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States, markets, and energy use patterns in China and India

Holly Sims[1]

During the second half of the twentieth century, states and private market-led forces emerged as key players in the production and distribution of the energy critical to the economic growth of pivotal developing countries, including China and India. In both countries, major responsibility for energy production and distribution was initially shouldered by states, with rapid industrialization as their overriding objective. The critical test of energy systems' performance was simple. They were to serve instrumental economic purposes, and to a much lesser extent political ones, since a share of scarce amenities was channelled to rural areas where most people lived.

A new criterion for assessing the systems'[2] performance – efficiency – became increasingly compelling in the 1970s and 1980s, due to global economic developments and domestic policy changes that widened scope for market-led forces. During roughly the same period, a third criterion for assessing energy systems – environmental responsiveness – arose from mounting international concern about the health of the planet. This chapter discusses the experience of China and India in developing energy systems since the 1950s, and compares their recent efforts to improve efficiency and environmental responsiveness. The argument may be summarized as follows. The political economy of Chinese and Indian energy policy evolved in broadly similar fashion from the 1950s until the 1970s. Thereafter, the two states responded to pressures for energy system effi-

ciency and environmental responsiveness in different ways, reflecting their contrasting political systems. For example, China's authoritarian structure that combines economic liberalization with political control has facilitated official efforts to pursue market-led energy policies which have foundered in democratic India. Yet India's federal system highlights ambiguities in notions of environmental responsiveness, and conflicts between national and local perspectives in particular.

Despite constraints imposed by political economy and political structures, there is considerable scope in both countries to develop energy systems that could be widely seen as environmentally responsive, particularly in rural areas which often are poorly served by state-led instrumental or market-driven energy systems. Examples of such promising initiatives are briefly noted in the concluding section.

It is important to emphasize the parallel factors that shaped the initial design of Chinese and Indian energy policy systems. China and India are among the few major countries whose primary source of energy is coal. The ''ignoble fuel'' (Ramage 1997, 71) blamed for greenhouse gas production, acid rain, and serious air pollution and health hazards accounts for almost 70 per cent of industrial energy use in China, and over half of primary energy sources used in India. Coal use helps both countries retain claims to some of the world's most polluted cities.

The priority of economic development is underwritten by the striking gap between industrialized and even rapidly growing non-industrialized countries in terms of energy access, and by population pressure. Although the range of high and low temperatures is broadly similar in China and the United States, the average person in China uses only 3 per cent of the energy used by the average American (Lieberthal 1995). An estimated 100 million Chinese live without electricity. India's population is three times that of the United States, but the former's energy use is little more than 10 per cent of commercial energy consumption in the United States (Ramage 1997, 36). Population pressure upon shrinking resource bases makes development all the more urgent. By 2025, China and India may represent 37.5 per cent of the projected global population of 8 billion (Population Reference Bureau 1997).

Variations in the impact of dissimilar political systems upon energy policy are highlighted when their national policy-makers are viewed with reference to both domestic and international constituencies (Evans, Jacobson, and Putnam 1993). The need to view policy from both vantage points became particularly important in the 1970s, due to widening global economic integration and international environmental concerns. Both trends influenced the roles of states, market forces, and international agencies in economic development and energy production. The ensuing

discussion explains why states took a leading role in energy policy in China and India, but first it is essential to clarify the criteria of energy policy systems' performance.

Criteria of performance

Contemporary Chinese and Indian energy systems evolved from broadly similar centralized, state-led production and distribution mechanisms that were primarily designed to be instrumental in economic growth via rapid industrialization. Since strategies to achieve that goal in low-income countries with vast and dispersed rural populations and limited infrastructure were not clear, policy-makers were concerned more with the goal of development than with specific means to achieve it (Thompson 1967, 83–98). Efficiency, denoting ''ability to produce the desired effect with a minimum of effort, expense or waste'' (Webster's 1983), was not a useful or even applicable test in the 1950s and 1960s. In the middle of the twentieth century, risks and costs of investment in the rural areas that predominated in most low-income countries were high and potential returns a distant mirage.

The efficiency of energy production and distribution can be judged only when standards of desirability and plausible relationships between causes and effects are clear and widely accepted. Specific problems and pressures that directed state leaders' attention to efficiency in energy production and distribution are noted in the ensuing section. Yet the pursuit of efficiency proved difficult in countries with elaborate state structures and real or potential political concerns.

The third criterion, environmental responsiveness, is potentially controversial, particularly when both standards of desirability, or goals, and strategies to pursue them are ambiguous or contested. Nuclear power offers a good example. People who broadly agree on the need for environmental responsiveness may disagree as to whether nuclear power's advantages relative to fossil fuels offset its intractable management risks and waste-disposal problems. Instead of proposing a narrow definition of ''environmental responsiveness'' based upon an exclusive list of such promising renewable energy sources as solar energy, wind power, biomass, and small hydropower projects, the definition of ''environmental responsiveness'' will be left broad, in order to focus more on policy change.

One of the most important obstacles to environmental responsiveness is persistent global reliance on coal, the earth's most abundant fuel. Coal generates about 35 per cent of the world's electricity, and the figure may rise to nearly 40 per cent by 2010. If coal remains the ''fuel of choice for

electricity generation in the foreseeable future'' (CERI and TERI 1995, 67, 109), new ''clean coal technologies'' that limit environmental emissions deserve serious consideration as possible means to advance environmental responsiveness, even if longer-term strategies emphasize alternatives to coal.

In the short term, other practices or technologies are also available to make energy use more efficient and/or environmentally responsive. They include conservation, sometimes called ''demand-side management,'' and cogeneration, which involves the simultaneous production of electrical or mechanical power and thermal energy from a single fuel source.

In sum, environmental responsiveness may accommodate a range of possible strategies whose absolute merit may be debated. In the meantime, clearer standards may crystallize as new technologies become available. Even when there is broad agreement on objectives and standards of environmental responsiveness, there may be trade-offs between efficiency and environmental responsiveness and also official instrumental goals.

For example, some might decry rising energy intensity in rural areas of India and China, as subsidized commercial fuels such as kerosene and coal encourage a shift from traditional biomass (Ishiguro and Akiyama 1995). Yet resulting losses in energy efficiency may be offset by gains in environmental responsiveness, since the use of commercial fuels obviates the need to collect biomass and thereby aggravate deforestation. Provision of subsidized fuels may also serve official instrumental goals related to the equitable distribution of critical resources (Shukla 1996). In short, prospects for improving efficiency may be limited by other important considerations. Yet the ensuing discussion of state-led instrumental energy systems suggests that there is broad scope for improving efficiency, in order to use energy with less pollution and waste.

State-led instrumental energy systems

The state-led energy production and distribution systems that emerged in China and India midway through the twentieth century bore the hallmarks of prevailing development theory. States and their public sectors took the leading role in economic growth, which was identified with rapid industrialization and import substitution through the centrally planned development of heavy industry. In India, the private sector was too limited in size and scope to orchestrate energy production and distribution on a large scale. The People's Republic of China established by Mao Zedong in 1949 envisaged no role for private participation in such a critical sector.

The priority task of industrialization-oriented power systems in low-income countries, including China, India, and Brazil, was large-scale energy production through massive dams, power plants, and oil refineries. Coal and oil, the fossil fuels that sparked eighteenth-century Britain's industrial revolution, were widely seen as ''modern'' energy sources, and critical ingredients for advanced large-scale production. China and India were well-endowed in terms of fossil fuel resources, and since they claimed some of the world's most majestic rivers, giant hydroelectric power plants offered another important energy option. In many rich and poor countries, major dam projects galvanized political and economic support as symbolic giant steps towards ''modernization'' (Reisner 1993). Indian Prime Minister Jawaharlal Nehru even called major dams ''the temples of modern India.''

The grandest hydroelectric project was conceived for China. For the Chinese political leadership, the Three Gorges Dam over the Yangtze River represented not only the source of 18,200 megawatts (million watts, or MW) of electricity, equivalent to energy produced by about 50 million tons of coal each year (*New York Times* 1997), but also a symbol of national pride and achievement.

If state leaders' ambitions for drastic change were sometimes heroic, their reach into the hinterlands was generally attenuated. Since benefits and opportunities of development were widely expected to trickle down gradually to widening constituencies, the countryside was often overlooked by urban-based policy-makers. Meanwhile, rural people overwhelmingly depended upon traditional biomass fuels, which were not traded in marketplaces but gathered from fields and forests (Shukla 1996; Yang and Yu 1996). Estimates of biomass use vary widely, reflecting difficulties of measuring trends beyond the market economy.

The importance of political factors – specifically, rural constituencies and official adherence to equity in China and India – served to extend both commercial energy and new industries to rural areas, particularly after the 1960s, when agricultural development drew increasing official attention. Economists might criticize ''inefficient'' uses of dispersed resources, but possible compensating advantages deserve note. In China and India, rural investment served to slow the pace of urban migration, thereby mitigating pressures of rapid urbanization. Brazil's rapid but regionally specific industrialization and relative concentration of energy resources in São Paulo and surrounding areas of south-east Brazil reflects state leaders' more narrowly focused priorities and constituencies. Also, while Brazil's concentrated efforts may have facilitated growth, its income equity contrasts unfavourably with that of India (Chaffee 1998; Ishiguro and Akiyama 1995).

On balance, Chinese and Indian state leaders' achievements merit recognition. Chinese leaders could take pride in mastering the design, manufacture, and operation of what became the world's third largest power system after those of the United States and Japan. In 1950, total annual electricity generation was only 4.6 terawatt hours (trillion watt, or TWh); by 1994, the figure had increased to 928 TWh (Yang and Yu 1996, 736). During the Ninth Five-Year Plan (1996–2000), officials hoped to increase annual electricity capacity by about 20 gigawatts (million kilowatts) per year, equivalent to adding a major power station every two to three weeks (USDOE 1997). India's power sector increased from production levels of 2,300 MW in 1950 to 69,618 MW by 1992. Officials said the country needed to add up to 8,000 MW of new capacity each year until 2013 (*India Abroad* 1997, 30).

Organization and management

Mid-century perspectives on the efficiency of centrally planned and orchestrated development significantly affected the organization of production and distribution of energy resources. In China, provincial and other subnational electricity providers in the country's 23 provinces and five autonomous regions operated within a nationally directed system. Until 1985, the Ministry of Water Resources and Electrical Power was the main official agency overseeing funding and management of power enterprises. Its annual investment and power-supply plans were prepared under guidelines of the State Planning Committee's Five-Year Plans (Yang and Yu 1996).

Central direction was diluted and diverted by India's democratic federal political system, which gave control of energy to constituent states. In general, India's 25 states and seven union territories are covered by a system of vertically integrated utilities that spans the administrative unit. Since states vary substantially in size and population, their leaders' energy goals and strategies reflected divergent interests and local socioeconomic power configurations.

State government officials have considerable influence over the activities and finances of state electricity boards (SEBs). Official reluctance to yield control over SEBs is reflected in the absence of provisions for effective regulation of the SEBs, by either central government or independent authorities (Salgo 1996; Ranganathan 1996).

Neither country has a power service that provides energy to all who might require it, and the distribution of existing supplies is unreliable. Both centralized and decentralized energy production and distribution systems have many shortcomings, including faulty distribution, ineffi-

ciency, and heavily polluting carbon intensity. Faulty distribution covers both sufficiency and reliability of supplies.

Faulty distribution

Even a casual visitor to Beijing or New Delhi may quickly experience a major shortcoming of state-led power systems. Power outages or blackouts, euphemistically called ''load-shedding'' in India, are a feature of daily life. Long-time residents of both capitals may attest to a deterioration in power supplies due to increased demand. In the 1960s and early 1970s, India produced more electrical power than it could use, but faced growing shortages in the 1990s. During peak hours in 1997, officials reported shortages of 20 per cent (CERI and TERI 1995; *India Abroad* 1997).

China also faced increasing and widening power shortages and gaps between supply and demand, even in such favoured areas as Shanxi Province, which has abundant energy resources. National average peak-hour power shortages ranged around 20 per cent. Losses in terms of economic output were high, and certain to increase, despite official efforts to expand supplies dramatically (Yang and Yu 1996).

The overall unreliability of energy supplies reflects such generic problems of underdevelopment as inadequate infrastructure, particularly transportation networks. China's coal production is centred in northern and north-western regions, whereas its booming industry is mainly in the south-east. The difficulties of transporting supplies from the world's richest coal region to south-eastern factories are ironically underscored by China's recent decision to import coal supplies from Australia (laGrange 1995). Production and transportation costs have also sobered potential private investors' enthusiasm regarding large oil reserves in China's landlocked Xinjiang region.

Ageing energy production facilities also impede reliability of distribution. About 40 per cent of India's power plants are more than 15 years old, and thus prone to repeated breakdowns. As in China, officials sometimes favoured investment in new plants instead of allocating adequate resources to plant renovation that could extend plant life and perhaps produce energy at far lower costs than those needed to build new plants (Purkayastha and Ghosh 1997).

Apart from technical problems related to transmission and distribution along power grid networks that are ill-equipped to adjust supplies and demand across regional jurisdictions, unreliable power distribution in India's constituent states also reflects extensive electricity theft. In many rural areas and surrounding towns, a power line is an inviting challenge

for entrepreneurs who hijack power resources to the detriment of the financially strapped SEBs.

Inefficiency

The efficiency of energy use may be assessed by financial profits or losses to providers, and by energy intensity. Neither measure is entirely satisfactory, but they indicate patterns of production and use that might be improved. It bears repeating that Indian and Chinese energy systems were not designed to minimize costs and maximize outputs measurable by profits. Dismaying statistics on financial losses of state-led power systems, which are available for India, should be regarded in that light.

India's SEBs are widely seen as the inefficient Achilles heel of its state-led energy production and distribution system. The SEBs' spiralling annual losses rose to about US$1.7 million by 1995 (Purkayastha and Ghosh 1997). Such haemorrhages deterred further investment in the power sector and also effective maintenance of existing facilities.

Although poor management is reflected in the SEBs' deficient metering practices, bill collection, and widespread power theft (Salgo 1996), pricing policy for power is the major factor in massive SEB losses. Price policy is a key indicator of official economic and political goals. Subsidies to electricity used in agriculture reflect not only the 65 per cent of the population in various state politicians' constituencies but also an overriding national priority, since agriculture constitutes 34 per cent of India's GDP (Ranganathan 1996). The broadly similar political and economic weight of agriculture in China is reflected in its subsidized electricity prices that were suppressed for 30 years under the regime led by its former pre-eminent leader, Mao Zedong.

China performs poorly in relation to a second measure of the efficiency of energy use, energy intensity, denoting energy consumption per US dollar of gross domestic product (GDP). China's energy intensity is 18 times that of Japan, whose energy intensity is lowest among industrialized countries, while India's is four times that of Japan (Ishiguro and Akiyama 1995). Economists might offer several explanations, including obsolete facilities and processes, poor energy management, and lingering low energy prices that discourage efforts to improve energy efficiency (Ishiguro and Akiyama 1995). It is important to note that a developing country may use more energy per unit of output precisely because it is developing, rather than using larger proportions of energy to support such economically non-productive activities as watching television and driving automobiles (Ramage 1997).

Deficiencies of state-run energy systems became more obvious as eco-

nomic growth and population pressure increased demand. Pressures for fundamental change arose from three major sources – energy price increases, and both domestic and global economic and political change.

Pressures for efficiency and market-led energy systems

Sharp increases in international oil prices during 1973 and 1979 represented the first major challenge to fossil-fuel-based industrial development strategies and heavily subsidized energy prices. National responses reflected their relative command of energy sources. China's fossil fuel reserves made it relatively invulnerable to international oil price increases in the 1970s; thus its energy policies did not change. At the other extreme, Brazil was profoundly shaken, and took decisive steps toward the development of indigenous renewable resources such as biomass-based fuels (Monaco 1991). Midway between those cases, India and the United States registered concern at enforced fuel economies. Both took small steps to support alternative energy sources but made no significant and lasting gains toward either energy efficiency or environmental responsiveness (Ramage 1997; Ishiguro and Akiyama 1995).

In different ways, domestic economic change constituted a second impetus for energy policy change in both China and India. China's major steps toward a market-led economy occurred almost a decade earlier than those of its Indian neighbour. They reflected deliberate policy initiatives to accelerate economic growth and thereby achieve state leaders' goals of technological modernization. The reforms initiated in 1978 by the late Vice Premier Deng Xiaoping decentralized economic administration, allowed scope for market forces, and opened China to the international economy (Lieberthal 1995). Because Chinese leaders were isolated from both major industrial powers in the international arena and domestic opinion, economic and political change was controlled to a degree unimaginable in democratic India.

In India, links between domestic and international politics and economics were as exposed and potentially hazardous as a wayward surging power line. Economic reforms were enacted in 1990–1991 in response to external crises, specifically in foreign exchange reserves, which followed a steep rise in world oil prices accompanying the war in Kuwait. Subsequent external pressure for economic policy change made state leaders vulnerable to criticism from attentive domestic constituencies who might contend that market-led growth and heightened foreign investment threatened important values of equity and self-reliance. The contrasting effects of authoritarian and democratic political systems are striking in

the two cases of attempted market-based energy policy change discussed in the two ensuing sections.

Political systems and the domestic arena

In the 1980s and early 1990s, both Chinese and Indian leaders dramatically reversed state-controlled energy policies based upon administered prices and public ownership. Policy-makers endorsed efficiency as a criterion of energy system performance and solicited external foreign investment for energy needs made more urgent by global economic integration and increasing competitiveness. At first sight, state leaders' approaches to potential private foreign investors seemed parallel, and the unforeseen complications broadly similar (*The Economist* 1995). Yet market-based initiatives were shaped by very different political systems which yielded dissimilar results.

China's authoritarian system facilitated drastic price reform and foreign investment in its critical energy sector. Both issues were policy questions addressed in cloistered official deliberations; in a democratic political system, they became public and political issues.[3]

In India, as in the United States, energy prices are inherently political issues. Proposed price increases justified as a means to efficiency or environmental responsiveness invite criticism from opposition leaders. Indian officials' efforts to relinquish power over prices have been painfully slow due to the country's regular elections and anticipated violent protests by farmers (*The Economist* 1997).

Chinese officials' resolve to wield a key instrument of market-led economic reform was apparently not tempered by the political obstacles that daunted their Indian colleagues (Yang and Yu 1996; Ishiguro and Akiyama 1995). Price policy has been set largely by Communist Party and state leaders, without regard to electoral schedules. In 1984, for example, party leaders accepted a gradual introduction of market-based measures such as price liberalization; in 1988, senior government leaders pushed through more drastic reforms. Although subsequent unrest triggered a retrenchment, China's acceptance of market-based rather than administered energy prices nevertheless contrasts with the Indian experience (Starr 1997; Mann 1997; Ishiguro and Akiyama 1995).

Similarly, administrative reform seemed uncomplicated in China but fraught with political difficulties in India. China's once-mighty Ministry of Water Resources and Electrical Power was superseded by new, streamlined organizations including 30 provincial power companies and six power groups from 21 of the 30 provincial companies. As bodies only partly owned by government, they were encouraged to follow a popular

trend to ''jump into the sea,'' a colloquialism suggesting entry into the marketplace (Yang and Yu 1996, 737).

By contrast, India's SEBs seemed unready to either jump or be pushed into the sea. External pressure from Bretton Woods agencies to dismantle them angered members of India's sizeable attentive public (Purkayastha and Ghosh 1997). Many observers expressed scepticism about the World Bank's reform efforts undertaken in Orissa, one of India's poorest states, which involved increased electricity tariffs, dismantling the state's financially troubled SEB, and establishing an independent regulatory authority.

Few members of India's attentive public might challenge economists' arguments that investment in dispersed rural communities was inefficient, and subsidized energy distribution in the countryside egregiously so. But even fewer Indian political leaders would willingly shoulder the repercussions of rising energy prices and limitations on energy distribution, particularly if changes could be linked to external pressure that challenged Indian sovereignty and to the financial interests of external utility company shareholders. Domestic political fallout thus reflected back upon national leaders as they faced external economic and political actors.

Political systems and external economic interests

Differences in the two systems' patterns of interaction with international economic interests are illustrated by state leaders' efforts to attract foreign investment in energy production. Such ''opening'' exposed policymakers to generic problems involved in revamping non-commercial infrastructure (Salgo 1996), and to political and economic risks that may be dramatized in an open society. In India, neither the terms of contract negotiations nor the types of energy production invited could be kept from public view and discussion; thus officials faced a painful and public learning process.

Central leaders' attempts to attract foreign investment with ''fast-track'' approvals backfired as various projects, most notably a power station proposed by the US-based multinational Enron Development Corporation, were engulfed in domestic political maelstroms and scathing criticism by India's attentive public.[4] For example, an environmental journal charged that:

> The incentives to attract foreign investment in India's power sector are iniquitous and make little commercial sense. Observers point out that if these projects go through, ''India will soon have unaffordable, 'gold-plated' power, greatly increased dependence on imports and foreign-exchange outflow and a ruined power equipment-manufacturing sector, besides rendering many industries hopelessly uncompetitive'' (Shrivastava 1994, 5).

Another commentator raised a common suspicion among India's attentive public that electricity privatization, like the economic liberalization initiated in 1991 in general, was "a decision imposed from outside" that was clumsily pursued by state officials (Ranganathan 1996, 825). Perhaps as a result of public criticism of national leaders' difficulties with both wary potential foreign investors and state-level politicians who traded subsidized power for political support, officials took steps to promote open competition for power contracts with foreign investors.

Senior Chinese officials' determination to monitor the location and nature of foreign energy investment was reflected in a statement by the Minister of Power and Industry: "Since power supply is of great importance to the national economy, foreign investment in it will proceed under the State's macro-control" (Shi 1994). Official ambivalence about external involvement was reflected in bureaucratic politics involving inter-agency and factional rivalries within government. Meanwhile, potential foreign investors consulted presumed experts on Chinese negotiating practices, and worried about the sanctity of contracts in a policy system with no tradition of formal law (Mann 1997).

With the exception of a major hydroelectric project discussed in the ensuing section, the type of energy project proposed did not emerge as a major public issue in China. In India, media and parliamentary discussions of alternative energy projects pursued a range of criticisms raised by external participation. Of gravest concern to environmentalists was the possibility that energy sources facing public opposition in Western democracies, such as nuclear power and coal, were being marketed instead in Asia, to policy-makers who discounted environmental and safety risks. Indian commentators also noted that many large power producers relied upon fossil fuels to maximize their convenience and profits (*Down to Earth* 1997a). Ironically, however, although India's abundant coal resources recalled those of fabled Newcastle, a multinational company's controversial Cogentrix plant proposed to bring imported coals to Karnataka because Indian coal is generally of inferior quality. The coal import proposal was duly denounced as a way to increase Indian dependency on fossil fuel imports despite an indigenously available resource.[5]

In sum, state leaders in China and India faced both domestic and external constituencies in different ways. In China, a small number of officials could arbitrarily raise energy prices or set a date for the phase-out of leaded gasoline. Domestic leaders' detachment from civil society also facilitated Chinese negotiations with external economic interests. In both cases, political conflict was played out within the state bureaucracy.

In India, national policy-makers faced open resistance in state political arenas and in rural society, where farmers' organizations sporadically but dramatically claim the public stage. Faced with an international market-

place, Indian representatives needed to anticipate close public scrutiny and potentially embarrassing questions that exposed pitfalls to negotiators and potential foreign investors. Indian debates raised questions about ''efficiency'' or ''profitability'' as absolute values, and as the ensuing discussion indicates, about perspectives on ''environmental responsiveness.''

Pressures for environmental responsiveness

Even as pressures for efficiency in terms of waste reduction and cost effectiveness drove efforts to deregulate and privatize instrumental energy systems in many parts of the world, environmental responsiveness emerged as an alternative criterion for their assessment. Concerns about environmental implications of energy use were fuelled by UN-sponsored global environmental meetings in Stockholm and Rio de Janeiro; the emergence of environmental problems as a public issue; and the development of institutional structures, including Chinese and Indian environmental agencies, to address unwelcome fallout from economic and social change.

As a criterion for energy system assessment, environmental responsiveness was limited by several factors. Like ''sustainable development,'' the term is vague and subject to divergent interpretations. Cause-and-effect relationships are often unknown or disputed; thus costs and benefits are unclear. As a result, strong and sustained support for environmental responsiveness as a yardstick for energy systems has not emerged on a global scale in either public or private sectors. In sharp contrast, private business support for profitability as a measure for efficiency is strong and constant.

Although environmental responsiveness has not become a standard for energy system assessment in China and India, their political structures have shaped its manifestation in interesting ways. In a democratic political system, environmental responsiveness is not exclusively defined by state leaders in either domestic arenas or settings where domestic and international actors meet. The reverse may be true in an authoritarian system.

Costs, benefits, and domestic politics

In either setting, national policy-makers can make a strong case that major hydroelectric projects are considerably more environmentally responsive than coal-based power projects. Upon its completion, China's proposed US$25 billion Three Gorges project on the Yangtze River will be the world's biggest dam. Many smaller but still massive projects have

been completed in India since the middle of the twentieth century, but their construction has stirred controversies almost unknown in China. In India's democratic political system, central pronouncements are challenged by state, regional, and local residents who ask, in essence, ''environmentally responsive for whom and what?''

Engineers' and national leaders' calculations of proposed benefits of major hydroelectric projects have often discounted environmental and resettlement costs. In an authoritarian system such as China, criticism and public debate can be and has been banned, and opposition within both government and society has been suppressed.[6] As a result, Western scholars and the international media generally frame controversy surrounding the Three Gorges Dam, which may displace 1.2 million people, as a dispute between its major proponent, Prime Minister Li Peng, and Dai Qing, a journalist and environmental activist identified as ''one of the few critics who dares to speak out'' (*New York Times* 1997, 14).

In India, critics of major energy projects include not only famous veteran activists such as Chipko movement leader Sunderlal Bahuguna, who hugged trees to protest deforestation in the Himalayan mountains and fasted to register local concerns about the Tehri Dam project, but also many ordinary men and women whose names never appear in print. While mobilizing concern in local, national, and international arenas, Indian activists have drawn attention to the painful displacement of people who traditionally lack political power and financial resources. Such dramatic measures have deterred investment in potentially controversial projects by international agencies, including the World Bank.[7]

In sum, public debate in India underscores the subjective dimension of environmental responsiveness, and the competing values that restrain unilateral action by national and state officials. Prospects for active local initiatives in public arenas apart from the marketplace revitalize the world's largest democracy by stirring widening constituencies into an active rather than passive role in public life.

Political systems and external interests

The presence or absence of freedom of speech and association exerts important influences upon Chinese and Indian state leaders' positions in the international arena. Indian leaders must express and defend positions regarding energy alternatives and their costs and benefits to an attentive public. Indian commentators and non-governmental organizations (NGOs) put state representatives on notice by monitoring their positions at home and abroad. No official has been immune from criticism.[8]

Indian officials are vulnerable to potentially embarrassing domestic criticism that cannot be suppressed.[9] In international forums, this can

strengthen Indian officials' claim to represent the world's second most populous nation. Thus, while Chinese and Indian negotiators may express similar misgivings about the equity of rich nations' proposals to apportion costs for remedying such transboundary problems as ozone depletion and global climate change among industrialized and rapidly growing low-income countries including China and India, for example, Indian concerns carry more moral authority. Commentary from within Indian society lends a democratic dimension to official policy positions, and because it is not controlled by government, it can influence constituencies beyond the horizons of the average state official.

Indian environmental activists play a critical educational role for a wide circle of NGOs and scholars throughout the world. Through mass media and more specialized forms of communication, Indian commentators have challenged easy assumptions about global environmental problems related to energy use held by both Northern NGOs and political leaders in the world's most profligate energy consumer, the United States.[10] In so doing, they raised important questions about strategies for reconciling possibly conflicting imperatives of economic growth and environmental protection. In particular, they have contested a widespread North American belief that "the market" discharges state responsibilities for agenda-setting and regulation by offering a range of painless and potentially profitable solutions to local and global environmental problems.

In sum, as a criterion for assessing energy systems, environmental responsiveness is weak in relation to the emerging efficiency criterion, which has strong economic and political support in both international and domestic policy circles. Environmental responsiveness is hindered by lack of consensus on goals and means. Like democracy or sustainable development, it is a process, not a fixed nostrum with supposedly universal validity (Fisher 1995). India's democratic political system facilitates debate about the nature of environmental responsiveness in ways foreclosed by an authoritarian system. In both systems, however, the spread of market-driven energy systems leaves vast scope for pursuit of environmental responsiveness in areas that yield neither wealth nor profits. As in the 1950s, such constituencies are overwhelmingly rural. Once again, they will need state support, but in ways that reflect intervening economic, technological, and political change.

Emerging arenas for clean and efficient energy development

Critical economic, technological, and political factors affecting areas where thousands of Chinese and Indian men and women live without modern energy resources may be summarized as follows. Economic con-

siderations include massive growth of demand for energy and the resources needed to meet it. Since neither state can mobilize such vast sums, the private domestic and foreign investment that was uninterested and perhaps unwanted in the 1950s is increasingly sought.

Private participation in energy systems has shifted attention from instrumental criteria of performance to efficiency and profitability considerations. Many rural areas would face continued delays in securing prized energy connections, and meanwhile aggravate biomass depletion and coal-based pollution, were it not for important technological developments.

Technological change since the 1950s entails a pronounced shift from perspectives guided by the economies of scale of the industrial revolution, which placed large-scale coal, oil, and nuclear energy production under centralized control. Contemporary planners have considered decentralized energy production and explored rather than assumed the nature of emerging demand (CERI and TERI 1995). From such vantage points, rural citizens' inexperience with the centralized power grids that urban customers take for granted can be seen as advantageous, for it facilitates innovation and an array of promising small-scale technological possibilities.

For example, an Indian environmental journal reported the development in Britain of a simple solar-powered pump that is much cheaper to run than conventional systems driven by fossil fuel engines. Due to the absence of engineering – indeed, its inventor calls the device the ''epitome of minimalist engineering'' – little maintenance is needed. The back-breaking, time-consuming and wasteful practice that involves millions of Asians, Africans, and Latin Americans in a daily grind of water extraction and delivery could be relegated to history if such promising developments are realized (*Down to Earth* 1996). Since Asia represents the world's most dynamic markets for energy, the size of the potential market may fortuitously be matched by the eagerness of their promoters.

An internationally funded project to increase energy efficiency and affordability through the use of copper was scheduled for implementation in both India and China beginning in 1998. The US$2.5 billion project, which is supported in part by the UN Common Fund for Commodities, will draw upon copper's power to conduct energy effectively to help meet Chinese and Indian demand for energy at lower costs to society and individual users (*Down to Earth* 1998).

Political factors influencing Asia's new frontier of energy development include a shift in perspectives on the role of the state, born of virtue possibly learned from past experience and necessity imposed by contemporary resource scarcities. Since the 1970s, the centralized state structure that specified and implemented presumed development through far-flung line agencies has deflated in both theory and practice. Particularly in

democratic political systems, local communities seek to claim authority to decide such critical matters as energy supply and use, and to define environmental responsiveness themselves, instead of passively accepting national officials' judgements.

Political and administrative decentralization does not obviate the need for state support. An important assessment of rural energy planning in India concluded that:

> intensive intervention, implemented at the cluster of villages level by block [administrative unit] institutions, supervised from the block, coordinated from the district, monitored at the state level and supported nationally appear to be the most promising combination for making effective interventions in the rural energy sector . . .'' (Sinha, Venkata, and Joshi 1994, 403–414).

Specific areas where official expertise is needed include planning and the reconciliation of local, regional, and national priorities and capabilities, and also in demonstrating, monitoring, maintenance, and evaluation of energy technologies.

Such tasks will draw upon the extensive experience of international agencies and, particularly, the United Nations, which has actively assisted the spread of energy technologies that are widely viewed as environmentally responsive, rather than the massive but environmentally controversial projects of the past. As a result, the United Nations offers vast experience with wind and solar energy technology and their use in rural areas of low-income countries. Its staff and advisers with general expertise in community development can assist both official and agency technical specialists and local community representatives. Perhaps one of the most critical emerging needs in the wake of energy deregulation and privatization is assistance in developing mechanisms for accountability that would make energy producers and distributors answerable to people beyond themselves.

Summary

In the middle of the twentieth century, states sought to develop energy for instrumental purposes. Initially, the political economy of energy production and distribution in China and India was broadly similar, because both states had abundant coal and shared perspectives on the need for a dominant, centralized state in promoting economic development. By the 1970s, however, key development objectives remained distant goals. As past strategies for achieving development were called into question by uncertain energy supplies, such as oil, and by technologies increasingly

recognized as wasteful and environmentally unsound, two new criteria of energy system performance emerged: efficiency and environmental responsiveness.

The preceding discussion illustrates how political regimes affected Indian and Chinese approaches to alternative energy system criteria. China's authoritarian system facilitated measures taken in pursuit of efficiency, including energy price reform and private foreign investment. India's democratic system illustrated complications that may arise when political leaders derive power from citizens, who may criticize both domestic and external economic interests. A democracy also highlights the many-faceted nature of environmental responsiveness, and the importance of debate and reassessment. Both Indian state leaders and international constituencies have faced the sometimes bracing test of Indian public opinion.

If the pursuit of environmental responsiveness is inherently a collective enterprise, so too is the monitoring of emerging energy systems. Private interests have strong incentives to monitor profitability, which is one aspect of efficiency. States have incentives to measure the overall efficiency of energy use and the effectiveness of its distribution. Environmental responsiveness is a shared concern of states, market-led forces, and the citizens who use energy in their daily lives. Because of its extensive experience with environmental technology and informal education about its use and effects, the United Nations can and probably will be a catalyst in crystallizing both goals and standards for environmental responsiveness in the twenty-first century. In particular, it can help rural communities draw clean energy from renewable sources, including wind and the sun, and thereby consign the "ignoble fuel" and its fellow fossils to history.

Notes

1. The author would like to thank Brian Halber and Rochelle Perry for research assistance, and Joshua Foster and Jeannie Sowers for helpful suggestions.
2. Unless otherwise indicated, "systems" refers to energy production and distribution.
3. For a discussion of issues and policy processes, see Kingdon (1984).
4. Among the extensive material on Enron, see, for example, Shrivastava (1994); Bartels and Pavier (1997).
5. Purkayastha and Ghosh 1997, 99. The old expression, "bringing coals to Newcastle," refers to the introduction of unneeded resources to an area where they are abundant.
6. See Qing (1994); Starr (1997); *New York Times* (1997). Among the many books chronicling the history of major dam construction, see, for example, Reisner (1993).
7. See *Down to Earth* (1997b, 39). On the controversial Sardar Sarovar Dam across India's Narmada River, see Fisher (1995) and Caulfield (1996).
8. Successive prime ministers have drawn pot-shots in many publications. See, for example, "Narasimha Rao Visits Jurassic Park," *Economic and Political Weekly*, 28 May 1994.

9. The Indian state's inability to do so was evident in its unsuccessful efforts to contain protest within India over the controversial Narmada or Sardar Sarovar Dam. See Fisher (1995, 44).
10. See, for example, Agarwal and Narain (1991).

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