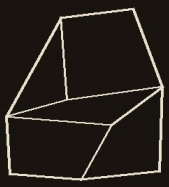
INDUSTRIES OF INDIA

COAL

Seam, Fire, Grid



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SOURCE COMPANION

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HOW THIS COMPANION WORKS

Every superscript number in the text of *Coal: Seam, Fire, Grid* resolves to a numbered entry below. Each entry records the publication, its link, how fully it was read, and the claims and figures the reading supports. Entries are marked FULL (the page or document was read end to end), EXCERPT (the cited passages were read directly), or HIGHLIGHTS (search-result extracts from the owning site were read; claims drawn from them are limited to what the extract showed). Sources consulted for background but not cited are listed separately at the end.

Forecasts and modelled figures are used as forecasts - the IEA Coal 2025 figures for 2025 and 2030 are projections, and the book says so where it uses them. Company production figures are from company or government reporting as listed. Where two sources disagreed, the book preferred the primary or the more conservative figure and noted the spread.

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{len(items)} numbered sources follow.

Illustrations. The four plates in this book are original digital illustrations produced for this edition in 2026 with generative imaging tools. They are not historical photographs or period artworks, and no identifiable real person is depicted.

S1 ASME, Newcomen Engine landmark brochure

https://www.asme.org/wwwasmeorg/media/resourcefiles/aboutasme/who%20we%20are/engineering%20history/landmarks/70-newcomen-engine.pdf

READ: EXCERPT. Thomas Newcomen (1663-1729) with John Calley; first successful engine 1712 near Dudley Castle, Tipton; vacuum from condensing steam; spread rapidly through Warwickshire and Newcastle coalfields.

S2 National Museums Scotland, The Newcomen engine

https://www.nms.ac.uk/discover-catalogue/the-newcomen-engine-and-its-role-in-britains-industrial-revolution

READ: HIGHLIGHTS. 1712 engine built to pump mine water; deeper mining enabled; coal vital to 18th-19th century machine manufacturing.

S3 English Heritage, History of the Iron Bridge

https://www.english-heritage.org.uk/visit/places/iron-bridge/history

READ: HIGHLIGHTS. Abraham Darby (1678-1717) pioneered coke iron smelting at Coalbrookdale, Shropshire, 1709; world's first iron bridge followed from the same works.

S4 National Gas Museum (UK), The early days of gas

https://www.nationalgasmuseum.org.uk/discover/the-early-days/

READ: HIGHLIGHTS. William Murdoch first lit his house with coal gas in Cornwall in 1792; Boulton & Watt then built small gasworks for factories.

S5 IEA, Coal 2025 - Demand chapter

https://www.iea.org/reports/coal-2025/demand

READ: FULL. 2024 global coal demand 8,805 Mt (+1.5%); China+India 71% of consumption; 2025 projected record 8,845 Mt; China 2025 steady at 4,953 Mt; India +225 Mt and ASEAN +127 Mt 2025-30; EU -153 Mt and US -106 Mt by 2030; coal share of global electricity mix 35% in 2024, 27% by 2030 (forecast); non-power steam coal+lignite 1,757 Mt in 2024 (~23% of steam/lignite use); met coal demand 1,114 Mt in 2025, China ~67%/742 Mt; met demand 1,061 Mt by 2030; hydrogen-based steelmaking expected to stay limited on cost and scrap.

S6 IEA, Global Energy Review 2025 - CO2 emissions

https://www.iea.org/reports/global-energy-review-2025/co2-emissions

READ: HIGHLIGHTS. Energy-related CO2 hit record 37.8 Gt in 2024 (+0.8%); atmospheric CO2 422.5 ppm, +3 ppm on 2023, ~50% above pre-industrial; fuel combustion +357 Mt CO2.

S7 US EIA, Coal explained

https://www.eia.gov/energyexplained/coal/

READ: FULL. Coal = combustible black/brownish-black sedimentary rock, high carbon and hydrocarbons, nonrenewable, from swamp-forest plants; four ranks by carbon and heat: anthracite 86-97% C (highest heating value; <1% of US 2022 mine output; all NE Pennsylvania; metals industry), bituminous 45-86% C (100-300 My old; 46% of US 2022 production; WV 31% IL 14% PA 14% KY 11% IN 9%; power + coking feedstock), subbituminous 35-45% C (46% of US 2022 output; Wyoming 89%), lignite 25-35% C (8%; ND 56% TX 36%; Great Plains Synfuels lignite-to-SNG).

S8 British Geological Survey (NERC), Coal profile

https://nora.nerc.ac.uk/id/eprint/534456/1/coal_profile.pdf

READ: EXCERPT. Coalification raises carbon from ~60% in peat to >90% in bituminous coal and ~95% in anthracite; calorific value rises ~15 MJ/kg (peat) to ~25 (brown coal) to 35+ (bituminous/anthracite).

S9 US EPA, Greenhouse Gas Equivalencies - calculations and references

https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references

READ: EXCERPT. US power-sector coal 2022: average heat content 20.71 MMBtu per metric ton; carbon coefficient 26.13 kg C per MMBtu; 100% oxidation assumed - i.e. ~0.54 t carbon, ~2.0 t CO2 per tonne of average power-station coal.

S10 Wikipedia, Hunter Valley Coal Chain

https://en.wikipedia.org/wiki/Hunter_Valley_Coal_Chain

READ: HIGHLIGHTS. Port of Newcastle is the world's largest coal export port; throughput 150.5 Mt in 2013 vs 68 Mt in 2000; ~40 mines, 11 producers, four rail operators, 20,000+ train movements and 1,600+ vessel loadings a year.

S11 Port Waratah Coal Services, What we do

https://pwcs.com.au/about/what-we-do

READ: HIGHLIGHTS. Combined licensed loading capacity 145 Mt across Carrington and Kooragang terminals; largest coal export terminal in the world.

S12 Nelsen, DiMichele, Peters & Boyce, PNAS 2016 - Paleozoic peak in coal production

https://www.pnas.org/doi/full/10.1073/pnas.1517943113

READ: EXCERPT. Carboniferous-Permian = greatest coal-forming interval in Earth history; contributed to glaciation and uniquely high oxygen; lignin-lag hypothesis tested and found secondary; coal abundance explained by basinal accommodation from Pangaea assembly plus everwet equatorial climate.

S13 National Geographic, Getting to the root of how Earth's massive coal seams formed

https://www.nationalgeographic.com/science/article/getting-to-the-root-of-how-earths-massive-coal-seams-formed

READ: EXCERPT. Popular account of lignin-lag hypothesis and its correction: 'The lag was in our understanding, not fungus evolution'; Carboniferous forests >300 Mya.

S14 US EIA, How much coal is left

https://www.eia.gov/energyexplained/coal/how-much-coal-is-left.php

READ: FULL. US resources 4 trillion short tons per 1975 USGS assessment (no newer national assessment); world proved recoverable reserves ~1,161 billion short tons at end-2021; five countries ~75%: US 22%, Russia 15%, Australia 14%, China 14%, India 11%.

S15 Wikipedia, Coal mining in the United States

https://en.wikipedia.org/wiki/Coal_mining_in_the_United_States

READ: HIGHLIGHTS. US 2023 production ~50% below the 2008 peak of 1,171.8 million short tons (1,063 Mt); ~45,000 miners vs peak 883,000 in 1923; coal 50% of US electricity in 2005, 15% in 2024; net exporter.

S16 US EIA, Annual Coal Report 2024 highlights

https://www.eia.gov/coal/annual/

READ: FULL. US 2024: production 512.5 MMst (-11.3% YoY), 524 mines; average employment 44,060 (-1,416); productivity 5.22 st/employee-hour; consumption 410.9 MMst, power sector 373.3 MMst (87.6%); prices: bituminous $86.72/st, subbituminous $18.06/st, met $180.02/st; stocks 156.2 MMst.

S17 Mysteel, NBS: China 2024 coal output record

https://www.mysteel.net/news/5074522-nbs-chinas-2024-coal-output-hits-record-high

READ: HIGHLIGHTS. China's 2024 raw coal output 4.76 billion tonnes, +1.3% YoY, all-time record (NBS, released 17 Jan 2025); December 438.85 Mt.

S18 Ministry of Coal, Government of India - Production and Supplies

https://www.coal.gov.in/major-statistics/production-and-supplies

READ: FULL. All-India coal production 997.83 MT FY2023-24; 1,047.523 MT FY2024-25 (+4.98%); CIL+subsidiaries 773.81 MT FY24, 781.056 MT FY25 (+0.94%); SCCL 69.01 MT FY25; India coal imports FY2024-25: coking 66.33 MT, non-coking 180.04 MT, total 246.37 MT.

S19 Wikipedia, Coal in China

https://en.wikipedia.org/wiki/Coal_in_China

READ: HIGHLIGHTS. Chinese coal use ~6,000 years ago; surface mining suspected ~3490 BC; Fushan mine cited as earliest coal mine, operating ~1000 BC; pre-modern constraints of technology and demand.

S20 Columbia University Asia for Educators, Song dynasty iron & steel

https://miscredirect-prod.cc.columbia.edu/songdynasty-module/econ-rev-iron-steel.html

READ: HIGHLIGHTS. Song iron output ~125,000 tons in 1078 CE, sixfold rise over 800 CE; uses from nails and tools to suspension-bridge chains and armour; coal largely replaced charcoal by end of 11th century after deforestation of north China.

S21 Allason-Jones 2005, Roman jet and shale jewellery (PDF)

https://artefacts.mom.fr/Publis/Allason-Jones_2005.pdf

READ: HIGHLIGHTS. Romano-British jet beads, armlets, hairpins, rings; jet and shale in personal adornment; geological sourcing.

S22 Arbeia Roman Fort (NE Museums), Roman jewellery and jet

https://www.northeastmuseums.org.uk/arbeia/learning/roman-jewellery

READ: HIGHLIGHTS. Jet objects and raw jet lumps at South Shields fort; probable jet-working workshop; Roman metalworking finds.

S23 The Antiquaries Journal (Cambridge), The use of coal in Roman Britain

https://www.cambridge.org/core/journals/antiquaries-journal/article/abs/use-of-coal-in-roman-britain/32EDB7DC644570124ABB65BBD235B2D0

READ: HIGHLIGHTS. Scholarly review treating coal as significant in Roman Britain; Webster 1955 synthesis as the standard account.

S24 CITiZAN, 'Seacoal: a vayne of secoles'

https://www.citizan.org.uk/blog/2018/Nov/20/seacoal-a-vayne-of-secoles/

READ: HIGHLIGHTS. NE England coal industry established by the 13th century; Newcastle burgesses vs Bishop of Durham vs Priory of Tynemouth for control; river Tyne wharves and keels.

S25 Wilcuma, Early coal mining in Northumberland

https://www.wilcuma.org.uk/the-history-of-northumberland-after-1066/early-coal-mining/

READ: HIGHLIGHTS. First recorded Newcastle-London coal shipment 1305 (Thomas Migg, the Welfare, wine out / coals back); by 1377 ~15,000 tons/yr shipped; exports to the Continent for smelting, building, fish-smoking, brewing.

S26 Scarborough Maritime Heritage Centre, coal history

https://www.scarboroughsmaritimeheritage.org.uk/article.php?article=277.html

READ: HIGHLIGHTS. London prohibited sea coal in 1306 as it 'tended to corrupt the air'; early castle coal use.

S27 Columbia AFE, From Charcoal to Coal (Song module)

https://afe.easia.columbia.edu/songdynasty-module/econ-rev-iron-steel.html

READ: EXCERPT. Charcoal first used in Song iron production, deforesting north China; by end of 11th century coal had largely taken charcoal's place.

S28 Columbia University Asia for Educators, The Book of Ser Marco Polo, ch. XXX (Yule translation, 1903)

https://afe.easia.columbia.edu/ps/china/polo_fuel.pdf

READ: FULL. Primary text: 'all over the country of Cathay there is a kind of black stone existing in beds in the mountains, which they dig out and burn like firewood... those stones burn better and cost less'; baths three times a week; wood would not suffice. Also notes scholarly debate over Polo's veracity.

S29 Science Museum Group, James Watt biography

https://collection.sciencemuseumgroup.org.uk/people/ap24508/watt-james

READ: HIGHLIGHTS. Watt repaired Glasgow University's model Newcomen engine in 1763; found ~80% of the steam's heat went to reheating the cylinder; had a working separate-condenser model by 1765.

S30 Library of Birmingham / Kingstanding history, James Watt

https://www.kingstanding.org/history/people/james-watt

READ: HIGHLIGHTS. Separate condenser insight dated 1765; 1769 patent 'A New Invented Method of Lessening the Consumption of Steam and Fuel in Fire Engines'.

S31 Dept. of Heavy Industry, India - Advanced Ultra Supercritical technology

https://heavyindustries.gov.in/en/advanced-ultra-supercritical-adv-usc-technology-thermal-power-plants

READ: HIGHLIGHTS. AUSC plant efficiency ~46% vs ~38% subcritical and ~41-42% supercritical; ~11% less coal consumption and CO2 vs supercritical.

S32 BBC Bitesize, Iron and steel in the Industrial Revolution

https://www.bbc.co.uk/bitesize/guides/zkxrxyc/revision/1

READ: HIGHLIGHTS. Sequence: Darby coke smelting 1709; Cort puddling 1784; Bessemer converter 1856; Gilchrist-Thomas 1879; pig iron output rose ~30-fold; great works at Cyfarthfa and Carron.

S33 Historic England, The Manufactured Gas Industry vol. 1

https://historicengland.org.uk/research/results/reports/8009/TheManufacturedGasIndustry_Volume1

READ: HIGHLIGHTS. Gas industry created coal-transport demand via canal, collier and rail; by-products coke, coal tar, ammoniacal liquor and spent oxide fed further industries.

S34 worldsteel, Raw materials

https://worldsteel.org/about-steel/raw-materials/

READ: FULL. BF-BOF route uses 1,370 kg iron ore + 780 kg metallurgical coal + 270 kg limestone + 125 kg scrap per 1,000 kg crude steel; EAF route uses 710 kg scrap + 586 kg ore + 150 kg coal + 2.3 GJ electricity; ~70% of world steel BF-BOF, ~30% EAF; ~1 billion tonnes met coal used in steel = ~15% of total coal consumption; ~450 kg coke per tonne pig iron; PCI can save ~30% of coal, 1 t PCI displaces ~1.4 t coking coal; recoverable coal reserves in ~80 countries, mined in 70+; Australia ~200 Mt of ~310 Mt global met coal exports.

S35 Historic England, Stockton and Darlington Railway overview

https://historicengland.org.uk/whats-new/research/a-brief-overview-of-the-stockton-and-darlington-railway/

READ: HIGHLIGHTS. S&DR opened 27 September 1825; opening train hauled by Locomotion No. 1 carried 600 passengers; linked collieries near Shildon to Stockton/Darlington; coal-to-ships traffic was the lucrative core.

S36 Ministry of Coal, India - History and Background

https://coal.gov.in/about-us/history-background

READ: HIGHLIGHTS. Commercial coal mining in India from 1774 (Sumner & Heatly, East India Company, Raniganj coalfield, Damodar); steam locomotives from 1853 lifted demand.

S37 Kentucky Geological Survey, Coal mining methods

https://www.uky.edu/KGS/coal/coal-mining.php

READ: HIGHLIGHTS. Room-and-pillar is the most common underground method: continuous miner cuts rooms and loads shuttle cars to conveyors; coal pillars left for roof support.

S38 The Independent, Last pit ponies (1994)

https://www.independent.co.uk/news/uk/last-pit-ponies-emerge-from-the-darkness-closure-of-northeast-s-only-remaining-colliery-marks-end-of-historic-partnership-reports-barrie-clement-1396254.html

READ: HIGHLIGHTS. February 1994: the last four British Coal pit ponies came up at Ellington colliery, Northumberland - end of the pit pony era.

S39 US Congressional Research Service, R48587

https://www.congress.gov/crs-product/R48587

READ: HIGHLIGHTS. US coal industry employment down 92% over a century; consumption peaked 2007, production 2008; decline driven by competing fuels and technology.

S40 CIM Magazine, Who brought the canary into the coal mine

https://magazine.cim.org/en/in-search/who-brought-the-canary-into-the-coal-mine-en

READ: HIGHLIGHTS. Mine rescue crews used canaries from around 1900 to detect noxious gas; the damps named: firedamp (methane), stinkdamp (hydrogen sulphide), blackdamp/chokedamp.

S41 Royal Institution, Humphry Davy's miners' safety lamp

https://www.rigb.org/explore-science/explore/collection/humphry-davys-miners-safety-lamp

READ: HIGHLIGHTS. First Davy lamp prototype 1815; wire gauze prevented methane (firedamp) igniting an explosion from the flame.

S42 Guinness World Records, worst coal mining disaster death toll

https://www.guinnessworldrecords.com/world-records/worst-coal-mining-disaster-death-toll

READ: FULL. 1,549 people killed by a coal dust explosion at Honkeiko (Benxihu) Colliery, China, 26 April 1942 - the worst coal mining disaster on record.

S43 Wikipedia, Monongah mining disaster

https://en.wikipedia.org/wiki/Monongah_mining_disaster

READ: FULL. 6 December 1907, Fairmont Coal Co. Nos. 6 and 8 mines, Monongah, West Virginia: 362 killed, the worst mining disaster in US history; contributed to creation of the US Bureau of Mines; suspected ignition of coal dust or methane by spark or open flame.

S44 AJRCCM / KVPR-NPR, Black lung resurgence in Appalachia

https://www.kvpr.org/npr-news/2026-08-05/black-lung-rates-in-appalachia-are-high-as-the-1970s-with-thousands-of-miners-sick

READ: HIGHLIGHTS. NIOSH: veteran underground miners in central Appalachia show the highest coal workers' pneumoconiosis rates in nearly 50 years; incurable and fatal.

S45 The Guardian, China mine deaths fall (2010)

https://www.theguardian.com/world/2010/jan/20/china-claims-drop-mine-deaths

READ: HIGHLIGHTS. China coal mine deaths: 6,027 in 2004 cut to 2,631 in 2009 - still more than seven a day; safety drive closed thousands of small mines.

S46 Wikipedia, Bagger 288

https://en.wikipedia.org/wiki/Bagger_288

READ: HIGHLIGHTS. Bagger 288: ThyssenKrupp bucket-wheel excavator, built 1978, German lignite mining; among the largest land vehicles ever built.

S47 NRDC, Appalachian mountaintop removal (report PDF)

https://www.nrdc.org/sites/default/files/appalachian.pdf

READ: HIGHLIGHTS. Mountaintop removal is the greatest earth-moving activity in the US; 502 peaks levelled in Appalachia (KY 295, WV 135, VA 65, TN 7); >1.1 million acres mined, nearly the size of Delaware.

S48 SkyTruth, Mountaintop removal analysis

https://skytruth.org/blog/skytruth-mountain-top-removal-analysis

READ: HIGHLIGHTS. Valley fills from mountaintop removal have buried more than a thousand miles of streams per US EPA.

S49 RWE, Water-management recultivation in the Rhenish lignite district

https://www.rwe.com/verantwortung-und-nachhaltigkeit/umweltschutz/wasserwirtschaftliche-rekultivierung/

READ: HIGHLIGHTS. RWE's recultivation programme in the Rhenish lignite region, including flooding former opencast pits into a lake district; internationally recognised reclamation record.

S50 Theodore Roosevelt Center, Anthracite Coal Strike

https://www.theodorerooseveltcenter.org/encyclopedia/capitalism-and-labor/anthracite-coal-strike/

READ: HIGHLIGHTS. Strike began 12 May 1902 in eastern Pennsylvania after operators refused to meet UMWA; railroad companies owned the mines; Anthracite Coal Strike Commission awarded the nine-hour day in March 1903.

S51 US Department of Labor, The Coal Strike of 1902

https://www.dol.gov/general/aboutdol/history/coalstrike

READ: HIGHLIGHTS. Roosevelt's 3 October 1902 meeting with operators and UMWA; anthracite strike threatened a 'coal famine'; unprecedented federal intervention.

S52 National Union of Mineworkers report (NUM)

http://num.org.uk/wp-content/uploads/2017/06/NUM-report-2.pdf

READ: HIGHLIGHTS. March 1984 NCB (Ian MacGregor) announced closure of 20 pits as uneconomic; NUM alleged a plan for up to 75 closures.

S53 People's History Museum, Miners' Strike 1984-85

https://phm.org.uk/blogposts/miners-strike-1984-to-1985/

READ: HIGHLIGHTS. 1 March 1984: Cortonwood Colliery closure announced for early April; miners walked out within a week; strike spread through the coalfields.

S54 Wikipedia, 1984-85 UK miners' strike

https://en.wikipedia.org/wiki/1984%E2%80%931985_United_Kingdom_miners%27_strike

READ: HIGHLIGHTS. Year-long national strike led by Arthur Scargill (NUM) against NCB pit closure programme; opposed by Thatcher government; among the bitterest UK industrial disputes.

S55 UK Parliament, The 1842 Royal Commission on mines

https://www.parliament.uk/about/living-heritage/transformingsociety/livinglearning/19thcentury/overview/coalmines/

READ: HIGHLIGHTS. 1842 Royal Commission report on women and children in mines caused public dismay; children commonly employed from age eight and younger.

S56 Earth Magazine, Rising global interest in coal fires

https://www.earthmagazine.org/article/rising-global-interest-coal-fires/

READ: HIGHLIGHTS. Centralia, Pennsylvania seam burning since 1962; ~70 fires in Jharia coalfield, India - largest coalmine fire complex in the world; spontaneous combustion on exposure to air; particulates and noxious gases.

S57 London Museum, Gas lamps illuminated London

https://www.londonmuseum.org.uk/collections/london-stories/gas-lamps-illuminated-london/

READ: HIGHLIGHTS. Gas lighting reached London in 1807 (Pall Mall); by 1842 most main streets lit; Gas Light and Coke Company and its gasworks.

S58 Science History Institute, William Henry Perkin

https://www.sciencehistory.org/education/scientific-biographies/william-henry-perkin/

READ: HIGHLIGHTS. 1856: Perkin accidentally discovered mauvine, the first commercialised synthetic dye, while working with coal tar; start of the synthetic chemical industry.

S59 World Coal Association (archived by EnergyBC), Coal & steel

https://www.energybc.ca/cache/coal/www.worldcoal.org/coal/uses-of-coal/coal-steel/index.html

READ: HIGHLIGHTS. 70% of steel produced today uses coal; met coal vital to steelmaking; 721 Mt coking coal used in 2010 (dated figures; prefer worldsteel for current).

S60 Wikipedia, Secunda CTL

https://en.wikipedia.org/wiki/Secunda_CTL

READ: HIGHLIGHTS. Sasol's Secunda plant, Mpumalanga: world's largest coal liquefaction (Fischer-Tropsch) facility; Sasol II built 1980, Sasol III 1984.

S61 The Hindu, Secunda petrochemical complex

https://www.thehindu.com/sci-tech/energy-and-environment/south-africa-secunda-petrochem-unit-largest-greenhouse-gas-emitter/article68794725.ece

READ: HIGHLIGHTS. Secunda supplies ~30% of South Africa's liquid fuels; 2.6% of GDP directly in 2021; identified as the largest single-point greenhouse gas emitter.

S62 CREA / Global Energy Monitor, China coal power H2 2024 report

https://globalenergymonitor.org/sites/default/files/migration/reports/CREA_GEM_China_Coal-power_H2-2024_FINAL_11.pdf

READ: HIGHLIGHTS. China approved 66.7 GW of new coal power capacity in 2024; 94.5 GW started construction (highest since 2015); 3.3 GW of suspended projects resumed.

S63 Reuters, China 2024 coal power construction 10-year high

https://www.reuters.com/business/energy/chinas-2024-coal-power-construction-hits-10-year-high-researchers-say-2025-02-13/

READ: HIGHLIGHTS. China started construction on 94.5 GW of coal-fired power in 2024, highest since 2015 (CREA/GEM findings).

S64 Financial Express, Coal India FY25 results

https://www.financialexpress.com/business/industry/coal-india-profit-up-12-in-q4-at-rs-9593-cr/3836527/

READ: HIGHLIGHTS. CIL FY25 production 781.05 MT (+1% YoY from 773.65); offtake 763.06 MT; Q4FY25 production 237.69 MT (-2%).

S65 Reuters, Britain first G7 country to end coal power

https://www.reuters.com/sustainability/climate-energy/britain-become-first-g7-country-end-coal-power-last-plant-closes-2024-09-29/

READ: HIGHLIGHTS. Ratcliffe-on-Soar, the UK's last coal power station, closed 30 September 2024; Britain the first G7 country to end coal-fired power.

S66 Ember, Global Electricity Review 2025

https://ember-energy.org/latest-insights/global-electricity-review-2025/

READ: HIGHLIGHTS. Low-carbon sources passed 40% of global electricity in 2024 (12,609 TWh, 40.9%); renewables added record 858 TWh; wind 8.1% and solar 6.9% together overtook hydro (14.3%); nuclear 9.0%, a 45-year low.

S67 IEA, Coal 2025 - Trade chapter

https://www.iea.org/reports/coal-2025/trade

READ: FULL. International coal trade record 1,544 Mt in 2024 (+3%): thermal 1,176 Mt (+26), met 368 Mt (+21); trade ~18% of global demand; >90% seaborne; Asia Pacific 85% of imports; China imports 548 Mt (record for any country), India 237 Mt, Japan 162 Mt - over 60% of imports; exporters: Indonesia 555 Mt, Australia 363 Mt, Russia 198 Mt (75% to Asia), top 3 = 74% of exports; 2025 trade forecast -5% to 1,468 Mt; thermal trade 936 Mt by 2030 (forecast); met trade back to 2024 levels by 2030.

S68 IEA, Coal 2025 mid-year update - Trade

https://www.iea.org/reports/coal-mid-year-update-2025/trade

READ: HIGHLIGHTS. 2024 thermal exports: Indonesia 549 Mt (+6%), Australia 209 Mt (+3%), Colombia 59 Mt (+8%); Russian thermal exports down on sanctions, logistics and profitability.

S69 Bloomberg, China Energy Investment record 2024 output

https://www.bloomberg.com/news/articles/2025-01-20/china-s-top-power-producer-saw-record-coal-output-in-2024

READ: HIGHLIGHTS. China Energy Investment Corp (China's biggest power producer) posted record coal output in 2024; spending 265.6 bn yuan (+15%).

S70 Mysteel, China Shenhua 2024 production

https://www.mysteel.net/news/5071276-china-shenhua-energy-to-meet-coal-production-goal-for-24

READ: HIGHLIGHTS. China Shenhua Energy (listed arm of China Energy Investment) on track for 2024 coal production goal of 316.1 Mt.

S71 China Shenhua Energy, 2024 annual results announcement (HKEX, 21 Mar 2025)

https://www.hkexnews.hk/listedco/listconews/sehk/2025/0321/2025032101839.pdf

READ: EXCERPT. Commercial coal production 327.1 Mt in 2024 (actual; target was 316.1 Mt); coal sales 459.3 Mt; production by mines and regions.

S72 PIB/Ministry of Coal press release, CIL at 50 years

https://www.coal.gov.in/sites/default/files/2025-11/Press011125.pdf

READ: HIGHLIGHTS. Coal India Limited established 1 November 1975 as apex holding company of nationalised coking coal mines (1971) and non-coking mines (1973); Maharatna PSU.

S73 Observer Research Foundation, Nationalisation of coal mines 1971

https://www.orfonline.org/expert-speak/43036-70-policies-nationalisation-of-coal-mines-1971

READ: HIGHLIGHTS. Industrial Policy Resolution 1956 placed coal among state-only industries; coking mines taken over 1971 (except TISCO/IISCO captive), non-coking 1973; BCCL formed.

S74 US EIA, Annual Coal Report 2024, Table 10

https://www.eia.gov/coal/annual/pdf/table10.pdf

READ: HIGHLIGHTS. Peabody Energy the largest US coal producer 2024: 95,789 thousand short tons, 18.7% of total US production - EIA Table 10, Major U.S. Coal Producers; US mines only (MSHA Form 7000-2 basis), excludes Peabody's Australian operations.

S75 SteelOrbis, Glencore 2024 coal output

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