government should initiate discussion on retraining and future redeployment of power station staff immediately in order to mitigate the loss of employment in the Vale of Glamorgan.

Given the certain closure of Aberthaw, the Welsh Government needs to plan also for the closure of the opencast mines that supply it. In particular, remediation of existing opencast sites will be supremely important once the overwhelming principal market for opencast coal in southern Wales collapses.



Potential retraining in the renewable industry

For a fixed amount of investment in energy developments, there are twice as many jobs in renewable energy as there are in coal<sup>59</sup>.

55 <https://www.rwe.com/web/cms/mediablob/en/1575016/data/97770/1/rwe-npower/about-us/RWE-in-Wales.pdf>

56 59,500 employed persons in the Vale of Glamorgan <https://statswales.wales.gov.uk/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/peopleinemployment-by-area-occupation>

57 <https://new.foe.co.uk/sites/default/files/downloads/welsh-government-action-aberthaw-employment-97427.pdf>

58 Pers. Comm. Calvin Jones 14 January 2016

59 <http://cleantechnica.com/2013/03/20/over-3-times-more-green-jobs-per-million-than-fossil-fuel-or-nuclear-jobs/>



### 3. Costs and benefits

Through direct employment, we estimate that Aberthaw generates £8.7 million in salaries annually<sup>60</sup>. It also supports employment in the supply chain, including in opencast coal mines. We assume that the equivalent of 50% of the salaries of jobs in the supply chain would be associated with Aberthaw. This additional salary generation equates to £10.5 million<sup>61</sup>, for a salary total of nearly £20 million per year.

Aberthaw generated 11,478 GWh of electricity in 2013. At a wholesale cost of 7.39p per kWh<sup>62</sup>, the value of this electricity is £848 million. The total economic benefit of Aberthaw power station is therefore in the region of £868 million per year.

However, the pollution caused by the emissions from Aberthaw power station also impose health and environmental costs on society. These costs are calculated below:

Pollutant	Societal cost per tonne (£) <sup>63</sup>	Tonnes emitted <sup>64</sup>	Total cost to society (£)
Sulphur dioxide	1,956	9,000	17,604,000
Nitrogen oxides	13,131	32,000	420,192,000
Carbon dioxide	60	8,500,000	510,000,000
<b>Total</b>			<b>947,796,000</b>

The net benefit to society of Aberthaw power station is therefore minus £80 million per year.

This of course predicates all of the costs and benefits as arising in Wales. However, the overwhelming benefit is the sale of electricity, which takes place as part of the UK electricity market. If we assume a pro-rata (Great Britain) share of the electricity generation, the benefit reduces to 6% of £848 million, or £51 million. Given that RWE nPower is headquartered in Swindon, it would appear fair to suggest that at least the salaries of directly employed jobs, and a portion of the supply chain jobs accrue principally to Wales. So the benefits to Wales appear to be in the region of £70 million.

Clearly not all of the pollution health and environmental impacts are visited on Wales because a proportion is exported to England and beyond. If we assume that 50% of the societal health and environmental costs accrue to Wales, the annual disbenefit is £473,898,000.

The net disbenefit to Wales is therefore £474 million minus £70 million, for a total annual cost to society in Wales of £404 million.

60 290 jobs at a mean salary of £30,000

61 700 jobs at a mean salary of £30,000, half of which is associated with Aberthaw power station

62 See 'large' electricity consumers in table 3.1.1 of [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415778/qep\\_mar\\_15.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415778/qep_mar_15.pdf)

63 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/460398/air-quality-econanalysis-damagecost.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/460398/air-quality-econanalysis-damagecost.pdf) for SO<sub>2</sub>, NO<sub>x</sub> and particulates; social cost of carbon dioxide estimated by Stern to be \$85 per tonne of CO<sub>2</sub> in year 2000 prices and subsequently described by Stern as an underestimate <http://www.theguardian.com/environment/2008/jun/26/climatechange.scienceofclimatechange>

64 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/454017/2015\\_SO2\\_NOx\\_return\\_jun15.xlsx](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454017/2015_SO2_NOx_return_jun15.xlsx) for SO<sub>2</sub> and NO<sub>x</sub>

## Conclusions

Aberthaw power station's impact on the health of people in Wales, its impact on the environment, and its contribution to climate change is unacceptable. There is no place in Wales' future for a coal-fired power station that discharges pollution at the level emitted by Aberthaw power station.

The reluctance by RWE Npower to implement effective means of reducing NO<sub>x</sub> emissions from Aberthaw, coupled with the UK Government's continued attempts to weaken and avoid emissions controls, demonstrate a complete lack of willingness to accept the gravity of the NO<sub>x</sub> problem.

The UK government is already being legally challenged by Europe for failing to regulate Aberthaw in its NO<sub>x</sub> infractions since 2008, and for the UK exceeding atmospheric NO<sub>x</sub> limits as defined by the European Commission's Air Quality Directive (AQD) since 1st January 2010.

As the environmental analyst Lesley James wrote in a 2009 report on Aberthaw:

*"In fact, since the UK plants started evading Selective Catalytic Reduction (SCR), they have already had a continued life, long enough to cover the 15 year period needed to amortise the debt of fitting SCR. But still they plead limited remaining life, poverty, prospective energy gaps etc, and the UK Government supports them in doing so".*

7 years on and we are no further forward with Aberthaw.

Lives depend on governments honouring their duty of care to society. Research has shown that the EU's proposed inferior air pollution standards for coal power plants could lead to 71,000 avoidable deaths between 2020 and 2029, due to increased risk of stroke, heart disease, lung cancer and other diseases associated with air pollution<sup>65, 66</sup>. NO<sub>x</sub> emissions from vehicles, planes, and power stations are estimated to cause 23,500 premature deaths annually in the UK.

Choosing solutions that deliver anything less than the best available techniques will result in unnecessary suffering and avoidable, early deaths.

The UK Government needs to act now to ensure that Aberthaw power station closes in the shortest possible time-scale.

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65 Greenpeace: Toxic coal: counting the Health cost of weak EU air pollution limits – media briefing, May 2015: <http://www.greenpeace.org/eu-unit/Global/eu-unit/reports-briefings/2015/BREF%20-%20health%20impact%20media%20briefing.pdf>.

66 Greenpeace and European Environmental Bureau, Health and economic implications of alternative emission limits for coal-fired power plants in the EU, May 2015, [http://www.greenpeace.org/sweden/Global/sweden/klimat/dokument/2015/Health\\_and\\_economic\\_implications\\_of\\_alternative\\_emission\\_limits.pdf](http://www.greenpeace.org/sweden/Global/sweden/klimat/dokument/2015/Health_and_economic_implications_of_alternative_emission_limits.pdf)

## Appendix

### Aberthaw power station details:

<b>Fuel</b>	Coal
<b>Fuel Type</b>	Low volatility, semi-anthracite
<b>Fuel Use</b>	Greater than 2 million tonnes of coal per annum
<b>Location</b>	Near Barry Island in the Vale of Glamorgan, South Wales
<b>Age</b>	45 years old - began full operation in 1971
<b>Operator</b>	RWE Npower
<b>Staffing</b>	290 permanent staff
<b>Size and Output</b>	3 boilers; 3 electrical generators generating circa 1.6GW

- Aberthaw power station emits about 32,000 amounts of nitrogen oxides (NO<sub>x</sub>) annually
- Nitrogen oxides (NO<sub>x</sub>) contribute to ill health, higher mortality rates, and acid rain
- The main recipient of airborne pollution is south-eastern Wales, with large population areas of Barry, Cardiff and Newport is in the path of the prevailing south westerly winds
- Aberthaw emits nitrogen oxides (NO<sub>x</sub>) at a continuous rate to a max of ~ 900 mg/Nm<sup>3</sup> <sup>67</sup>
- Aberthaw emits about 8.5 million tonnes annually of carbon dioxide (CO<sub>2</sub>), a greenhouse gas (GHG) that is the leading contributor (by volume) to global warming and climate change.
- There are no plans to control Aberthaw's carbon emissions to the atmosphere during its remaining lifespan
- If Aberthaw operated as it had done in 2013 until the UK Government's 2025 coal phase-out date it would emit a further 76.5 million tonnes of CO<sub>2</sub>

<sup>67</sup> Aberthaw SO2 NOx return 2015, <https://www.gov.uk/government/statistics/so2-nox-return-2014>



## List of Acronyms

ACI	Activated carbon injection
AQD	Air Quality Directive
BAT/BEP	Best Available Techniques/Best Environmental Practices
BREF	Best Available Techniques Reference
CCR	Coal Combustion Residues
CNS	Central Nervous System
DEFRA	Department for Environment Food and Rural Affairs
EC	European Commission
ELV	Emission Level Values
ESI	Electricity Supply Industry
ESP	Electrostatic Precipitator
EU	European Union
FGD	Flue Gas Desulphurisation
GHG	GreenHouse Gas
HAP	Hazardous Air Pollutant
IED	Industrial Emissions Directive
LCP	Large Combustion Plant
LCPD	Large Combustion Plant Directive
LLD	Limited Life Derogation
NERP	National Emission Reduction Plan
NO <sub>x</sub>	Nitrogen Oxides
PAH	Poly Aromatic Hydrocarbon
PM	Particulate Matter
SCR	Selective Catalytic Reduction
TWG	Technical Working Group
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
WHO	World Health Organisation