

# A MANCHESTER BUSINESS LEADER: W. M. CARR AND THE BRITISH GAS SUPPLY INDUSTRY

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While the endeavours of leading Manchester industrialists feature prominently in the economic history literature, less well-known are the exploits and achievements of businessmen in the service sector. As this city claims to be the 'cradle of the Industrial Revolution', perhaps such an imbalance is not surprising. On the other hand, given the undoubted importance of the service sector to Manchester's development over the last 200 years, it is useful to provide detailed insights into prominent figures, especially where they influenced the national scene. With specific regard to gas supply, Manchester has a long tradition as a pioneer, having been responsible for establishing in 1817 the first municipal gasworks and developing over the following decades one of the largest supply networks in the country.<sup>1</sup> By the early-twentieth century, Manchester was also the base for one of Britain's most influential gas engineer-managers, W. M. (Bill) Carr, during a crucial period for this industry when it was suffering badly at the hands of its major rival, electricity. Indeed, Carr not only provided regional leadership, but also helped to fashion strategies for the entire British gas supply industry in the run up to, and aftermath of, nationalisation in 1949.

A survey of Bill Carr's career, and especially his work as chairman and managing director of both the United Kingdom Gas Corporation and the North Western Gas Board, will provide significant findings in several respects. In the first place, it will illustrate how parts of the gas supply industry responded to what amounted in the 1930s and 1940s to a crisis situation, elaborating strategies which were imitated nationally. Secondly, in outlining the structural forms adopted by Carr's operations, we shall discover that the managerial shortcomings apparent in British manufacturing were avoided.<sup>2</sup> Indeed, there is evidence that at his Manchester headquarters Carr was imitating some of the most advanced forms of organisation which were emerging in the United States at that time, including office automation and devolved management systems. Finally, his practical experience was frequently referred to in the late-1940s, when contemporaries were considering effective responses to the industry's imminent nationalisation. It is consequently vital that the career of W. M. Carr is given some prominence when historians consider both the regional and national business scenes, providing some balance to the excessive concentration by most historians on industrialists and engineers.

## A Troubled Industry

By the early twentieth century, town-gas supply in Britain was still largely based on the atomistic structure which had characterised the industry since its foundation in the period

1812-1826.<sup>3</sup> Only in conurbations like London, Birmingham, Sheffield, Liverpool and Manchester had attempts been made to build extensive distribution networks connecting several communities, while elsewhere each town would be supplied by an undertaking within its own statutorily prescribed area. This restriction on the size of gas undertakings was further reinforced in regions like the north-west by the division of ownership between private and municipal bodies, Manchester having pioneered local authority control of gas supply in 1817. In fact, by 1947 there were fifty-nine municipal gasworks out of a total of 104 undertakings in the north west, which accounted for sixty-nine per cent of the region's total gas sales.<sup>4</sup> While Manchester Corporation went on to develop an ambitious strategy of linking surrounding townships into its network, other local authorities jealously guarded their distribution rights and prevented integration with neighbouring systems. Similarly, most statutory and non-statutory private undertakings proved unwilling to engage in extensive merger activity, because of the conservatism and defensiveness of shareholders and board directors anxious to maintain control over gas prices and dividends.<sup>5</sup>

Having noted these points, it is important to remember that this atomistic structure had actually proved successful for much of the nineteenth century, when no effective competition in the energy markets existed. It was only after the development of a viable electricity supply industry from the 1880s, and the wider availability of oil after the First World War, that more intense competition was beginning to appear. Gas undertakings had originally been founded to provide a source of light for local streets, factories, shops, pubs and (later) homes. This provided a sound market base for an industry which continued to expand right up to the First World War. With the advent of competition from electric lighting, however, much greater efforts were made to diversify further into the domestic heating, cooking and industrial processing markets. The introduction of prepayment meters in the 1880s also allowed more working class consumers to take a supply. However, the sales per consumer to this sector were never impressive, leading to general concern about the economic wisdom of supplying that particular market. In fact, total gas sales in the north-west grew at a sluggish rate in the inter-war period as a whole, leading to some attempts at streamlining operations, especially in the larger gasworks.<sup>6</sup>

In this light, it might seem surprising that the gas industry was not moving towards the kind of grid structure employed in electricity supply after 1926. One of the obvious pitfalls to avoid when discussing a possible rationalisation of gas supply, however, is likening these two industries.<sup>7</sup> While electricity suppliers could exploit substantial economies of scale by generating from a small number of large stations

# The British Gas Industry and the Future\*

By Col. W. Moncreiff Carr, O.B.E.

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THE public supply of gas for illumination began in 1812, and while its use as a fuel for domestic purposes was developed throughout the latter half of the last century, it is only during the last 20 years that it has come into extensive use for industrial purposes.

It is one of the largest industries in the country, and has maintained a standard of efficiency in gas service in advance of any other European country. The gas industry, processing over 20 million tons of coal per annum, is of vital importance in the national economy. This has been clearly proved in two world wars. It is comprised of company and municipally-owned undertakings operating under statutory control regulating areas of supply, charges for gas, quality of gas, and rate of dividend. For many years, transition from small to large units has been taking place by amalgamation, and more recently, by holding company grouping.

The supply of gas to industry has rapidly increased in the last decade, and in some undertakings supplying industrial areas, the quantity of industrial gas sold is considerably in excess of that for domestic purposes. The necessity for accurate control of heat treatment, and increased factory production, has led our manufacturers to purchase their heat requirements on tap, and the use of coal in its raw state in many heat treatment processes is not only unscientific, but uneconomic. The conservation of the national coal resources must envisage the carbonisation of all available gas and coking coals, much of which is still being consumed in domestic open grates at, approximately, one-third the efficiency in use.

The principal processes employed in the manufacture of town gas are high temperature carbonisation of coal in retorts of various types, and the production of water gas from coke usually enriched with oil. High temperature carbonisation of coal producing gas, coke, tar, benzole, ammonia and other products is a highly efficient process in which 80 per cent. of the heat units in the coal are recovered in the products. The production of water gas, while not as efficient as high temperature carbonisation, has the advantage of flexibility, and can be brought into operation rapidly to meet sudden demands for gas.

Our president's father was a pioneer in



Col. W. Moncreiff Carr

the design and construction of, and first introduced, stoking machinery for gas retorts, and he has been emulated by his son in the development of continuous vertical retorts, which he is constantly improving.

The gas industry is a two-fuel industry, supplying gas and coke which, in combination, are ideally suited to provide the total fuel requirements of a modern house at a lower cost than any other form of fuel if utilised in the efficient appliances which are available to-day.

The storage and distribution of gas have a most important bearing upon the efficiency of gas supply. Before the war progress was made in the automatic control of pressure, and this will rapidly extend as labour and materials become available.

The standard of efficiency and service throughout the gas industry is high. There are weak spots in one or two large, and in quite a number of small, undertakings, but it is wrong to assume that efficiency is dependent upon size. It is significant that for many years, in the early part of the present century, the Widnes corporation gas undertaking—a relatively small unit—sold the cheapest gas in the world. Load factor, of course, has a bearing on cost, particularly of distribution, and the industrial load is a valuable cost reducing factor.

The process of integration of gas undertakings has continued throughout the life

\* Summary of an address delivered to a meeting of the North West Fuel Luncheon Club, in Manchester, December 4.



Bill Carr with his National Fuel Plan depicted as Mr Therm characteristically riding to hounds in his beloved countryside.

and transmitting at high voltages across a nationally integrated grid distribution system, gas suppliers were not in such an advantageous position. The key criterion to consider was the position of each gasworks in relation to both its coal supplies and market, bearing in mind the relative costs of delivering fuel, as opposed to the price of supplying gas from a large works to a neighbouring community. Coal-gas was produced at such a low pressure that distribution costs could be prohibitively expensive when considering the integration of systems, reducing the benefits to be gained from producing in centralised works. A further factor to consider was accessibility to a market for the coke produced in town-gas manufacture, because by the inter-war years most undertakings relied on the income generated from this by-product (and many others) to such an extent that its loss could result in a significant increase in the price of gas. Indeed, measured simply in terms of production and distribution costs, up to the 1940s a small isolated works could be just as efficient as its much larger counterparts, confounding any suggestions that gas supply ought to imitate the grid system established for the electricity supply industry in 1926. On the other hand, a strong case could be made for regionalising gas supply, concentrating production and distribution in areas where inefficient undertakings could be linked into larger, well-managed businesses with the resources to exploit any available economies of scale.<sup>8</sup>

By the 1930s, expert commentators were beginning to make

radical suggestions for reform of the gas industry, arguing that there was an urgent need to move towards a minimum efficient size for supply undertakings. A 1939 PEP study identified the notional figure of one million therms as "large enough for economic production" (including a full range of bi-products).<sup>9</sup> By this measure, as Table 1 indicates, in the north-west seventy-one of its 104 undertakings were apparently inefficient. Wormsley later calculated that net production costs would fall from 19.0 pennies per therm in undertakings with an output of up to 50,000 therms per annum to 8.66 pennies per therm where output exceeded one million therms, demonstrating the gains to be achieved from linking many of the region's gas supply systems.<sup>10</sup> Furthermore, urbanisation in the region was so extensive that the vast majority of these smaller suppliers were within economically viable distances of a larger works, providing the basis for a wholesale reorganisation of the industry. Indeed, by the 1930s several commentators were advocating the creation of regional gas industries which could reap the benefits known to be available from the concentration of production and the integration of distribution networks.

Table 1: Sales Distribution among North-West Undertakings in 1935 (in million therms).

M Therms	No of Works	Total Sales of Group	Ave. Sales in Group	Proportion of NW Sales
<0.05	6	0.22	0.03	0.08%
0.05-0.1	9	0.75	0.08	0.39%
0.1-0.3	18	3.39	0.19	1.76%
0.3-1.0	38	21.15	0.56	21.15%
1.0-3.0	16	29.33	1.83	29.33%
3.0-10.0	15	76.10	5.07	39.42%
>10.0	2	62.10	31.05	32.17%
<b>Total</b>	<b>104</b>	<b>193.04</b>	<b>1.86</b>	<b>100.00%</b>

Source: Board of Trade Annual Returns 1935.

## Regional Solution

Bill Carr was certainly aware of all these issues, having been immersed in the industry from an early age.<sup>11</sup> His father, Isaac Carr, was not only a consulting gas and water engineer, but also prior to the First World War engineer-manager at the Widnes gas works, where he achieved fame after producing what was regarded as the cheapest gas in the world. Isaac Carr believed firmly in providing his son with a first class education, sending him to the University of Manchester to do a degree in engineering and then encouraging him to go to Germany to study what was the world's most successful chemical industry. After a year in Germany, where he learnt much about chemical engineering and the management of works, he joined his father's consultancy to apply some of this knowledge to the British gas industry. Such was his burgeoning reputation that in 1911, at the relatively young age of twenty-five, the Ormskirk District Gas Co. made him their engineer-manager. He broke off his gas industry career to fight in the First World War, where he rose to the rank of Colonel in the army.

Although Carr's health was badly affected by his wartime experiences, this did not disrupt his civilian life too much. In fact, as the cartoon indicates, he was always a keen

horserider, which kept him relatively fit. His career also took off again in 1922, when he secured the post of engineer-manager at the much larger Stretford and District Gas Board. It was at Stretford that Colonel Carr first came to national prominence, when he first announced a simple philosophy based on the slogan 'Sell or Die!'. A clear manifestation of this strategy was the introduction of an innovatory contract and pricing system based on offering discounts to bulk purchasers who would sign up to long contracts. While many in the industry regarded this as foolhardy and contrary to all received wisdom, the Stretford works actually trebled its sales during the 1920s, establishing Carr's position as one of the most successful gas engineers in the country.<sup>12</sup> In recognition of his enhanced standing in the industry, by 1931 he had been elected to the presidency of the Manchester District Association of Gas Engineers, while the ultimate honour was bestowed upon him in 1935, when Bill Carr became President of the Institution of Gas Engineers.

Apart from his successes at Stretford, another dimension to Carr's reputation was his increasingly strong belief in the need to reorganise the entire gas supply industry. As we noted in the last section, the sluggish growth of sales, the fall in consumption per customer, and the ascendancy of electricity in lighting and industrial markets were worrying many in the industry.<sup>13</sup> More importantly, perhaps, within the industry there was only a half-hearted interest in adopting a more integrated structure which would allow larger suppliers to exploit the available economies of scale in production and distribution.<sup>14</sup> In fact, by 1935 as far as England and Wales was concerned, 1,070 undertakings (out of a total of 1,250 gas supply operations) were still supplying less than what was generally accepted as the viable minimum of one million therms per annum.<sup>15</sup> As Table 1 reveals, in the north-west similar imbalances existed, limiting the regional industry's ability to cope with the increasing competition. This prompted certain pioneers to devise a solution which would eventually result in the development of a company which became a leader in its field.

Before going on to discuss the creation of this company, it is important first of all to note that the north-west was not the only region involved in formulating new approaches to the gas industry's problems. Indeed, the pioneer in this respect was the Gas Light & Coke Co., in London, which had not only been acquiring several smaller operations, but also creating the South Eastern Gas Corporation.<sup>16</sup> The latter was the brainchild of G. M. Gill, a gas engineering consultant, who in 1932 persuaded the Gas Light & Coke Co. and the merchant banking firm of Dawnay, Day & Co. to finance the establishment of a holding company.<sup>17</sup> The purpose of this new company, hereafter referred to as SE Gas, was to buy up gasworks in the south-east of England and link them all together in a regional grid. This set the pattern for a series of similar developments which connected City firms and gas interests, reflecting the tremendous potential in a strategy which was one of the more appealing means of moving towards the regional structure advocated by many as a solution to the industry's problems.

Of course, one must always remember that several gas holding companies had been trading since the 1820s.<sup>18</sup> Similarly, in the electricity supply industry by the 1930s

powerful City-backed holding companies like the Greater London & Counties Trust and Edmundsons Electricity Corporation controlled over one-sixth of electricity sales.<sup>19</sup> Nevertheless, the Gas Light & Coke Co. was responsible for initiating the first moves to build large, domestically-oriented gas holding companies, sparking off a trend which was to have important implications for Bill Carr. Moreover, the Board of Trade encouraged this movement, by facilitating the acquisition of financial interests in other undertakings though the abolition (in the 1932 Gas Undertakings Act) of the need to seek parliamentary approval for such a move. The 1933 report by the Gas Legislation Committee (Board of Trade) was also supportive of holding companies, arguing that this form could offer to smaller operations the possibilities of easier access to capital, a central technical and commercial service, and the bulk purchase of coal and appliances on more favourable terms.<sup>20</sup>

### The 1930s Movement

Holding companies consequently seemed to presage many of the developments advocated by those in favour of regional concentration. G. M. Gill's success in persuading the Gas Light & Coke Co. to establish the South Eastern Gas Corporation also precipitated a significant new trend as others in both the financial and gas supply communities moved to exploit the new legal environment created by the 1932 Gas Undertakings Act. The *Investors' Chronicle* reported as early as May 1935 that "the geographical grouping of companies has proved that many advantages can be obtained".<sup>21</sup> It also recommended that the shares of one new holding company, Gas Consolidation, looked to be "a sound holding", encouraging other institutions to venture into the field.<sup>22</sup> Consequently, as Table 1 reveals, by 1938 twenty domestic gas holding companies had emerged, indicating how many contemporaries were both prepared to invest in this form of organisation and accept it as a solution to the industry's problems.

While 260 operations had been absorbed into holding companies by 1938, it is clear that the movement had not been as extensive as in its main rival, electricity supply. Nevertheless, by 1937 well over £15 million had been raised by these companies, at a time when the capital invested in the 706 statutory gas supply undertakings amounted to £225.8 million.<sup>23</sup> By that time, apart from the relatively small amount of gas made by the British Gas Light Co.'s operations, holding companies accounted for nine per cent (134 million therms) of total gas sales in England and Wales (1,494 million therms).<sup>24</sup> The trade press was also beginning to talk optimistically about how these firms would substantially improve the industry's competitiveness.<sup>25</sup> In particular, there was special interest in the possibilities of achieving what we noted earlier as the widely-proposed regional solution to gas supply's inherent weaknesses. The 1939 PEP report, for example, anticipated a wide range of 'reforms', especially the provision of central technical services for subsidiaries which in the past had never possessed the resources to employ adequate staff in this area. It was also hoped that a holding company's headquarters would co-ordinate group operations, technically and financially, while at the same time implement effective marketing strategies, purchase coal and domestic appliances in bulk, and raise capital on more favourable terms.<sup>26</sup> If one added to this list the total reconstruction of outmoded works and pipeline

systems, it is clear that there were considerable possibilities in moving towards a holding company pattern of ownership, substantially improving the performance of many smaller undertakings, private and municipal, at a time of great urgency.

Table 2: *Holding Companies in the Gas Supply Industry by 1938.*

	No. of Subsidiaries	Average Output Per Subsidiary (Thousand Therms)
Associated Gas & Water	16	710.2
Associated Utilities	3	2697.7a
British Electric Traction	8	172.6
British Gas Light Co	24b	161.8
Caledonian Gas Corporation	17c	161.4
Cambrian Gas Corporation	4	128.8
Devon Gas Association	12	49.6
Gas Consolidation	11	593.2
General Gas & Electric	15	62.6
Holyhead & North Wales	8	N.A.
Joint Gas Undertakings	1	1090.0
Palatine Gas Corporation	1	1460.0
Severn Valley Gas Corporation	24	586.7
South Midlands Gas Corporation	3	487.3
South Wales Gas Corporation	1	38.0
South Eastern Gas Corporation	28	1447.9
South Western Gas Corporation	23	169.7
Swindon & District Gas	7	294.6
Tottenham & District Gas Co	5	N.A.
United Kingdom Gas Corporation	49d	737.7
Totals	260	N.A.

Key: N. A. signifies that no information is available on this corporation's output.

a. This corporation owned the Reading Gas Co, with an annual output of 7705 thousand therms.

b. This corporation also owned directly a further fourteen gas-works, including those at Hull and Norwich.

c. Wholly owned by UK Gas.

d. Contemporary sources give the figure of 44, but more detailed research reveals that UK Gas had 49 subsidiaries by 1938.

Sources: PEP, *Report on the Gas Industry*, pp. 192-8, and *Gas World Register of the Gas Industry* (1936), pp. xiv-xvi.

## United Kingdom Gas Corporation

In view of the optimism surrounding gas holding companies, it is interesting to assess the role played in this movement by Bill Carr. As we saw earlier, apart from building up a national reputation for his achievements at Stretford, he was also beginning to advocate publicly the regionalisation of gas supply. In pursuit of the latter, by 1935 he was working very closely with a holding company which had been incorporated in February of that year, the United Kingdom Gas Corporation (hereafter, UK Gas).<sup>27</sup> This holding company had been created by the leading merchant bank, Erlangers Ltd., one of whose directors, R. B. H. Ottley, took

the position of chairman.<sup>28</sup> Indeed, UK Gas was well connected financially, because Angus V. Hambro (of Hambros Bank Ltd.) joined Ottley on the board, Philip Hill & Partners were recruited as financial advisors (along with Hambros and Erlangers), and the Prudential Assurance Co. acted as trustees of the £400,000 worth of 3.5 per cent debentures issued in 1935.<sup>29</sup> As UK Gas also needed short-term liquidity, by August 1935 a £500,000 overdraft facility had been negotiated with Barclays Bank. This demonstrates how UK Gas arose directly out of City of London interest in the financial potential inherent in gas holding company operations. Its shares were certainly regarded as a solid investment, leading to the successful issue of £3 million worth of capital by November 1935. This capital was also extended in 1937 by the creation of a further £1 million in debentures, such was the voracious appetite with which UK Gas absorbed subsidiaries.<sup>30</sup>

Although financial institutions had undoubtedly been responsible for establishing UK Gas, they very soon brought on to the board several experts in the field of gas supply to advise on strategy. The first of these technical directors was M. H. Tetley, a director of the Imperial Continental Gas Association, and Henry F. H. Jones of the British Gas Light Co. This reveals how the older holding companies were closely connected with their 1930s variants, combining effectively with the financial institutions to establish a potentially viable operation. However, it is vital to stress that the most crucial appointment to the board did not occur until August 1935, when Bill Carr became a director. In fact, Bill Carr had been advising UK Gas as a consultant on acquisitions for at least three months before his elevation on to the board. Although he only became managing director in January 1936, there is little doubt that Carr was primarily responsible for fashioning the organisation's structure and strategy almost from the outset. As managing director of UK Gas, he also made an enormous impression on the provincial gas supply industry, laying the foundations of a commercial strategy and organisational ethos which were later to influence attitudes in the nationalisation era.

The acquisition of Colonel Carr's services in 1935 was clearly one of UK Gas's wisest early moves. His services did not come cheap, because apart from expenses and a pension Carr was to command an annual salary of £5,000. Nevertheless, his ideas on integration and pricing policies provided a clear sense of strategic direction when the board came to consider how best to exploit the competitive advantage associated with its abundant financial resources. These ideas were best expressed in a prospectus issued by UK Gas in October 1935, which outlined how, after acquiring substantial interests in public supply undertakings:

*The policy of this company shall be the co-ordination of sales organisation and co-operation in technical and commercial organisation. In areas suitable for the purpose, gas undertakings shall be grouped together, thus enabling them to render more efficient and economical service. Joint working between neighbouring undertakings will be established, while as far as possible individual local management will be maintained. Wherever technical conditions are favourable the physical link-up of works ... will be carried out.*<sup>31</sup>

This was a comprehensive approach to enhancing the per-

formance of both the acquired operations and the corporation as a whole, reflecting the cohesion in Bill Carr's grasp of both the challenges and opportunities. Above all, though, the statement reflects his belief in the imperative need to improve services if gas supply was going to flourish. 'Sell or Die!' was indeed an accurate slogan summing up his career.

## Strategy and Structure at UK Gas

The first task facing UK Gas was consequently the purchase of controlling interests in nominated firms. This activity was at first conducted in a clandestine fashion, because the financial institutions involved were well aware of the inflationary effect on share values which inevitably followed an outright bid for a company. The board soon realised, however, that controlling interests were difficult and time-consuming to accumulate in this way. Instead, personal negotiations with a company's senior management were initiated as an alternative approach. It was in these personal negotiations that Bill Carr first demonstrated his value to UK Gas, exploiting his widespread reputation to gain access to directors who might listen willingly to the firm's entreaties. Furthermore, not only was UK Gas ready to compensate directors and senior engineers for the loss of office, but also the holding company usually required the existing management to continue in post, providing substantial incentives to those approached.<sup>32</sup> When one combines this with the financial and technical resources UK Gas could offer, it is clear that Carr was in a strong bargaining position.

Although the widespread resistance to merger activity in gas supply remained a major problem for UK Gas, at times limiting the development of regional interconnections, after 1935 Carr succeeded in accumulating a large number of subsidiary operations. As Table 2 reveals, UK Gas had acquired sixty-six subsidiaries by 1938 (including the Caledonian Gas Corporation's works), while in total (see Appendix 1) seventy-five operations had been purchased by 1948.<sup>33</sup> It is a moot point whether in different circumstances UK Gas would have built further on this base, because the Second World War undoubtedly hampered progress, while the election in 1945 of a Labour government which was committed to nationalising gas supply made it uneconomical to buy many more companies.<sup>34</sup> Nevertheless, it is interesting to examine how Colonel Carr tackled the challenge of implementing UK Gas's avowed aim of integrating and rationalising the sixty-six operations which they controlled by 1938, particularly in view of their extensive geographical dispersion (see Appendix 1).

The organisational response devised by UK Gas to dealing with this extensive degree of geographical dispersion will be analysed in the next section, because it is first of all necessary to understand fully the strategic intent behind senior management's thinking. In the first place, as we noted earlier, one must remember that the holding companies were largely concerned with the acquisition of small operations which demonstrated an inherent weakness when dealing with the competitive pressures of the era. The rationale behind this strategy was simple: because gas prices in all undertakings had been set many years previously, according to the production and distribution practices prevailing at that time, it was possible by introducing new managerial and engineering techniques to improve substantially the

returns on invested capital.<sup>35</sup> The holding company could also charge constituent enterprises for both financial and technical resources provided by the central organisation. This presented management with a sound investment opportunity, without contravening the existing regulatory framework. Once again, it is important to stress how a combination of competition from other holding companies and a traditional reluctance amongst both municipal and small, private undertakings to indulge in mergers inhibited a complete elaboration of this strategy. Nevertheless, in exploiting the possibilities, UK Gas was more successful than most of its rivals, largely by forging a series of alliances which would provide the opportunity to generate reasonable returns for the financial backers. While this strategy was being implemented, Colonel Carr and his team also started to deal with the organisational requirements of a business which by force of circumstances was highly geographically dispersed (see Appendix 1). As we shall see later, Bill Carr was not an advocate of regimented centralisation, arguing forcibly that the local engineer-manager was always the more appropriate focus for decision-making. On the other hand, it was deemed essential at UK Gas to establish a strong central administration, in order better to monitor activities across the organisation as a whole, and specifically to give senior management the opportunity to spot problems in the subsidiaries. Although this function was initially performed in a very *ad hoc* fashion, after Bill Carr and H. F. H. Jones had presented a detailed report to the board in January 1936, the other directors backed their scheme to establish a group headquarters in Manchester.<sup>36</sup> The first premises, at 46 Brown St., were opened three months later. By 1937, though, the company had moved into the much larger and more prestigious Bridgewater House, where a series of organisational innovations was introduced as a means of providing effective co-ordination across the expanding empire.<sup>37</sup>

One of the first of these innovations was the appointment of a co-ordinating accountant. In view of the acute shortage of talent in British business at that time, however, UK Gas was initially obliged to rely on a Manchester firm of chartered accountants for this service. Only later in 1937 was a chief accounting officer appointed, while in the meantime Ashworth Mosley & Co. was commissioned to introduce a monthly reporting system which all subsidiaries were obliged to use.<sup>38</sup> Severe problems were experienced introducing these controls, largely because many of the subsidiaries did not possess staff capable of providing the necessary information.<sup>39</sup> Nevertheless, towards the end of 1936 suitable arrangements had been made to ensure that regular reports were received from all operations.<sup>40</sup> This allowed the Manchester office to operate more effectively, because when problems appeared in the reports specialist staff could be immediately sent out to the subsidiary concerned in order to implement any necessary reforms. As the provision of a trouble-shooting technical service was actually one of the main functions of the Manchester office, Carr decided to offer relatively high salaries in order to recruit staff which the smaller undertakings could never have afforded.<sup>41</sup>

The Manchester office clearly played a crucial role in monitoring and regulating the performance of all UK Gas subsidiaries. Bill Carr also ensured that every effort was made to streamline its activities, introducing the latest office machinery and well-qualified staff. However, one must not

be misled into describing UK Gas as a highly centralised form of organisation, because a crucial feature of Colonel Carr's philosophy was operational autonomy. As he said during a debate on holding companies,

*... the fact must never be lost sight of that ... the most important man must remain the man on the spot who was responsible for the undertaking, and those who were connected with the conduct of a holding company must be extremely careful not to take the initiative and destroy the initiative of the man who was responsible on the spot, who, after all, would make or mar the success of the undertaking.*<sup>42</sup>

This was rather a cumbersome way of emphasising how holding companies ought to develop a balance between centralised supervision and local autonomy: 'the man on the spot' should be allowed complete freedom to determine how the local market should be exploited. At the same time, the Manchester HQ, apart from dictating overall strategy, should provide the necessary services and resources necessary for successful operational development. This reveals how the holding company label lacked much accuracy when referring to UK Gas, because to all intents and purposes its ethos was best encapsulated by the multidivisional form (M-form) of organisation. Indeed, it is likely that UK Gas was a better example of an M-form than ICI, because not only did the latter's chairman (Lord McGowan) adopt an excessively centralised approach in the 1930s, Bill Carr also developed a grouping system which allowed for autonomous management.<sup>43</sup>

To clarify this claim, it is important to note there were two distinguishing characteristics of the UK Gas structure: firstly, the subsidiaries were grouped together; and secondly, a group general manager was primarily responsible for running this combination of works. The grouping of subsidiaries arose out of the technical possibilities associated with linking production and distribution systems, Carr having been one of the most vigorous advocates of regional gridding in the industry. Three basic principles guided the Manchester office when considering this process: firstly, it was necessary to pool production and distribution resources, in order to reduce costs; secondly, service to the consumer should be improved; and thirdly, specialist staff should be recruited to perform all the various functions, technical and managerial.<sup>44</sup> This ensured a relatively smooth transition from independent to group operation, bringing each works into a planned programme of modernisation and expansion.

Although it was not always possible to achieve geographical proximity, every effort was made in the main acquisition phase to buy undertakings which were reasonably close to each other, in order to allow interconnections. As Appendix I illustrates, almost all of the subsidiaries were linked together with near neighbours, resulting in the establishment of fifteen groups. Crucially, each group was controlled by a single general manager who took responsibility for the performance of each works under his control, instilling a spirit of enterprise into the organisation which Bill Carr regarded as an essential condition for success. While the respective companies retained their own legal identity, and as such would still have their own boards of directors to run the operations, the group general manager acted as the link between operational activities and Bill Carr's headquarters. While he could always be dealing with central

engineering and sales staff to assist any works in his unit, it was the group general manager's responsibility to hold periodical staff meetings, produce standardised reports, and call personally at head office to discuss all aspects of the business.<sup>45</sup> This demonstrates how UK Gas worked along highly devolved lines, providing the flexibility which was so essential to effective management.

Grouping and the appointment of group general managers were clearly central to the further extension of Colonel Carr's strategy of increasing gas sales. Furthermore, in rationalising both production and distribution systems, as well as installing specialist staff with extensive responsibility for the provision and selling of services, UK Gas was able to boost each subsidiaries' competitiveness at a crucial time for the industry. Perhaps the most outstanding illustration of this philosophy in action was the creation of a subsidiary, the West Yorkshire Gas Distribution Co., to integrate the supply of gas from undertakings and coke-oven plants in that region. The initial plan (costing £2 million) was to link twenty towns through seventy-six miles of high-pressure main, as well as construct substantial production and purification plant at appropriate points on the system.<sup>46</sup> In fact, most of the works were already interconnected by 1938, UK Gas having acquired them over the previous three years and laid mains totalling over 800 miles. However, the new scheme would provide the model for a brand new type of regional grid, linking together gasworks and coke-oven gas plants in a highly original manner. Lord Heyworth later commented on both the scheme's 'unique' nature and UK Gas's success in achieving "substantial economies in production and distribution".<sup>47</sup> Indeed, between 1938 and 1944 gas sales at the original twelve stations had increased by an average of 119 per cent, demonstrating the tremendous potential in what would become a model for others to copy.<sup>48</sup>

## UK Gas Performance

Acquiring and improving the performance of an increasing number of subsidiaries, linking them together into rational groups with an integrated management structure, and where possible constructing grids to exploit the possibilities in coke-oven gas, were three of the more prominent reasons why UK Gas succeeded in making such an impressive impact on gas supply from the 1930s. Certainly, its financial backers would have been pleased with the returns generated by UK Gas shares, because as Table 3 (over) reveals the ordinary share dividend only fell below four per cent during the difficult early years of World War II. It is important to remember that, as the merchant banking houses had turned their attentions to such domestic investments because of the dual problems of falling overseas demand for their services and the Bank of England's decision to hold interest rates at two per cent, clearly in this respect UK Gas provided a steady return on their risk capital.<sup>49</sup> In addition, of course, the fixed-interest capital also paid out every year, confirming the earlier predictions that holding companies would be 'sound' investments. Although one might argue that these returns were hardly spectacular, City houses were never interested in activity which was regarded as excessively risky. The unspectacular nature of these profits also undermines any claims that holding companies like UK Gas were exploiting their position. Even though by the late-1940s the company's dividends were generally higher than the indus-

try average of five or six per cent, this could hardly be described as significant.

Table 3: *The Performance of the United Kingdom Gas Corporation, 1936-48.*

Financial Year a	Net Revenue £	Gas Sales b Thousand therms	Ordinary Share Dividend %
1936	87,829	4,375	5
1937	110,188	4,547	5
1938	128,937	4,652	5
1939	122,443	4,768	5
1940	94,398	5,007	4
1941	40,837	N.A.	3
1942	101,210	N.A.	3
1943	103,780	N.A.	3
1944	111,263	14,063	5
1945	137,470	15,380	6
1946	160,090	17,624	7
1947	165,387	N.A.	7
1948	180,254	N.A.	7

**Key:**

a – the financial year ran from January to December.

b – this figure gives the gas sales for all those undertakings owned by UK Gas.

N.A. – not available

Sources: UK Gas archives and *Gas World*, 1936-49.

Although the impending nationalisation of UK Gas's supply operations would have affected planning during the late-1940s, it is also important to stress how Colonel Carr continued to develop the organisation as effectively as he thought possible in the circumstances. In 1946, bringing the issued capital to £7 million, a further £1 million in 3.5 per cent debentures was issued, along with another £350,000 worth of £1 ordinary shares. These funds were used partly to repay the bank overdraft, and partly to fund a series of capital projects which were being planned. By that time, Bill Carr was formulating plans to invest over £4.5 million in new production and distribution plant, including a £1.25 million unit at Tingley, West Yorkshire, which would carbonise 500 tons of coal to produce seven million cubic feet per day.<sup>50</sup> In 1947, UK Gas was also granted permission by the Ministry of Fuel & Power to initiate a £3.5 million reorganisation scheme in the North Cheshire group, starting with the construction of a new gasworks at Denton capable of producing six million cubic feet per day.<sup>51</sup>

These investments reflected the firm's continued commitment to progress in the industry, in spite of the raging paranoia about nationalisation and compensation rates. Plans were also devised to allow UK Gas to continue trading after its gas supply operations had been nationalised.<sup>52</sup> In the end, though, as with so many of its counterparts across the industry, the board meekly acquiesced in Labour's plans, taking the compensation offered and allowing the firm to be liquidated. UK Gas was actually valued at almost £7.4 million at the time of nationalisation, with each £1 share receiving in compensation from the government £1.1s. (£1.05p).<sup>53</sup>

Having noted how well UK Gas performed as an invest-

ment, it is vital to remember that the principal reason why UK Gas had fulfilled the financial expectations of its initiators was the strategy and structure implemented by Bill Carr. One can also emphasise how UK Gas's most significant general achievement was in providing a model on which the gas supply industry could have built an effective response to the market challenge provided by electricity. Over the period 1935-48, while average sales in statutory gas companies rose by fifty-six per cent, with regard to UK Gas subsidiaries the figure is ninety-six per cent.<sup>54</sup> This confirms how under the ambitious management of Bill Carr's team undertakings were capable of radically improving their performance, largely by taking advantage of both new techniques and equipment, as well as the inherent benefits of grouping. Again, one must reiterate how Colonel Carr consistently argued that local initiative ought to be encouraged, revealing how autonomy was a crucial feature of the company's broad philosophy. On the other hand, the resources and advice provided from the centre were vital to the success achieved at subsidiary level, ensuring that an elusive balance between headquarter interference and local autonomy was effected at UK Gas.

### Carr's National Role

Not only had UK Gas provided a healthy return on the funds invested by several City institutions, but also in many ways it acted as a useful vehicle for extending Colonel Carr's influence in both the gas supply industry and at higher political levels. Of course, his successful 'Sell or Die!' campaigns at Stretford had provided a platform for his views, leading to his election to the post of President of the Institution of Gas Engineers. Similarly, the forceful development of UK Gas, epitomised at its best through the construction of the West Yorkshire Gas Distribution Co.'s mains network, further reinforced the point in the eyes of many contemporaries that Carr's views were worth consulting. As a consequence, his speeches were extensively reported in the trade press, while in national debates about both the gas industry specifically and energy issues generally Bill Carr was always amongst those quoted.

By far his most significant contribution to the raging 1940s debates about energy policy was the 'National Fuel Plan' he submitted to the Prime Minister in November 1947.<sup>55</sup> One must remember that as a result of a combination of appalling weather and equally poor planning, in late-1947 Britain was experiencing an energy crisis. At the same time, in view of the Labour Government's nationalisation programme and attempts at co-ordinating economic policies, there was growing concern at the lack of any cohesive energy policy.<sup>56</sup> Bill Carr consequently offered the Prime Minister a ten-year national fuel plan, involving capital outlays of up to £450 million. Not surprisingly, the gas industry was to play a central role in this plan, especially as Carr suggested a four-fold expansion in coal carbonisation. He argued that this was essential if consumers were going to be supplied regularly and efficiently with cheaper energy, providing the economy with a useful multiplier effect through its links with consumer demand and industrial heating.

While with hindsight it is clear that Bill Carr was never going to succeed in persuading the Labour Government to spend £450 million on a four-fold expansion of coal car-

bonisation, it is a reflection of his standing in the energy industry that the plan went personally to the residing Prime Minister, Clement Attlee. The Government had in any case decided to continue to increase the economy's reliance on electricity, such was the widespread belief that this energy source provided the economy with a more efficient base. Nevertheless, Carr and his colleagues at the British Gas Council continued to lobby in favour of more favourable treatment for their industry, arguing that it had a valuable role to play in Britain's future.

Never were their arguments more forcefully expressed than during the debates over whether the gas industry should be nationalised. Once again, Bill Carr was prominent in this debate, having been appointed on to the executive committee of the industry's principal trade association, the British Gas Council.<sup>57</sup> As a fervent believer in private enterprise, he felt that nationalisation would only damage the industry, especially as electricity supply was nationalised first and was regarded by the Ministry of Fuel and Power as the fuel of the future. At the same time, as a realist Carr ensured that the industry did not destroy its chances of securing adequate compensation from the Government as a result of nationalisation. Furthermore, he was keen to play a major role in the publicly-owned industry, lobbying hard for an appointment as one of the chairman of a regional unit.

In considering the future of gas supply, the 1945 Heyworth Report had concurred with most authoritative contemporaries by recommending that England and Wales should be divided into ten regions.<sup>58</sup> These regions would be run by Area Boards, each of which were given considerable autonomy in managing the production and distribution of gas. At a later stage, the British Gas Council persuaded the Ministry of Fuel and Power that a central body was required to co-ordinate such matters as pricing, marketing and publicity, as well as negotiations with government ministries.<sup>59</sup> However, it would be Area Board chairmen and their boards of directors who were principally responsible for devising suitable strategies and structures capable of arresting the relative decline of gas supply. In view of his substantial contributions to the industry since the 1920s, Colonel Carr was consequently invited to take charge of the North Western Gas Board. By that time, of course, not only was he sixty-three, but also in 1947 he had been forced to stand down as managing director of UK Gas as a result of bad health and take the less onerous position of Chairman. Nevertheless, the Ministry was convinced that Colonel Carr had both the ability and vision to take on the demanding position of founding chairman of the North Western Gas Board (NWGB).

This is not the place to recount the early history of the NWGB, interesting though it is.<sup>60</sup> Of central importance to that story, though, was the role played by UK Gas, and in particular the strategic and structural legacy inherited by the nationalised body. In the first place, it is vital to remember that the NWGB was initially managed from the former headquarters of UK Gas in Manchester, facilitating what would in other circumstances have been a difficult transition period. Bill Carr was also able to continue using his most senior management from UK Gas operations. This was actually one of the more sensitive aspects of the transition period, because there was naturally some resentment from the senior management of the region's larger undertakings. For example, the Liverpool general manager,

C. H. Leach, coined the phrase 'If you're UK, you're OK', to reflect Bill Carr's preference for employing former colleagues in key positions.<sup>61</sup> On the other hand, not only were the UK Gas staff all well qualified to advise on the development of a regional grid, but also Carr was in a strong position when it came to appointing the appropriate people.

Having acquired a head office staff, headed on the engineering side by the man responsible for building the West Yorkshire distribution system, W. Hodkinson, Bill Carr was able to continue using the working philosophy established at UK Gas.<sup>62</sup> In essence, this ethos had been based on three tenets: a sales policy which bluntly meant 'Sell or Die!'; extensive co-ordination wherever possible of production and distribution plant; and the appointment of group general managers who would take full responsibility for running their local operations. Once again, while emphasising how the latter was balanced by adequate central supervision by Colonel Carr and his headquarters staff, it is crucial to stress how autonomous local management remained a hallmark of the NWGB structure.

It was this guiding ethos which saw NWGB through the difficult early years of public ownership, providing the organisational basis in handling the challenges of co-ordinating activity across 104 separate undertakings. Carr recognised the value of this approach when he noted in 1949 that "headquarters organisations should exist for the benefit of the constituent undertakings and not in order to batten on them or bewilder them by a mass of directives".<sup>63</sup> Although he only served as Chairman for less than two years, his poor health forcing him to retire in 1951, he clearly established a working philosophy at NWGB which endured for many years. The UK Gas legacy was consequently of great significance to the future of gas supply in those areas where it had operated. This point is further confirmed by the chairman of the North Eastern Gas Board, Dr. R. Edwards, who noted of the West Yorkshire distribution system that UK Gas "set a pattern for the gas industry which is likely to be the pattern for the future development of gas production throughout Great Britain, especially in ... their concentration of production".<sup>64</sup>

## Conclusions

While one must be extremely wary of eulogising about the achievements of any individual, there are clearly grounds for believing that in Colonel W. M. Carr one has a significant figure who must secure a prominent position in the business history of Manchester. In particular, his work in building UK Gas into the country's most successful gas holding company was impressive on many counts. In the first place, he significantly improved the technical performance of each gasworks acquired in the company's brief history. Having achieved this aim, in applying his working philosophy of 'Sell or Die!' he ensured that these operations increased their sales and revenue by pursuing aggressive marketing and pricing policies. This emphasis on operational performance was also backed up by the provision of central technical and sales expertise on which the group general managers could call at any time. Furthermore, in organisational terms UK Gas was highly advanced, especially compared to many of its counterparts in British industry which refused to adopt the multidivisional structure

and utilise extensively the office systems Bill Carr introduced into Bridgewater House.<sup>65</sup>

UK Gas would have been a lasting monument to Carr's ideals and vision had Labour not nationalised the company in 1949. Regardless of this change, Carr was able to continue implementing his ideas as Chairman of the NWGB, using this pan-regional body as 'UK Gas' writ large. In spite of some internal murmurings about favouritism, NWGB developed into one of the most efficient of regional gas boards, continuing the rationalisation programmes initiated by Carr during his brief period as Chairman. By the time he had died in December 1956, NWGB was building grids to connect most of the gasworks it managed, as well as modernising those which had been neglected for some years. Of course, the gas industry continued to suffer at the hands of its two main rivals, electricity and oil, continually losing market share throughout the 1950s. The management at NWGB, however, remained committed to the ideals first espoused by Bill Carr in the 1920s and 1930s, that the gas industry must sell more of its output or face extinction. By laying the foundations, in terms of organisational improvements and technical modernisation, NWGB was building for a future which turned out far better than most anticipated, largely because of the benefits derived from natural gas. Even with this enormous fillip, though, NWGB would have been incapable of reaping the benefits had it not implemented the visions first enunciated by Bill Carr.

#### Appendix 1: Subsidiaries of the United Kingdom Gas Corporation.

[Those names in bold indicate the name of the group]

Aberdare & Aberaman Consumers' Gas Co.	<b>Merthyr Tydfil Gas Co.</b>	<b>Bedford Group</b>	Merthyr Vale
<b>Aylesbury - Leighton Buzzard Group</b>	<b>North Cheshire Group</b>	Bedford	Quakers' Yard
Aylesbury	Broadbottom	Aspley Guise & Woburn	Rhymney
Leighton Buzzard	Hollingworth	Stony Stratford	Rossendale Group
Princes Risborough	North Cheshire	Woburn	Rossendale
Thane	Prescot & District Gas Co.	Bridlington Group	Ramsbottom
Tring	<b>Radcliffe, Farnworth Gas Co.</b>	Bridlington	Runcorn-Northwich Group
Winslow	<b>Rhymey &amp; Aber Group</b>	Hornsea	Northwich
		Caledonian Group	Runcorn
		Armadale	Scarborough Group
		Beith	Scarborough
		Broxburn	Pickering
		Callander	West Riding Group
		Fauldhouse	Cratleford & Whitwood
		Galston	Featherstone
		Gurvan	Garforth
		Irvine	Hemsworth
		Kilmacolm	Kippax
		Lasswale	Knottingley
		Leslie	Morley
		Muirkirk	Normanton
		Stane & Dykehead	Pudsey
		Strathaven	Rothwell
		Thurso & North of Scotland	Royston & Brodsworth
		Vale of Leven	Sherburn
		West Calder	Rawcliffe
		Elland-cum-Greetland Gas Co.	Whitby Gas Co.
		<b>Leyland-Ormskirk Group</b>	<b>York-Harrogate Group</b>
		Leyland	Easingwold
		Ormskirk	Harrogate
		<b>Littleborough Gas Co.</b>	Malton
		<b>Llanelli Group</b>	Otley
		Gowerton	Yeadon
		Llanelli	Wakefield
		<b>Louth Group</b>	Whitwood
		Alford	<b>West Yorkshire Gas Distribution Co.</b>
		Louth	

#### Notes

I am indebted to the regional management committee of what was British Gas North Western for supporting the early stages of my research into this topic. I would also like to thank Mr. Terry Mitchell for help in drafting this article.

1. See John F. Wilson, *Lighting the Town: a study of management in the north-west gas supply industry, 1805-1880* (1991), pp. 184-212; and T. Mitchell, *What Manchester Did Yesterday*, British Gas North western, 1990.
2. For a detailed review of British business developments at this time, see J. F. Wilson, *British Business History, 1720-1994* (Manchester, 1995), pp. 133-55.
3. For studies of the early gas industry, see Wilson, *Lighting the Town*, pp. 1-11, and T. I. Williams, *A History of the British Gas Industry* (Oxford, 1981).
4. For more on the private-public sector split in gas supply, see J. F. Wilson, 'The motives for gas nationalisation: practicality or ideology?', in R. Millward & J. Singleton (eds), *The Political Economy of Nationalisation in Britain, 1920-1950* (Cambridge, 1995), pp. 144-54.
5. B. Wormsley, 'Some technological and economic problems of the gas industry' (unpublished Ph.D. thesis, University of London, 1954).
6. For further information on these trends, see P. Chantler, *The British Gas Industry: an economic study* (Manchester, 1938), and PEP, *Report on the Gas Industry in Great Britain* (1939).
7. This issue is best discussed in Wormsley, 'Some technological and economic problems', p. 4.

8. PEP, *Report on the Gas Industry*, pp. 84–7.
9. *Ibid.*
10. Wormsley, 'Some technological and economic problems', p. 11.
11. The personal details of Carr's background can be found in a series of obituaries published in 1956. For example, *Gas World*, 8 Dec. 1956, p. 1194, and *Gas Times*, 21 Dec. 1956, p. 323.
12. See *Stretford & District Gas Board* (privately printed, 1949).
13. See especially PEP, *Report on the Gas Industry*, pp. 1–3.
14. Wilson, 'The motives for gas nationalisation', pp. 144–54.
15. This standard was accepted by the influential Heyworth Committee of 1945 as the basis for efficient gas supply. Heyworth Report (1945), *The Gas Industry. Report of the Committee of Enquiry*, Cmd. 6699.
16. Between 1920 and 1938, the capital's larger companies absorbed thirty-four undertakings. See D. Matthews, 'The London gasworks: a technical, commercial and labour history' (unpublished Ph.D. thesis, University of Hull, 1983).
17. Details on this story, and on G. M. Gill, can be found in *Gas World*, 29 May 1937, pp. 546–9, which reprints his paper 'Technical aspects of the holding company movement'. Gill's father was J. B. Gill, a former chairman of Commercial, European and Oriental Gas Co., a major gas holding company created back in the 1820s to create gasworks overseas.
18. The three most prominent were Commercial, European and Oriental Gas Co., Imperial Continental Gas Association and the British Gas Light Co. Only the latter had operations in the United Kingdom.
19. L. Hannah, *Electricity before Nationalisation* (1979), pp. 223–34 & 246–8.
20. Heyworth Report, para. 20.
21. *Investors' Chronicle*, 14 July 1934, p. 83.
22. *Ibid.*, 4 May 1935, p. 1085.
23. This figure is an estimate based on figures derived from both the *Investors' Chronicle* and the *Gas World Register of the Gas Industry* (1936), pp. xiv–xvi.
24. PEP, *Report on the Gas Industry*, p. 163.
25. One *Gas World* editorial (1 May 1937, p. 423) on holding companies was headed 'Aspiration and Achievement', typifying the general attitude towards these firms.
26. PEP, *Report on the Gas Industry*, pp. 173–6. P. Chantler was largely responsible for drafting this report. See also Chantler, *British Gas Industry*, pp. 134–6.
27. The United Kingdom Gas Corporation archives are now held at the National Gas Archives, at Partington.
28. Ottley was made a director of Erlangers Ltd. in 1934, having joined the firm in 1919 after distinguished military service in the Middle East. He was also chairman of the South Western Gas & Water Corporation.
29. UK Gas Co. Board Minutes (hereafter, UKGBM) 1 March 1935 and 14 May 1935.
30. *Investors' Chronicle*, 12 June 1937, p. 1678.
31. Reprinted in the *Gas Journal*, 2 Oct. 1935, p. viii.
32. For example, £9,150 was paid in compensation to the directors at Bridlington. UKGCBM, 4 July 1935.
33. The Caledonian Gas Corporation was established to run the subsidiaries purchased in Central Scotland.
34. Only two works were acquired between 1945 and 1949.
35. This strategy is clearly explained in J. Castle, *The Obstacle Course. An Autobiography* (1993), p. 87.
36. UKGCBM, 15 Jan. 1936.
37. Bridgewater House was one of the most prestigious office blocks in Manchester at that time, housing a group of major companies.
38. UKGCBM, 25 March 1936.
39. *Ibid.*, 31 July 1936. On this problem, see also P. Knowles, 'Administration and accounting in small and medium undertakings', *Gas World*, 13 Feb. 1943, pp. 161–5.
40. The system is well described in Castle, *The Obstacle Course*, pp. 104–6.
41. The technical service is described in W. Hodkinson, 'Technical work in a holding company', *Gas World*, 23 April 1938, pp. 368–70. See also Castle, *The Obstacle Course*, pp. 77, 91 and 120, for a view on the high salaries.
42. *Gas World*, 3 June 1937, p. 610.
43. For a full explanation of the UK Gas structure, see *Gas World*, 14 June 1941, p. 300. On ICI, see W. J. Reader, *Imperial Chemical Industries*, Vol II (Oxford, 1975), pp. 140–3.
44. *Gas World*, 23 April 1938, p. 369.
45. For Colonel Carr's views on this subject, see for example his paper 'The future grouping of gas undertakings', given to the IGE's debate on the future of the gas industry, reported in *Gas World*, 14 June 1941, p. 300.
46. *Gas World*, 17 Dec. 1938, p. 543.
47. Heyworth, *The Gas Industry*, para. 72.
48. The stations were at Castleford, Featherstone, Garforth, Kippax, Knottingley, Morley, Normanton, Pudsey, Rothwell and South Milford. This success was based on a one-third reduction in bulk prices. For a fuller description of the scheme, see the paper by W. Hodkinson and H. B. Taylor, 'The development of a gas grid', *Gas World*, 15 June 1946, p. 647.
49. These trends are analysed in further detail in Wilson, *British Business History*, pp. 181–8. See also P. J. Cain and A. G. Hopkins, *British Imperialism. Crisis and Deconstruction, 1914–1990* (1993).
50. *Gas World*, 26 July 1947, p. 141., and 16 Aug. 1947, p. 218.

51. *Gas Journal*, 2 July 1947, p. 30.
52. Amongst other ideas, UK Gas created an engineering subsidiary and acquired a meter manufacturer. UKGCBM, 24 May 1946, 1 Oct. 1946, 9 Sept. 1947.
53. By that time, UK Gas had invested nearly £6.2 million in its subsidiaries.
54. Average sales of each subsidiary at acquisition were 104 million cubic feet, while at nationalisation this figure stood at 204 million cubic feet.
55. For a full description of this plan, see *Gas World*, 22 Nov. 1947, pp. 712-7.
56. This period is covered in Wilson, 'The motives for gas nationalisation', pp. 144-54.
57. *Ibid.*
58. Heyworth Report (1945), *The Gas Industry*.
59. See Wilson, 'Motives for gas nationalisation', pp. 155-61, for an analysis of these discussions.
60. See John F. Wilson, 'Meeting the challenges: a history of the North Western Gas Board, 1949-72', paper given to a conference at the Hagley Centre, Wilmington, USA, in 1992.
61. I am grateful to my friends in the North West Gas Historical Society for relating this, and many other, tales to me during my research.
62. W. (Bill) Hodkinson was later to become Chairman of NWGB.
63. Speech on managing nationalised bodies, quoted in *Gas World*, 1 Jan. 1949, p. 8.
64. *Gas World*, 19 March 1949, p. 464.
65. See Wilson, *British Business History*, pp. 148-50.

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