

An island of coal: the British National Coal Board and their 'Plans for coal' 1947 to 1987

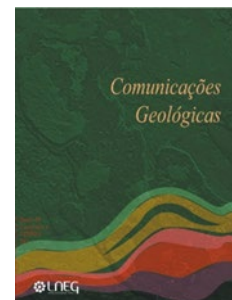
Uma ilha de carvão: o British National Coal Board e os 'Planos para o carvão' 1947-1987

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Abstract: By the end of World War II, the UK coal industry was in slow decline. It was revitalised in 1947, when it was nationalised, as the National Coal Board. The first 'Plan for Coal' and its revision were published in the 1950s. Modernising many collieries achieved an increase in coal production. Geological exploration also identified coal reserves for new deep collieries mainly in concealed measures that surrounded the existing coalfields. The Yom Kuppur war in 1973 highlighted how dependent the UK was on oil and gas from the Middle East. A balanced energy strategy was needed, that included increased coal production. The second 'Plan for Coal' was published in 1974. Geological exploration was concentrated on the concealed coalfields and the Selby mine complex, Yorkshire, was established. 'Plan2000' soon followed in 1978. It envisaged that extra coal production would be required by 2000. Exploration proved considerable coal resources, but by the end of the 1980s the use of coal was in decline and the industry was privatised. The study demonstrates how the 'Plans for Coal' increased our knowledge of coal geology and proved that the UK is indeed an 'Island of Coal.'

Keywords: United Kingdom, National Coal Board, geological Exploration.

Resumo: No final da Segunda Guerra Mundial, a indústria de carvão do Reino Unido estava em lento declínio. Foi revitalizada em 1947, aquando da nacionalização e criação do Conselho Nacional do Carvão (*National Coal Board*). O primeiro 'Plano para o Carvão' e a sua revisão, foram publicados na década de 1950, permitindo a modernização de muitas minas de carvão e o aumento da produção de carvão. A prospeção geológica também permitiu identificar reservas de carvão para novas minas profundas, em jazigos ocultos nas vizinhanças dos campos de carvão existentes. A guerra do Yom Kuppur em 1973, trouxe à superfície a dependência do Reino Unido do petróleo e do gás do Médio Oriente. Era necessária uma estratégia energética equilibrada, que incluísse o aumento da produção de carvão. O segundo 'Plano para o Carvão' foi publicado em 1974. A exploração de carvão concentrou-se então nos campos ocultos, estabelecendo o complexo da mina Selby, no Yorkshire. O 'Plano 2000' surgiu em 1978; previa-se que até 2000 seria necessária uma produção extra de carvão. Embora as pesquisas demonstrassem a existência de recursos de carvão consideráveis, no final da década de 1980, o uso do carvão estava em declínio e a indústria foi privatizada. Este estudo mostra como os 'Planos para o Carvão'

vieram aumentar o conhecimento das bacias carboníferas e provaram que o Reino Unido é de facto uma 'Ilha de Carvão'.

Palavras-chave: Reino Unido, Conselho Nacional do Carvão, exploração geológica.

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Introduction

Up to the end of World War II, only one new coalfield had been discovered in the United Kingdom. There was little new investment in the industry and the coal industry was in slow decline. The coal industry was revitalised in 1947, when it was nationalised, as the National Coal Board. During the life of the nationalised coal industry, there were three major initiatives to ensure the future success of the industry, with the prime objective of increasing coal production to fulfil expected demands.

The first 'Plan for Coal' was published in 1950. The industry was restructured with the objective to produce 240,000,000 tons of coal between 1961 and 1965. This would be achieved by modernising 500 of the 950 collieries (90%). The remaining 10% would be obtained from new Collieries, achieved by proving new coal reserves with an extensive exploration programme, including offshore drilling (a new technology). Over ten deep collieries were eventually sunk, mainly in concealed measures surrounding existing coalfields. In 1959, the 'Plan' was revised, and coal output was increased by 10 million tons.

During the 1960s the industry underwent significant changes. Manual coal extraction methods were superseded by mechanised coalfaces that used powered roof supports, and coal cutting machinery. The overall result was further colliery closures primarily because many of the older collieries couldn't be mechanised.

A war in the Middle East in 1973 highlighted how dependent the UK was on oil and gas from that region. Indigenous oil and gas

production from the North and Irish Sea fields were in their infancy, and not up to full production capacity. A balanced energy strategy was devised involving oil, gas, nuclear and coal.

The second 'Plan for Coal' was published in 1974. It envisaged that an extra 40 to 42 million tons of coal would be required by 1985. Achieved by further modernisation of collieries, for example, constructing surface conveyor drifts, and sinking new collieries. Geological exploration was concentrated on the concealed parts of existing coalfields. This required the use of advanced boring techniques to prove coal reserves, and seismic exploration to evaluate coalfield structure. The most significant coal producer was the Selby Complex, Yorkshire, planned to produce 10 million tons per annum over 25 years.

A further initiative, 'Plan2000' was devised in 1978. It was envisaged that a further 60 million tons of extra coal production would be required by 2000. Exploration was again increased and much of that work examined concealed coal deposits and proved considerable new coal resources. When the results of this exploration work were combined with the data from onshore exploration for oil and gas, it did prove that the UK really was an 'Island of Coal'.

Unfortunately, by the end of the 1980s the use of coal was in decline. Collieries were closed and what was left of the industry was privatised and all exploration work ceased.

The author's 'Memories of Coal' are very personal as he was employed as a geologist in the UK coal industry for 24 years (1969 to 1993) and was very much involved with the second 'Plan for Coal' and was peripheral to 'Plan2000', as a dedicated exploration unit implemented the latter. Most accounts of the UK coal industry sadly have looked at the negative side of the enterprise; the strikes, the declining communities, the colliery closures, but at least one section of the industry had a positive eye on the future, and perhaps it is time for part of that story to be put on record.

Coal in the 19th and early 20th Century

In the mid-1850s the UK had an intensive coal industry. Coal was used to produce steam power for the majority of British industries. The source of coal was from exposed coalfields, located mainly in the midland valley of Scotland, the north and South Wales coalfields, and from the major coalfields of England, located in Northumberland & Durham, Yorkshire / Nottinghamshire / Derbyshire, and Lancashire. They were all true bituminous coals, from the Carboniferous Coal Measures. In addition, anthracite was produced from the western side of the south Wales coalfield.

East of the English border with Wales the Coal Measures strata are generally overlain by the Permo-Triassic unconformity. In some areas, particularly in the English Midlands, scattered coalfields occur as inliers, brought to the surface by folding and faulting. Major examples include those of Shropshire, Staffordshire, and Leicestershire.

As the coalfields expanded, it was realised that there was the potential for concealed coalfields to exist beneath the Permo-Triassic strata, and occasional exploratory boreholes were put down to prove coal. They met with little success, and those who did encounter coal were disappointing as the drilling technology at the time was inadequate to prove the thickness of the coal seams with any degree of accuracy. The friability of coal resulted in just a few fragments of coal being recovered in the drill samples, and any coal horizons were generally recorded as being too thin to mine.

In 1882, another use was found for coal. The world's first coal-fired electricity generating station was constructed; the Holborn

Viaduct power station, (The Edison Electric Light Station) in London (Anonymous, 1987, p. 17). Coal-fired power stations would be the main source of UK electricity for the next 100 years.

Figure 1 shows the majority of known coalfields at the end of the 19th century. Hatching denotes the areas where the exposed rocks are younger than the Coal Measures and hence have the potential to conceal coalfields.

In 1855 an English geologist Godwin-Austen presented a paper that speculated that a concealed extension of the French coalfield might exist under the English county of Kent (Godwin-Austen, 1855). The British Association for the Advancement of Science organised exploratory drilling, but the two boreholes were abortive (Willett *et al.*, 1875). It wasn't until about the turn of the century when exploratory work was being carried out for a potential Channel Tunnel connection to France that coal was discovered in Kent. Location is shown in figure. 1.

By 1919, forty-two boreholes with a combined total length of 94,945 ft (29 km), had been drilled to prove the extent of the Kent Coalfield (Richie, 1919, p. 301). The workable Coal Measures were shown to incrop against Cretaceous strata. The Kent Coalfield was a concealed basin. The original borehole at Shakespeare Cliff, Dover, took four years to drill (1886 to 1890) and reached a total depth of 2300 ft. Later boreholes sometimes exceed depths of 3,000 ft and were taking about 1 year to complete. Despite various attempts to sink shafts, only five collieries ever produced coal from the Kent coalfield.

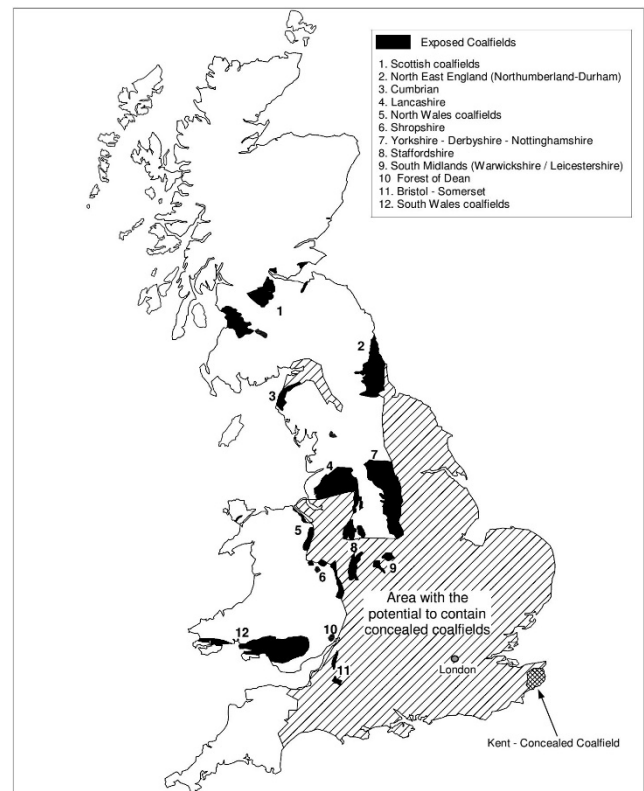


Figure 1. Map of the United Kingdom (England, Wales and Scotland) showing the known exposed coalfields c1900, and the concealed Kent coalfield.

Figura 1. Mapa do Reino Unido (Inglaterra, Gales e Escócia) mostrando as jazidas de carvão conhecidas c. 1900, e o campo carbonífero oculto de Kent.

World War I to the end of World War II (1914 to 1945)

At the start of World War I annual coal production in the UK was less than 300 million tons per annum produced by about 3,000 collieries (Anonymous, 2022). Some were private mines, employing just a few men, but by this time, the majority were public-financed colliery companies that often worked a number of collieries in their group. In addition to coal production, they might also produce gas, coke for the metallurgical industry, and chemicals.

In this period, very little geological exploration was being conducted and recording of the underground geology was the responsibility of the colliery survey department. Surface boreholes were often logged by someone employed by the drilling company, often from a university geology department, or a mine surveyor who had overall geological knowledge of a particular coalfield. It is no wonder that sometimes coal seams were occasionally miscorrelated! In later years staff of the British Geological Survey would be involved in borehole logging.

The 1920s and 1930s saw periods of depression and social unrest that resulted in industrial disputes. The coal industry was in decline, and several proposals to nationalise the coal industry were mooted (Anonymous, 1919). However, they were shelved at the start of World War II.

During World War II it was apparent that there was a shortfall in coal miners, who were leaving the industry to serve in the Armed Forces, so a scheme was introduced to conscript young men into the coal mining industry. Known as 'Bevin Boys', named after the then Minister of Labour and National Service, Ernest Bevin, the scheme was initiated in December 1943 (Taylor, 1995). [When the author joined the industry in 1969, he noted that many of the original 'Bevin Boys' who had stayed in the industry, had risen to managerial positions.]

By the end of World War II annual coal output had fallen further. Production was about 190 million tons per annum produced by approximately 1,500 collieries. Annual coal production had halved in 33 years. Clearly something needed to be done to stop this declining trend, so the industry was finally nationalised.

Nationalisation of the Coal Industry and the first 'Plan for Coal' (1950)

The Coal Industry Nationalisation Act 1946 resulted in the complete nationalisation of the coal industry (Coal Industry Nationalisation Act, 1946). On 12th July 1946 the National Coal Board (NCB), came into being. On the vesting date, 1 January 1947, the productive assets of some 970 or more private collieries and their employees were transferred to the NCB. As part of the nationalisation process, there were also a number of establishments set up to future-proof the industry and ensure it was kept up to date with advances in mining technology. Important examples include:

- i) The Mining Research Establishment in West London was formed in 1951. It merged with another, the Central Engineering Establishment to form the Mining Research and Development Establishment (MRDE - Bretby) in 1969. This organisation looked at advances in mining machinery and studied in detail the effects of such machinery on the mining environment.
- ii) Coal Research Establishment (CRE – Stoke Orchard) was opened in 1950. The CRE's main objective was to improve the efficiency of burning coal, whilst also trying to keep emissions down. It was implemental in the production of a range of smokeless fuels for the domestic market.

- iii) The scientific functions of the industry were also brought under one unit, and they would be responsible for scientific analysis of the industry. One of their functions was to administer the coal survey. The responsibility of the survey was to map the depth, thickness and structure of individual coal seams as well as mapping chemical and physical properties. The survey was also important for establishing a system of seam correlation using marine bands, tonsteins, and plant spore assemblages in coal.

Standardisation was perhaps one of the main achievements of nationalisation, as well as a proper career structure for employees. For example, an apprenticeship scheme was introduced for the various trades (surveying, electrical, mechanical, and mining, etc.), and common safety standards were applied to all branches of the industry.

Of course, there had to be a plan for the nationalised coal industry, and the first 'Plan for Coal' was published in November 1950, although some aspects of it were already being implemented (Anonymous, 1950). It was proposed to spend £635 million to reconstruct the industry.

By the 1960s, production would be 240 million tons of coal per annum. It was proposed to close about 450 collieries thereby reducing the workforce by 80,000 miners to 618,000 by 1965. The loss in capacity would be replaced by sinking new collieries and increase the efficiency of existing mines. Opencast (strip) mining introduced during World War II would be phased out by 1965. In 1959 the plan was revised, and the output target was raised by a further 10 million tons of coal (Anonymous, 1959).

It was expected that coal output would come from:

- Reconstructing 250 of the 950 existing collieries – 70% of output.
- Retaining a further 250 collieries (remainder would be closed) – 20% of output.
- New Collieries and Adit (Drift) Mines – 10% of output.

Most of the coal produced would go to coal-fired power stations. Many of the sites were located on coalfields, and adjacent to major rivers that provided water for cooling purposes. In some instances, new power generating stations were built to take coal directly from the new collieries.

It was inevitable that the majority of the new collieries to be sunk into concealed reserves would pass through a significant thickness of water-bearing strata (sandstones and limestones) in the Permo-Triassic. There was some experience in doing this. In the Kent coalfield, for example, many of the shafts were sunk using large diameter augers, and iron tubing (a steel lining tube). Elsewhere, later shaft sinking would employ freezing techniques. The first attempts were problematic. At Thorne colliery in the Yorkshire coalfield, which at the start of the 20th century would be one of the deepest collieries in the UK, shaft sinking started in 1912 and finished in 1925. It was sunk through 460 m of Permo-Triassic strata. However, water in the Thorne colliery shafts was always a problem. By the 1950s however, the freezing technique had been perfected, and the shafts for many of the new collieries, like Kellingley in Yorkshire, would be sunk successfully.

At the end of World War II, the process had already been started in prospecting for new collieries. The concealed coalfield to the south of the Nottinghamshire coalfield had already been explored, and it was here that Cotgrave Colliery, the first of the new collieries was sunk, and opened in 1952. Elsewhere a major borehole was drilled between the South Staffordshire and the Warwickshire coalfields. It proved that there was a concealed connection between the two coalfields, and this resulted in the sinking of two new collieries, Lea Hall and Daw Mill. They started

producing coal in 1960 and 1956, respectively. Lea Hall was set to be the first colliery in the UK to produce 2 million tons per annum. Such was the scale of geological exploration at that time the Chairman of the NCB stated that *'As much boring is at present done in one year as in about two decades before nationalisation.'* Elsewhere, some of the investment was very short-lived. One example was the Harry Stoke Drift Mine in the Fitton area of the Bristol Coalfield. The project was started in 1952, but the mine closed 11 years later.

In Scotland, the Longannet scheme linked five collieries underground and the coal was conveyed in a tunnel that surfaced at the Longannet power station, as well as being brought in by rail and sea. The power station was once one of the biggest in Europe and consumed about 4.5 million tonnes of coal per annum.

However, some factors presented problems in exploring new reserves. In Scotland some of the coal reserves project to be worked lay under the sea (The Firth of Forth). There were three issues here. i) How far did the coal reserves extend? ii) Were the coal seams thick enough to work? iii) Was there sufficient strata between the seabed and the workable seams for the coal to be worked safely without seawater entering the workings? The only way these questions could be answered was to drill offshore boreholes. However, this would require drilling platforms. In the 1950s, it was only really possible to drill in shallow water. The water in the Firth of Forth was considerably deeper, about 50 m, and the offshore drilling technology associated with oil and gas exploration in the North Sea would not be developed for another 15 years. To overcome this issue, the NCB had a drilling platform constructed. The platform itself was something that had been designed and manufactured during World War II – an offshore fort or anti-aircraft gun platform that was mounted on two large floats that could be flooded and would sit on the seabed. A conventional drilling rig was mounted on the platform. During the 1950s, about seven boreholes were drilled in the Firth of Forth with this equipment (Drydale *et al.*, 1957-58).

Similar issues existed in the Northumberland-Durham coalfield (northeast England) that extended east under the North Sea, so a second drilling platform (Fig. 2), designed in a similar manner, was constructed a few years later. That offshore platform drilled 18 boreholes (Foster, 1964; McGraw, 1963).

In the 1950s, geologists recruited from the British Geological Survey did much of the geological work. From the beginning, the majority of boreholes were logged by Survey staff. Some would eventually become specialised in Coal Measure geology of specific areas, so it was really a natural progression that eventually those geologists would be given the post of Regional Geologist in the NCB. During the 1960s, the Coal Survey would become part of the Geological Branch, and it was usual for the Deputy Regional Geologist to be a coal scientist.

The 1960s and mechanisation

The period from 1960 to 1970 was one of considerable change for the UK coal industry. The emphasis was not so much on exploration but on mechanisation. The days of hand-got coal were ending. Powered roof supports and coal-cutting machinery (*e.g.* Ranging Drum Shearer), coupled with armoured face conveyors (known as Panzers) were being introduced. This meant that coalfaces could advance at a faster rate, thus increasing coal production. Elsewhere, the MRDE were experimenting with using full-face tunnelling machine in the ironstone mines of Lincolnshire (Hay *et al.*, 1965). Some collieries were not able to make this change and became uneconomical. In 1959 the industry operated

793 collieries. In 1967, there were 317. In 10 years, 476 collieries had been closed, purely for economic reasons.

One disadvantage of a mechanised coalface is that it is more vulnerable to geological changes. The caving (the collapsing) of the overlying roof measures once the coal was removed was an important safety issue. A massive sandstone roof might not collapse instantly but stay up unsupported. When it did finally cave, the sudden force of air would blow out air doors, for example, used to control ventilation in the mine. Or if the sandstone was very thick, it could put uneven loading on the powered supports and damage them. Unexpected faulting could displace a coal seam and if the fault had a small throw the coalface would have to be graded through it to ensure maximum coal output was achieved.

One major disadvantage of mechanising the coalface was that it produced a dirtier product. The old manual methods of coal extraction solely produced coal. Mechanised coalfaces were non-selective, so mudstones and very inferior coals (a high percentage of ash was left after the coal was burnt) were also extracted with good-quality coal. However, opencast coal mining was selective and produced a clean product that could be blended with deep-mined coal to reduce the ash content. Opencast mining was given a reprieve!

Therefore, the geology of the mine environment needed to be mapped so that geological changes could be considered in greater detail. The industry started to recruit mine geologists to map the underground geology. So, in 1969 the author was appointed Mine Geologist at Lea Hall Colliery. The duties were simple, map the underground geology, log underground and surface boreholes, and feed the information into the mine planning system. Certainly, it was a unique and interesting position, as the work was unpredictable. One thing you can say with certainty about geology is that it is full of surprises!

The 1970s and the second 'Plan for Coal' (1974)

In the early 1970s, the coal industry was in slow decline because the emphasis of UK power requirements was trending towards oil and gas. 'The dash for gas' as it became known meant that reliance



Figure 2. The National Coal Board's Second Off-shore Drilling Platform (Tower) being towed from the Port of Hartlepool to its boring position off the Durham coast (*National Archives, Kew, London. Coal 80/1096-42*).

Figura 2. A segunda Plataforma *offshore* de perfuração do National Coal Board a ser rebocada do porto de Hartlepool para a sua posição de perfuração ao largo da costa de Durham (*National Archives, Kew, London. Coal 80/1096-42*).

was being placed more on imported oil and gas for energy needs. Power stations were switching to gas. In addition, there were also nuclear power stations that supplied a relatively small percentage of total energy requirements.

Then in 1973, the Yom Kippur War occurred in the Middle East. It was a major conflict between Arabic and Israeli nations, and it disrupted oil and gas supply to the UK and elsewhere. It had the effect of highlighting just how vulnerable the UK's energy needs were. Consequently, the whole of the UK's energy policy was re-examined, and the decision was made to increase coal production and maintain it at a certain level.

The second 'Plan for Coal' was published in 1974 (Anonymous, 1974). In essence, the plan required an extra 40 to 42 million tons of coal to be produced per annum required by 1985. On top of normal coal production, the additional coal would come from:

- i) An extra 9 million tons of coal by extending the life of existing collieries.
- ii) An extra 13 million tons from major schemes. This would entail opening up areas of new reserves, and often accessing them with surface conveyor tunnels (Drifts), to speed up the process of bringing coal to the surface.
- iii) An extra 15 million tons by increasing opencast production.
- iv) A further 20 million tons would be required from new collieries.

Once again, geological exploration would concentrate on the concealed parts of known coalfields, in four areas: Yorkshire, Nottinghamshire, West and South Midlands. In Yorkshire, one borehole had been drilled just to the south of the City of York and disproved the concept that the incrop of the concealed Coal Measures trended east-west beneath the Vale of York (Goossens, 1972-73). Rather, the borehole proved that it trended roughly North-South and that there were vast coal reserves under the Vale of York, to the north of the town of Selby. This would eventually become known as the Selby Project.

The exploration in Nottinghamshire was concentrated in two areas, i) At the southern end of the coalfield, south of Cotgrave Colliery in the Vale of Belvoir, and ii) To the east towards the River Witham and the City of Lincoln.

The boreholes drilled in the West and South Midlands were also finding coal under the Permo-Triassic and proved that there was some degree of continuity between the North and South Staffordshire Coalfields. A new mine prospect to the north of Lea Hall Colliery became known as Park Mine. In the South Midlands geological exploration was concentrated on exploring a southern extension of the Warwickshire coalfield towards Oxford. Previous boreholes (1960 and 1970) drilled by the British Geological Survey had proved concealed Coal Measures just to the west and north of Oxford (Poole, 1971).

Other exploration concentrated on proving the reserves at existing collieries. Some were relatively shallow and could be easily accessed by new drift mines.

Not all the exploration was successful. A series of four boreholes were drilled to the south of the Durham coalfield to determine if it continued southwards under the Permo-Triassic towards the Yorkshire coalfield, but they proved a concealed anticline structure of Lower Carboniferous Limestone.

However, to expedite this intensive program, there had to be some changes. At the end of the 19th century a borehole 2,000 ft to 3,000 ft deep, would take one to two years to drill, if you were lucky! At the time the NCB was formed a similar borehole might take 3 to 6 months to drill. This was inadequate for the exploration

programme the NCB had in mind, so they turned to North America for help and brought to the UK two Canadian drilling companies and their drilling rigs. One German-based company was also invited to try their hand. The Canadian companies proved that deep boreholes could be drilled in two weeks. One British drilling company of good repute also upgraded their equipment and matched the successes of the Canadian companies.

The majority of the boreholes were open-holed through Permo-Triassic strata and cored in the Coal Measures. The boreholes were also geophysically logged as this provided a check on the borehole results, particularly on coal thickness, and the open-holed portion of the borehole where only chipping samples provided information.

The geological structure was equally important. In the past, various attempts had been made to evaluate geological structure. This varied from drilling shallow boreholes to geophysical methods, that included earth resistance and gravity surveying. The Research and Development Branch of the NCB had also tried to look at the problem. They had devised a 'game' that became known as 'Geosimplan' whereby the geological structure of the known coalfield was superimposed on an unexplored area, and it was used to determine just how much coal could potentially be extracted with minimum geological risk.

However, in the early 1970s, a new technique was introduced, seismic exploration. The author was privileged to see some of the first trials of this technique on the surface at Lea Hall Colliery. Eventually, this exploration method would provide an essential part for evaluating geological structures. In the early days reliance was placed on consultants to interpret the data, but by the end of the 1980s, the NCB had its own geophysics unit.

After this flurry of exploration activity, some potential areas for new mines were eliminated, for example, the Park Mine Project in Staffordshire where the coal had high sulphur content. Two areas did however come to the fore: Selby in Yorkshire, and Belvoir in the South Nottinghamshire / Leicestershire border area. A possible project for a southern extension of the South Midlands coalfield was not immediately discounted. However, they would also have to go through the Government planning process.

The Selby Project was approved following a Public Enquiry and shaft sinking started in October 1976 (Anonymous, n.d.a). The coalfield area covered about 170 square kilometres and was initially confined to one coal horizon: the Barnsley seam that varied from 1.5m to 3m in thickness. The reserves were confined both physically and geologically. To the north lay the City of York, and to the south the seam split. On the west side, the seam incropped against the Permian and to the east, the seam was over 1,000 m deep.

It was accessed by five pairs of shafts at: Wistow (390 m deep), Stillingfleet (700 m), Riccall (814 m) Whitmoor (964 m) and North Selby (1044 m). Underground the coal fed onto two spine roads (over 12 km long) that conveyed the coal to the surface via two surface drifts at Gascoigne Wood, where it was loaded onto trains for transport to the electricity generating stations. (See Fig. 3).

The reserves in the Barnsley seam were calculated to be 250 million tons of coal. The mines would produce 10 million tons of coal per annum over a 25-year period. The Selby mines finally ceased production in 2004.

The Vale of Belvoir Project didn't fare well under the Government's planning process mainly due to 'Green' issues. The original proposal was to sink three pairs of shafts, but planning permission was only given for one pair at the southern end of the prospect, at Asfordby, on the site of an old iron-works

(Anonymous, n.d.b). From a geological point of view, this was not the best of the three sites, it was close to seam incrops, and there were volcanic rocks in the sequence that contributed to underground water problems. The mine was never really successful and closed in 1997.

Elsewhere in the UK, there were numerous small projects at existing collieries. The author was promoted and moved to the Yorkshire Coalfield in 1974. He was indirectly involved with the Selby project, but that had its own Project Team geologist. However, intense exploration took place at a number of the 20-plus collieries under his responsibility, as well as a new surface drift project to access new coal reserves at the Prince of Wales Colliery, Pontefract.

This expansion process was extended to all administrative Areas within the NCB. In some of the Areas, projects involved establishing a centralised coal washery fed by a number of collieries that gave the option of blending coals of different qualities to make it a more marketable product.

Plan2000 (1977)

The 2nd 'Plan for Coal' only covered the period up to 1985, so in 1977, a more forward-looking plan was published: 'Plan2000' (Kershaw, 1977). It was envisaged that by the year 2000, the coal industry would be required to produce per annum:

- i) 150 million tons from deep mines.
- ii) 20 million tons from opencast.

This was based on the assumption that beyond 1985, the energy demand would increase, and natural gas and oil reserves would be on the decline. Beyond 2000 deep-mined coal output was projected to fall to 90 million tons per annum, and so it was speculated that some 60 million tons of new deep-mined capacity would be required. This was the equivalent to 30 new mines. To achieve this objective, the NCB authorised an expanded programme of coal exploration. Part of the plan was to drill 400 deep exploration boreholes to prove new areas of potential coal reserves and establish mines, as well as the expansion of existing mines.

To pull all this information together, a National Exploration Unit was established. They would be responsible for initiating

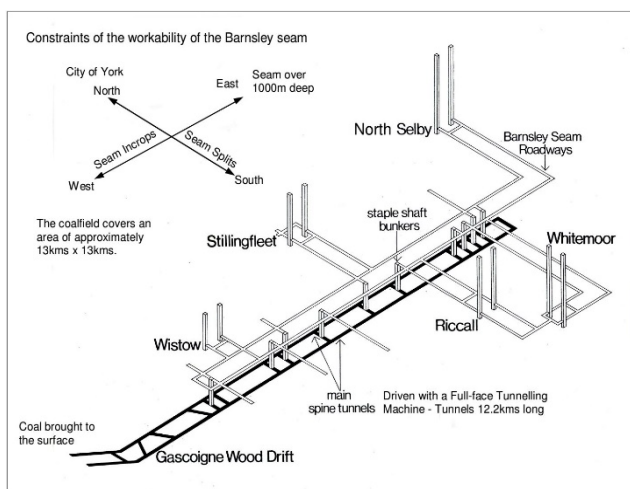


Figure 3. Selby Project: Diagrammatic representation of the Selby Coalfield, showing the relative locations of all the major shafts and underground roadways.
 Figura 3. Projeto Selby: representação esquemática da jazida de carvão de Selby, mostrando a localização relativa dos principais poços e vias de circulação subterrâneas.

and coordinating coal exploration throughout the UK. They would have an exploration budget and would explore areas beyond the accepted boundaries of existing coalfields and would liaise with coalfield operational areas that had their own exploration programmes. Exploration techniques would involve both boreholes and surface seismic. Drilling technology had advanced so much that a 2000 ft (610 m) deep borehole could be drilled by a contractor in less than two weeks, often utilising 60 ft (18.3 m) long core barrels. Geophysical exploration now became part of a NCB geophysics unit that could provide both a data acquisition and interpretation service.

This period in the NCB's history also coincided with a surge in onshore oil and gas exploration. This source of geological information was also used to assess coal resources.

Plan2000 achieved some of its objectives, major new coal discoveries included:

- i) An extension of the Yorkshire coalfield to the north and west of the City of York. Some of the coal seams were found to merge and this resulted in some instances of 6m thick coal horizons. (North Ouse Prospect) (Anonymous, 2003, *Map12a South Yorkshire*).
- ii) The Yorkshire coalfield was also explored towards the east coast, and workable seams were identified towards the town of Goole. (East Yorkshire Prospect) (*ibid.*, *Map12a South Yorkshire*).
- iii) On the west side of the country, boreholes extended the North Wales coalfield into the City of Chester area and indicated a link to the Lancashire coalfield. (South Dee Prospect) (*ibid.*, *Map 9a North Wales*).
- iv) Possibly the most surprising result was in the Midlands where an extensive area of concealed Coal Measures extended southwards from the Warwickshire coalfield towards the town of Reading (60 kms to the west of London), and this is now known as the Oxfordshire-Berkshire Coalfield (*ibid.*, *Map 6a Oxfordshire and Berkshire*).
- v) In the Cumbrian Coalfield in northern England, offshore deposits were being evaluated as well as an extension northward into the Canonic area of southern Scotland (*ibid.*, *Map 14a Cumbria-Canonic*).

Not all the work was successful. Coal Measures were known to exist under the North Sea, just offshore from the town of Cromer, Norfolk. It was hoped that a concealed portion extended onshore, but exploration proved Carboniferous Limestone. The Carboniferous Coal measures were not present onshore.

Figure 4 shows the extent of proven onshore coal reserves at the present time, but a future expansion of the coal industry into these new coal reserves was not to be.

The final objectives of Plan2000 would never materialise. Industrial action (a strike) by the coal miners union (NUM) lasted over a year (1984 to 1985) and very little coal was produced. After the strike some of the collieries had deteriorated so much that they would never produce coal again and were closed. The NCB was renamed British Coal in 1987, and the trend was towards privatising the industry, which was done in 1994, with the passing of the Coal Industry Act (1994). The last deep exploration borehole was drilled for the Selby Coalfield. The assets of British Coal, consisting of 16 collieries were transferred to the Coal Authority, and the industry was sold off to private organisations. The last private deep mine, Kellingley Colliery on the Yorkshire Coalfield, closed in 2015.

Epilogue

The author left the coal industry in 1993, shortly after he became involved with writing the geological sections for Prospectuses to sell off individual collieries. It was a career that spanned 24 years through one of the most expansive phases in the industry's history.

But just how successful were the 'Plans for Coal'? The two graphs in figure 5 show coal output and number of collieries for the period from 1947 to 1994, taken from UK Government statistics. Throughout the whole period of nationalisation, the author believes that the industry never made a profit. It did however fulfil its objectives in supplying coal for electricity generation.

The results of the first 'Plan for Coal' (1950) under-achieved its objectives by a shortfall of between 30 to 50 m tons of coal per annum. The second Plan (1974) only partly achieved success, although coal output was very consistent over the period of that Plan. Sadly, the objectives of 'Plan2000' (1977) were never fulfilled.

The author was employed as a geologist undoubtedly through one of the most exciting periods in the history of the UK's coal industry, probably never to be repeated. It was a career that has given him many interesting memories and has left him with the satisfaction that he had a small part to play in proving that indeed the United Kingdom is an 'Island of Coal.'

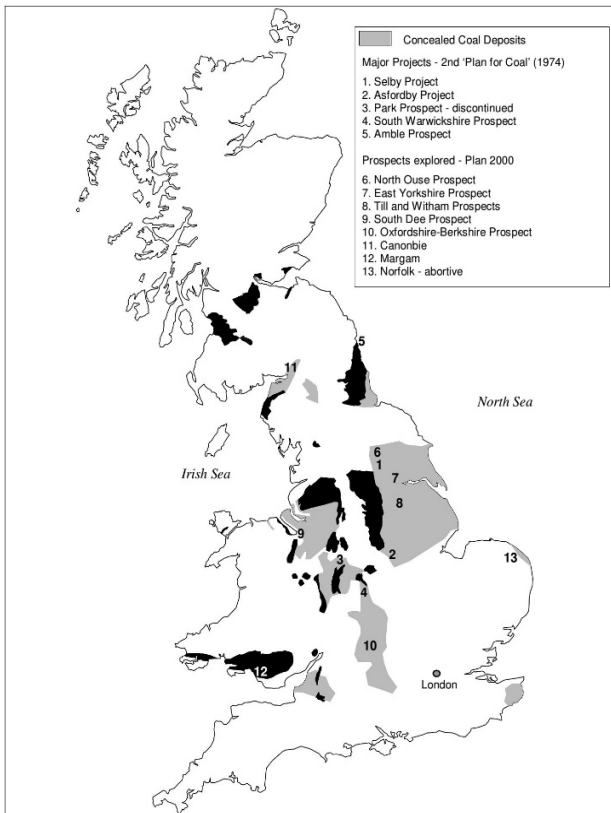


Figure 4. Map of the United Kingdom showing the extent of proved concealed coal deposits, and the locations of major Projects and Prospects examined under the second 'Plan for Coal' and 'Plan2000.'

Figura 4. Mapa do Reino Unido mostrando a extensão dos depósitos de carvão comprovadamente ocultos e a localização dos principais projetos e prospeções analisados no âmbito do segundo "Plan for Coal" e do "Plan2000".

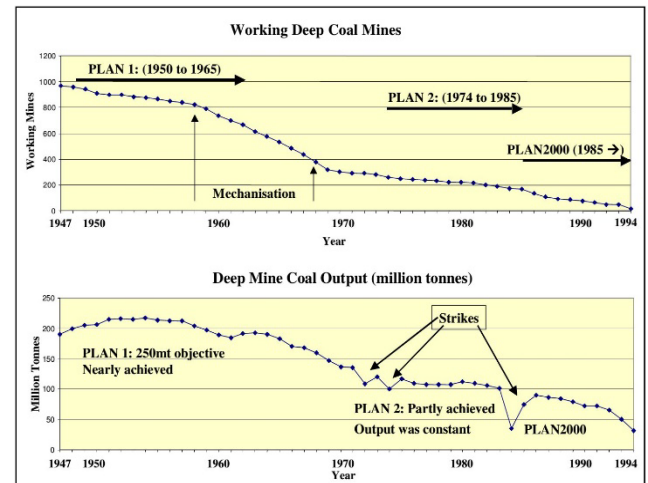


Figure 5. Graphs comparing colliery closures and tonnages produced – 1947 to 1994. The duration of the 1st and 2nd 'Plans for Coal' and 'Plan2000' are also shown. (Statistics taken from: Historical Coal Data, 1853 to 2021, Department of Business, Energy and Industrial Strategy).

Figura 5. Gráficos comparando o encerramento de minas de carvão e as toneladas produzidas de 1947 a 1994. São também apresentadas as durações do 1^o e 2^o 'Plans for Coal' e do 'Plan2000'. (Fonte: Historical Coal Data, 1853-2021, Department of Business, Energy and Industrial Strategy).

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