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INVESTMENT IN COAL SUPPLY

(Prepared by the International Energy Agency *)

I. WHERE IS INVESTMENT NECESSARY?

1. Coal demand is expected to be strongest in the developing world and the transition economies, where local resources are ample and production costs are low, but production methods are often under-capitalised. India and China alone will account for close to two-thirds of the increase in world coal use over the period 2000 to 2030. Coal demand will increase slowly in OECD North America and the Pacific, but will fall in OECD Europe as gas replaces coal. Investment will be necessary primarily in China and India, to a lesser extent elsewhere in Asia, the United States of America and Canada, Russian Federation and the Ukraine.

2. Other Asian demand will be met by imports from established exporters. Growth in Asian coal demand therefore will require investment in coal supply in China and India to reform and increase indigenous production, and for export in China, Australia, Indonesia, South Africa and Canada for export.

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3. Demand is primarily for steam coal for power generation, and could therefore be met from many sources, but principally from Australia and Canada for coking coal.

4. Investment in indigenous production will be necessary to meet growth in demand in North America, Russian Federation and Ukraine. Growth in demand in the United States will be met primarily from domestic supply, with some imports, primarily from Canada. Growth in demand in Russian Federation, Ukraine and Canada will be met from domestic supply.

5. Investment needs and constraints are summarised in Table 1 for major exporters and some other major producers. The Table illustrates the diverse influences on the level of investment but, except in cases where there has been a history of government intervention, or government policy is not responding to issues within its general responsibilities that affect the investment climate, the rate of return in a highly competitive market is the key constraint.

II. WHAT STIMULATES INVESTMENT IN THE COAL INDUSTRY?

(a) Growth in Coal Export Capacity

6. During the past 15 years coal supply capacity grew in advance of demand. In periods of strongly rising demand such as from 1988 to 1991 inclusive, or from 1994 to 1998 inclusive, it took only one or two years to achieve a substantial expansion of export capacity to meet the additional demand. On the other hand, in periods of slowing growth in demand, for example from 1991 to 1994, producers delayed confirmed expansion programmes for several years until demand picked up again. On average it takes about six to eight years to develop a new mine and bring it into production. For example, the new capacity expansion planned in 1990 became fully operational in 1997.

7. These trends need to be interpreted cautiously. The fall in planned capacity appears to be associated with the fall in price of internationally traded coal, but may also reflect changed production strategies. Much of the increase in production has been a result of capacity coming into production that was planned on the basis of forecasts made before the Asian crisis in 1998. Not only were these forecasts often over-optimistic and an adjustment therefore inevitable, the Asian crisis has encouraged exporting companies to adjust capacity more closely to a shorter-term outlook for growth.

(b) Growth in Supply Capacity in the Long-Term

8. In the longer-term new investment in coal-fired power stations and investment in blast-furnace based steel production, i.e., using coke ovens, are the main influences on the level of investment in coal production. Demand for steel will be the principal influence on coking coal demand, in turn influenced by the rate of world economic growth. The choice of steel-making technology will also be essentially an economic issue for steel-makers. But, for steam coal, the principal influences on investment in new coal-fired power generation will be the price of electricity and the impact of environmental standards on fuel choice.

9. In deregulated markets, investors are likely to look more favourably on proposals for construction of gas-fired power generation plants that have lower capital requirements and lower payback periods. The role of coal-fired power in deregulated markets remains uncertain on commercial grounds alone, notwithstanding heightened risk from environmental pressures. Underlying the outlook for coal use and investment are two long-term trends: first, the delivered cost of coal for electricity generation has fallen steadily for more than 15 years, and second, the proportion of coal mined for electricity generation has risen steadily for 20 years to a level as high as 90% in the United States and similarly elsewhere.

10. In a highly fragmented industry with low growth prospects, low earnings growth is to be expected, and low investment in new capacity is the inevitable outcome until the earnings outlook improves. In these circumstances, individual coal companies will act more rationally, particularly in capital allocation decisions, to ensure that shareholders earn attractive returns.

11. The outlook for growth in new coal-fired capacity is complicated by the ageing stock of operating coal-fired generation capacity requiring investment to remain in operation. As the existing capacity ages, more investment is required to maintain system reliability and high capacity factors, as well as environmental regulations. Cost may result in plant closures if alternatives, including purchased power options, are less expensive.

12. Most countries do not plan new capacity, leaving decisions on the choice of fuel and technology to private investors. Japan is an important exception, where there are plans for 52 630 MW in new generation capacity by 2009, including 19 840 MW in coal-fired capacity. Coal will be the largest single power source in new generation capacity. However, Japan has a commitment to reduce emissions of greenhouse gases by an average 6% of their 1990 levels between the years 2008 and 2012. The power utilities industry may come under pressure to shift to alternative fuels (for example, from coal to natural gas), to construct new nuclear plants, or to place restrictions of some kind on coal-fired power production.

13. The outlook in most other countries is less favourable. As more utilities respond to economic, reliability and or environmental issues associated with older coal-fired boilers, more coal boilers will be retired with corresponding decreases in coal consumption. Throughout the world, 60% of coal-fired power plants are over 20 years old, and in Europe the figure is 70%. In the United States, over one-third of the coal-fired power plants are over 30 years old.

(c) Growth in Supply Capacity in the Short-Term

14. In the short-term, existing producers are likely to invest to maintain viability rather than to expand output. To do so, they will be obliged to operate their mines at the highest possible level of output at minimum cost. Output is difficult to adjust for technical reasons, and price is not significantly influenced by any one producer apart from quality premiums, particularly for coking coal, and possibly a reputation for supply and quality reliability. In these circumstances, defending and expanding market share is fundamental.

15. Investment to meet longer-term growth in demand will be directed to increase output. Investment to gain market share may also increase output, but is primarily directed to reducing costs to raise margins. Investment may increase capacity as a competitive strategy to increase market share, but could be expected to replace less efficient capacity so that net mining capacity does not necessarily increase over a span of years.

16. Despite the large mining capacity required, it is unlikely that coal supply would ever be at risk because of the large number of existing mines located in many countries capable of expanding output at short notice, and the potential for new mines because of the large and widespread resource base. As described below, price does not need to rise to encourage new investment to raise productivity and lower costs. If new capacity is needed to meet a underlying growth in demand, investment in new capacity to lift output would always be available with lead-times shorter than the lead-times for new coal-fired power plants or steel mills, and at a price that would probably not be significantly higher than current real prices. Investment in the coal industry, in the short- or long-term, is therefore unlikely to be a limiting factor on growth in the energy sector as a whole.

III. INFLUENCES ON INVESTMENT IN COAL SUPPLY

17. In general, decisions on coal supply investment will be determined by the rate of return that could be earned from coal mining compared with the rate of return from any other form of investment. In practice, proposals for investment in coal supply will be decided by company boards comparing rates of return achievable by a range of projects competing for capital available to the corporation. The rate of return from a particular project is likely to be compared with a "hurdle" rate of return set by the company. The rate may vary according to the degree of risk, and be higher when geological or other risks are present.

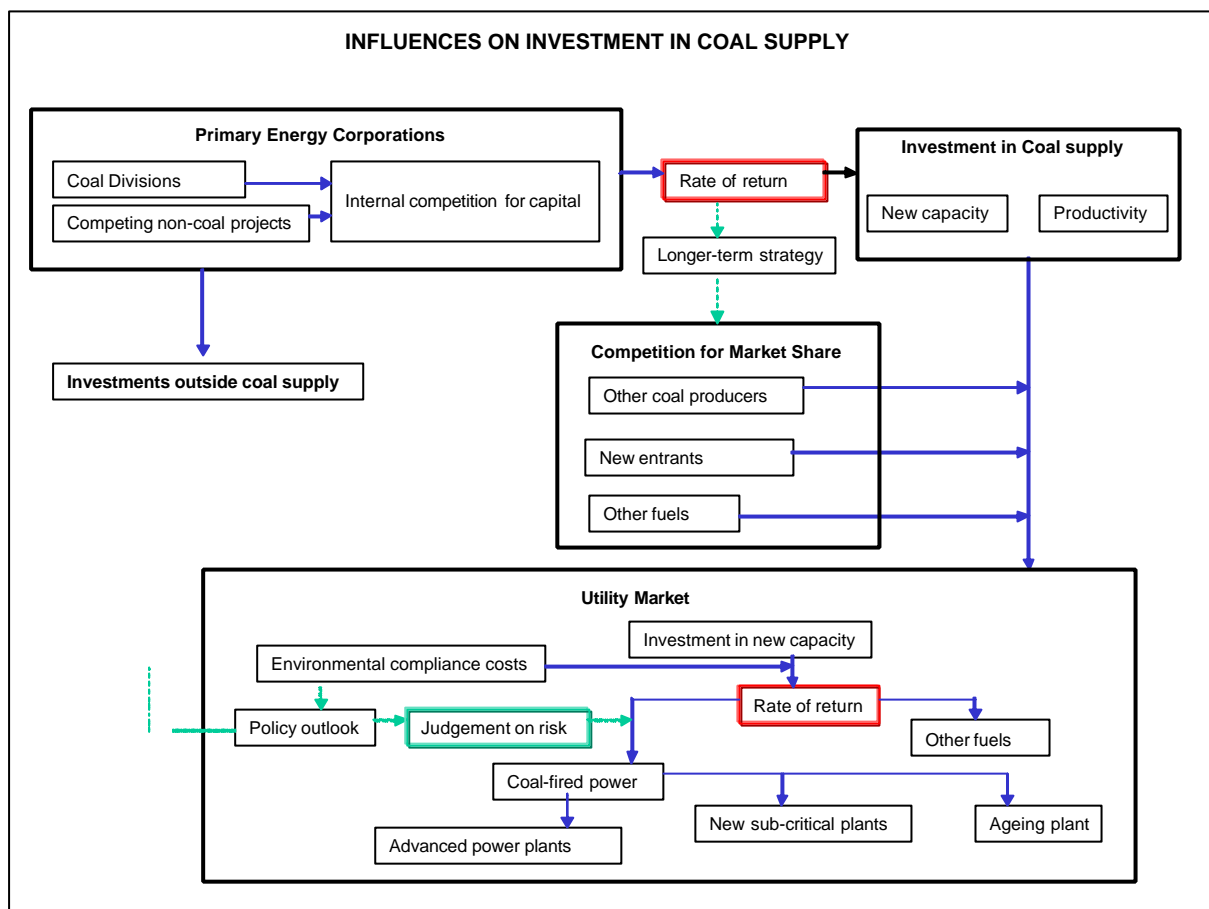
18. The outlook for environmental policy will be an important element in judging the confidence that a company might have in the range of possible outcomes from its forecast rates of return. It may influence the choice of technology by the company, but as advanced coal-fired technology will involve higher cost and hence lower rates of return, it will not encourage the take-up of new technologies in the absence of concrete policy measures designed to boost the rate of return that could be earned by the company. The policy outlook for coal-fired power will indirectly influence decisions by primary energy suppliers on decisions taken between coal and other investment opportunities. Also affecting decisions will be judgements about the long-term competitive position of the company, and hence the weight given to capturing market share in anticipation of later returns.

19. The previous points are illustrated in Figure 1.

IV. INVESTMENT TO MAINTAIN MARKET SHARE

20. If investment in the coal industry is assumed to be stimulated by price increases alone, then the expectation would be that insufficient investment would occur to match supply with expected growth in demand because international coal prices are expected to remain nearly flat in real terms. But, growth in coal demand acts as an incentive to reduce costs through investment in productivity improvement to maintain market share at the prevailing real price or lower. A higher price would encourage new entrants to the industry, or expansion in production by existing low-cost producers, so that any producer competing on the world market that seeks higher prices would be outbid by competing producers. Even with ownership concentration, new production may be sourced from the same companies operating in several countries.

Figure 1



(a) Coal Exporters

21. An exporting company that accepts a reduced market share would experience steadily reducing margins as the increase in supply stimulated by growth in demand could be expected to over-shoot the demand growth and reduce prices because of the large potential supply capacity. Periods of over-supply are inevitable, although more closely managed since 1997, recognising that increasing tonnage to maintain cash-flow when prices fall is a self-defeating strategy. Expanding supply as a strategy to capture market share from competitors could now be a more important factor. A producer that fails to invest to reduce costs will ultimately be forced out of the market because over-supply will inevitably reduce prices for a time to bring supply and demand into balance again. If the producer survives the temporary price downturn resulting from over-supply, the company still has to survive in the longer-term on lower output and a lower margin.

(b) Producers for Domestic Markets

22. Most coal demand growth will be met by domestic supply, but the performance standard could be expected to be set internationally in the traded coal market. Producers principally meeting domestic demand will have a degree of "natural" protection from the international market because of transport costs. They may also be protected by government policies designed to maintain indigenous primary energy supply and employment. A producer whose market is

domestic must nevertheless respond proactively by investing to increase productivity or face the prospect of competition from imports and a widening gap between the price of coal available on the international market and the price the company must charge to recover costs. Domestic coal prices that are higher than prevailing international prices would contribute to higher-than-necessary electricity generation costs, higher coke prices, and higher costs in other coal-consuming industries such as cement. With the global spread of electricity competition, and the international market for steel – these two industries accounting for most coal use – higher input prices cannot be readily absorbed.

23. Producers for essentially domestic markets are either keeping pace with international productivity standards, such as in the United States which is only out of the international market because of higher returns on the domestic market, or increasingly falling behind, such as European and Indian producers.

24. Investment in coal transport and handling to reduce costs would have the same impact as productivity improvements by causing a downward shift in the industry supply curve. Tariff reform could stimulate appropriate investment by ensuring the correct price signals are in place, provided the services are managed on a commercial basis. This has increasingly been the case for export-oriented producing countries and the United States, but is an issue of fundamental importance in India and China.

V. TRENDS IN INVESTMENT

(a) Return on Investment

25. In major coal-consuming countries, coal is in increasing demand for electricity generation, because of its security of supply and attractive economics. Add-on emission control technologies, use of higher quality coal, and the closure of older plants have successfully reduced emissions. Although environmental regulation has strengthened, coal-consuming countries tend to require performance standards reached after consultation with industry to avoid disrupting energy supply.

26. Nevertheless, returns to coal producers are low because electricity prices have generally fallen under the influence of market liberalisation; generators have turned increasingly to gas-fired power because of its better economics, and to politically-encouraged renewables; public perceptions of coal are generally poor. These factors have discouraged investment.

(b) Productivity Growth

27. Because electricity prices are low, coal prices have also been depressed. To increase revenue, producers must capture market share in an expanding world coal market, by increasing the supply of coal at any price level. This requires investment in productivity improvement to lower costs to maintain margins. Australian analysis suggests that, in general, investment must increase the capital-labour ratio. Specifically, this could be achieved in coal-mining in three ways:

(i) By reducing manning levels with existing capital, such as through changes in work practices and improved safety performance to reduce lost-time accidents. This would require investment in training the labour-force;

- (ii) Concentrating on new open-cut mines to replace, in particular, older underground mines; and
- (iii) Introduction of long-wall equipment in underground mines.

28. All three are important, but are effective in different ways. In Australia, the greatest labour productivity improvements in open-cut mines took place after 1990 and were largely the result of increased output rather than reductions in employment. Use of long-wall equipment appears to have reduced employment rather than increased output, and had its greatest impact in the five years to 1990. The scope for replacing labour with capital is expected to decline, so the focus of investment might be properly on raising output rather than reducing manning in future. Investment in productivity has been the principal way in which capacity has kept in line with growth in demand. Can productivity improvement continue? At what point will investment in new capacity be required?

29. For the time being, continuous improvement in productivity seems certain. From 1990 to 1999, productivity (output per man-year), increased by 120%, and over the same period in Canada by 80%, in Colombia by 110%, in South Africa by 85%, and in the United States by 80%. Impressive as these figures are, there is scope for still further major improvement. In absolute terms, productivity in South Africa is less than one-half the level achieved in Australia, Canada and the United States. In China, productivity is only 289 tonnes per man-year, and in Coal India's operations it is only 603 tonnes per man-year, compared with Australia at 12 100 tonnes per man-year and the United States at 11 900 tonnes per man-year. Among the developed-country exporters, consolidation in the industry has been driven by the potential for productivity improvement in existing mines, as an alternative to investment in greenfield sites. In China, greenfields developments are replacing smaller-scale mines as a means of raising productivity.

30. Reserves suitable for greenfields expansion are plentiful in all major exporting countries except South Africa, where export-quality coal reserves are limited. Expansion of exports in South Africa would require development of multi-product mines supplying high-grade coal for export and lower-grade, including middlings from preparation plants, for domestic consumption.

(c) Australia

31. Australia's coal industry has increased its output by some 5% per year in recent years, with the vast bulk of extra production intended for export. The increase in capacity resulted from investment decisions made in the years immediately preceding the 1997 Asian crisis, and a tonnage-based response-mentality by producers to declining prices. Larger scale developments have increasingly been highly productive longwall operations that, despite high capital cost and some geological difficulties, have produced low-cost coal.

32. Increasingly, the financial difficulties of the industry have encouraged an increase in the rates of mergers and acquisitions as well as the emergence of a number of small, low-capital, contractor developed open cut mines. Producers at existing operations have undertaken extensive cost-cutting, and productivity levels in the industry have lifted significantly. Rail freight costs, particularly in Queensland, remain at levels that cause concern for producers. Establishing third-party access to contestable track services is expected to deliver significant savings.

33. A compensating downturn in investment in new capacity might follow. While new investment could be expected to more closely track demand in future, the development of new mines on much lower capital cost structures, including contractor arrangements, has added to the speed with which new operations and brownfield expansions have started.

34. A number of producers have expansion capacity that they will only develop if the market situation warrants their expansion or development. The mix, timing and size of future developments will depend to a large extent on market conditions, particularly for sales to Japan, Korea and Republic of Taiwan. Producers are in a position to meet any growth in demand by expanding current operations or developing new operations, but the willingness to do so will be driven by market conditions.

(d) China

35. China appears to have been more successful than India in raising performance standards in the coal industry, through government investment. Thousands of small local government and private mines have been reported as shut down, and replaced by new, very large, central government-funded mines. Production fell briefly during a short transition period, 1999-2001, but has since risen sharply. Exports have also risen in line with announced government policy. Mine capacity for exports is expected to rise from 175 Mt in 2000 to 228.5 Mt, or just over 30%.

36. The apparent success of Chinese policy will need on-going support through investment in as wide a range of areas as in India. Investment priorities include mechanising underground mines, construction of coal preparation plants, rail transport, water supply, and waste disposal. The question arises as to how successfully the required level of investment could be achieved in the absence of fundamental reforms to the way in which the industry is managed. For example, illegal and small-scale mining continue to be problem areas; safety standards and regulation are poor; large-scale state-owned mines carry a wide range of social responsibilities that may distract management from achieving commercial goals; coal pricing and taxation policies need to be refined to encourage efficiency, and specifically to encourage production of low-sulphur, washed coal.

(e) Europe

37. The outlook for protected industries is for an ever-widening gap between domestic industry performance and international standards of performance. This will arise because productivity improvements resulting from market incentives are far out-stripping productivity improvement arising from reform of subsidies. In Europe, governments have tried to help industry restructure, but the results have not always been as dramatic as those brought about by market pressures alone. For example, in the period 1990 to 2000, German coal production fell in line with reduction in subsidies, and productivity rose as the industry focused on the better mines. But, productivity rose by only 7% in Germany compared with a doubling of productivity in countries such as the United States, Australia, South Africa and Canada. Reductions in manning were a similar proportion at about one-third, but only 2 000 in total compared with 10 000 in, for example, Australia. Only in the United Kingdom has the impact of government-assisted restructuring been comparable to or greater than in the non-European producers.

38. In practice, reductions in state aid in Europe result in mine closures and reduced production, rather than any worthwhile improvements in productivity. This is because the scope for productivity improvement in Europe is limited by geology. European state-aid is now largely directed to reducing activity and to meeting inherited liabilities. Investment is directed by this means to enabling a smooth transition to imported coal to the extent that coal will continue to be used. More recently in Europe, state-aid is seen as a means of encouraging investment in coal on the grounds of security of energy supply, which could have the effect of maintaining a domestic, high-cost, domestic industry in Germany and Spain, in particular.

(f) India

39. Productivity in the Indian coal industry is well below international standards in almost all mines, arising from low levels of mechanisation and poor mine design. Investment is needed along the whole coal chain, from production to use, but investment funding is not generated because of the poor financial position of the principal buyers, the state electricity generators. Some reforms to pricing have been implemented, but much more needs to be done. Large-scale investment is particularly needed to expand mine capacity and to improve beneficiation of coal. Investment in rail transport (and port capacity for imports) is also necessary. The scale of investment required calls for continuing liberalisation of the domestic coal market and the reduction of restrictions on foreign investment. Investment is impeded by inadequate geological data and by the lengthy and bureaucratic approval procedures governing land acquisition and new mine development. Rationalisation of existing mines is necessary. Employment policies and labour relations need to be addressed to raise productivity and mining profitability. Only then could adequate investment be generated for new facilities, especially in coal beneficiation plants to improve coal quality and to reduce the burden of transporting waste material.

40. Reform of the coal industry is only part of wider economic reform. Progress will be influenced strongly by progress in reform of the electricity sector. Imported coal will continue to be necessary. Competition with imports could be a stimulus to improving performance in the domestic industry and hence for raising the attractiveness of the sector for investment.

(g) South Africa

41. A major influence determining the future of coal exports from South Africa is the availability of coal reserves of export quality. The Witbank and Ermelo coalfields are considered to have reserves sufficient to support large mines, but potential blocks are divided between several owners. Development would require the owners to agree on joint venture arrangements. The quality of the coal also varies considerably. New mines would need to be developed as multi-product mines, producing high-grade thermal coal for export, and lower-grade coal for domestic consumption. As both ESKOM and SASOL, the main domestic consumers, have tied supplies and, in the case of ESKOM at least, probably excess supply capacity resulting from over-optimistic electricity demand projections, this strategy may not be feasible.

42. No significant greenfields projects are planned by South African companies, because of the low thermal coal prices in the export market. Some brownfields projects are being developed as replacement export projects. South African coal exports are predominantly to Europe. The

ability for coal to be allowed to compete in Europe on a cost competitive basis after allowing for potential environmental cost impositions is a major issue for the industry. Domestically, the regulatory authorities are particularly concerned with use and disposal of water, discard handling and dumping, and adequacy of surface rehabilitation. Nevertheless, downstream consequences such as greenhouse emission issues related to coal use are not currently affecting mining developments. In South Africa's position as a developing country with high unemployment, it appears unlikely that global issues will take precedence over local issues such as job creation and cost reduction.

(h) United States of America

43. Coal consumption in the United States has grown by just under 2% per year over the 1990s, as a result of higher utilisation of existing coal-fired plants. Continued increases in coal burn at existing coal-fired plants are expected to be partially offset by conversion to gas or retirement of older, less efficient, coal-fired plant. Demand has been met by reducing the level of exports, and productivity improvements in the western coalfields. Production in the east has stabilised as productivity improvements in existing mines have been offset by closing uneconomic mines or mines with depleted reserves. Productivity improvements have led to net increased production in the west, but most investment has been limited to replacement equipment and high-return expansion and efficiency projects at existing mines. There have been virtually no major greenfield mining operations in the eastern United States, and only a few in the Powder River Basin in the western United States. In large measure, increased demand is being met by productivity improvements at mines developed in the period 1960 to 1980. Acquisitions have also enabled capacity additions.

44. Since the mid-1980s, there have been virtually no major greenfield mining operations in the eastern United States and only a few in the Powder River Basin. Investment has generally been limited to replacing equipment, and high-return expansion and efficiency projects at existing mines. United States producers have sought to produce more coal at lower unit costs from fewer mines. In some cases, producers have acquired existing mines and expanded production.

45. The investment pattern is attributable to the relatively lower cost of productivity improvement and acquisitions compared with the cost of greenfield mine development, and uncertainty over demand projections. The principal impact has been on exports, possibly with a longer-term impact on export capacity because of reduced investment in coal transport infrastructure, discussed further below.

VI. INVESTMENT IN COAL TRANSPORT

46. Efficient transport is an essential factor in determining the competitiveness of coal. For example, rail costs account for 25% of the cost of coal delivered to ports in Queensland. Continued investment in domestic coal transport infrastructure (principally railways and ports, sometimes also roads) has been made possible by the fact that coal transportation is generally only part of its role. In some cases, transport is dedicated to coal and under management of the coal producers. In these cases, investment will be matched to production and market needs. Private transport companies usually also match investment in new capacity with growth in output, and negotiate bilaterally with coal companies.

47. In cases where transport is under government responsibility, such as Australia, tariffs are often an issue but generally not the adequacy of the level of investment. Rail and port infrastructure in China, India, and the countries of the former Soviet Union are major exceptions to this general observation. In these countries, there is an urgent need to adopt cost-reflective tariffs to establish a cash flow to fund investment, and price signals that could direct investment to priority areas. In these countries, investment in coal transport and handling would benefit national or regional coal industries but needs to be preceded by restructuring to ensure that coal infrastructure is managed on a commercial basis.

48. In the United States, excess production and transport infrastructure has historically enabled the country to act as swing producer. The sustained fall in United States exports in recent years may alter the capacity of transport infrastructure to respond quickly to price changes because of disinvestment.

49. Transport is often cited as a constraint on South African exports, but this may not be the case. South Africa has lost market share to Australia, China and Indonesia, and its competitive position may continue to be eroded as reserves of export quality coal are depleted. The Richards Bay Coal Terminal in South Africa has expanded with no additional capital cost in recent years and its capacity currently exceeds exports.

Table 1: Investment Needs and Constraints in Major Coal Exporting and Producing Countries

Country	Investment Needs	Constraints	Government involvement
Australia	Productivity improvement and new capacity to meet growth in coal trade, and reclaim market share.	Exchange rate; transport costs.	Not required -- principal constraints are related to the operation of the market and availability of higher returns in non-coal investment.
China	New capacity to replace low-efficiency mines, and to meet domestic and export targets.	Government-directed investment, dampening market signals and imposing non-commercial objectives; uncertain investment climate for inwards and other private investment.	Required to provide capital, unless basic reforms made to encourage private investment; need to ensure transparent commercial pricing.
Colombia	Road and rail infrastructure to support new capacity.	Political stability; government ownership of much of the industry.	Required to maintain progress in privatisation and to improve physical security.
Europe	None from a commercial viewpoint; EU encourages investment to secure minimum level of coal supply.	Level of investment depends on continuing subsidies; uncertainty created by changing policy environment based on security of primary energy supply.	Required, if investment is to be maintained, but otherwise only required for social adjustment. EU policy encourages reliance on continuing government support and requires clarification.
India	New capacity to replace non-viable mines; mechanisation of underground mines; replacement equipment; coal preparation; rail transport; port facilities for coastal trade and imports.	Debt level of state electricity boards impeding development of a free market in electricity; limits on inwards and other private investment; possibly government ownership of coal production and railways, and certainly widespread government intervention in the coal market.	Required to lead fundamental reforms in the electricity and coal industries directed to creating free markets; also to develop a national environmental regulatory framework, rationalising and co-ordinating local requirements.
Indonesia	Development of new capacity; continuing productivity improvement in existing mines.	Political climate; policy on ownership; local autonomy and regulation.	Review and stabilisation of policy on ownership and management.
Russian Federation	Continuing rationalisation of capacity.	Policy favouring gas for export; rail transport costs; progress in general economic reform to improve the investment climate; poor quality and delivery reliability.	Commitment needed to market approach to the coal industry, and to open gas/coal competition for domestic and export markets; coal price reform; rationalisation of rail tariffs.
South Africa	New capacity to replace depleted capacity.	Available export quality resources; mine-site infrastructure notably water supply; port and rail infrastructure if production can be expanded; social objectives imposed on companies.	Not required for commercial activities other than rail transport.
Ukraine	Rationalisation of existing mines; new capacity to replace less efficient mines; changed management practices to raise productivity.	Restrictions on foreign ownership; delays in privatisation.	Required to lead privatisation programme and to encourage inwards and other private investment.
United Kingdom	Port and rail import facilities; new capacity where commercially justified.	Planning permission for new surface mines.	Not required -- continuing ambivalence of policy on the industry encourages reliance on government intervention in the last resort.
United States of America	Continuous productivity improvement; rail transport to maintain export capacity.	State and local government environmental/planning restrictions on mine developments in the east; level of investment in coal-fired power; level of prices in the international market.	Not required -- in the west, principal constraints relate to the operation of the market and availability of higher returns in non-coal investment; in the east to regulation of mining, and costs; in the central and east to restrictions on sulphur emissions reducing the market for higher sulphur coal.
Venezuela	Transport infrastructure, particularly road, but also rail and ports. Future growth in output depends on Mina Norte expansion, in turn depending on availability and cost of transport.	Restrictions on transport.	Encouragement of inwards and other private investment in transport infrastructure.