

# ENERGY AND DEVELOPMENT IN LATIN AMERICA \*

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- ENERGY AND DEVELOPMENT IN LATIN AMERICA.* By NAZLI CHOUCRI. (Lexington: D. C. Heath, 1982. Pp. 226. \$23.95.)
- NUCLEAR POWER IN DEVELOPING COUNTRIES.* By JAMES EVERETT KATZ and ONKAR S. MARWAH. (Lexington: D. C. Heath, 1982. Pp. 373. \$28.95.)
- OIL AND POLITICS IN LATIN AMERICA: NATIONALIST MOVEMENTS AND STATE COMPANIES.* By GEORGE PHILIP. (New York: Cambridge University Press, 1982. Pp. 577. \$49.50.)
- CONSULTA DEL CARIBE SOBRE ENERGIA Y AGRICULTURA.* Edited by NORBERTO A. QUEZADA and CRISTIAN REYNA T. (Santiago: Instituto Superior de Agricultura, 1980. Pp. 679.)
- ENERGY FROM ALCOHOL: THE BRAZILIAN EXPERIENCE.* By HARRY ROTHMAN, ROD GREENSHIELDS, and FRANCISCO ROSILLO CALLE. (Lexington: University of Kentucky Press, 1983. Pp. 185. \$20.00.)
- ENERGY ALTERNATIVES IN LATIN AMERICA.* Edited by FRANCISCO SZEKELY. (Dublin: Tycooly International Publishing, 1983. Pp. 165.)

Since the early 1970s, the countries of Latin America have been going through a continuous process of adjustment in adapting to the realities of fluctuating energy prices and supplies. The energy supply "shocks" of the 1970s resulted in major economic problems for both oil-importing and oil-exporting nations. The resulting economic problems presented a challenge for policymakers. The problem was not only how to stabilize economies suffering from inflation, balance of payments deficits, commodity price instability, declining growth, and high unemployment but also how to engage in conscious energy planning to adjust to the new energy realities. By the late 1970s, the adjustment process had been somewhat successful in the short run, and many nations embarked upon the path of energy planning and management in order to use energy more efficiently and expand the available supply of do-

\*I wish to acknowledge the assistance of my colleague, Charles Sackrey.

mestic energy. These trends have been documented in this journal and elsewhere.<sup>1</sup>

What has been the experience since the late 1970s? From 1979 to early 1985, economic instability for both oil-importing and oil-exporting nations has intensified, and the process of energy adjustment has largely been arrested. Sluggish economic growth in the western industrialized nations and a petroleum glut (beginning in 1981) have created tremendous problems for Latin American nations. The new reality of the 1980s has been the emergence of the debt crisis that has been particularly difficult for Argentina, Brazil, and Mexico. This debt crisis has severe implications for the economies of Latin American nations and the process of energy adjustment as well. The Inter-American Development Bank recently concluded that "energy development in Latin America in the past two years [1982–83] has been strongly affected by the current economic recession and external debt crisis in the region, which have led to lower energy consumption and reduced access to commercial funds for energy projects."<sup>2</sup>

### *Energy Overview*

For most Latin American nations, petroleum is the lifeblood of their economies. The development style (or model) of most nations is an industrialization policy that is dependent upon fossil fuels, particularly petroleum. Although petroleum consumption has decreased in recent years due to the recession, petroleum is still the major energy carrier and accounts for approximately 70 percent of commercial supplies. Crude oil production in Latin America totaled 2,225,200 thousand barrels in 1983, with Mexico and Venezuela producing 44.3 percent and 29.5 percent, respectively. In 1983 Latin America imported 403,527 thousand barrels of oil, at a value of \$10.6 billion (U.S.), with Brazil importing 266,450 barrels, or 66 percent of the total imports. Other major importers were, in order of dependence: Trinidad-Tobago, Chile, Uruguay, and the Dominican Republic. In 1983 Latin America exported 1,019,335 thousand barrels of crude oil worth \$34 billion (U.S.) resulting in net earnings of \$23.4 billion. Mexico exported \$15.43 billion in petroleum and Venezuela \$14.83 billion or 89 percent of the total earnings of Latin America on oil imports. In terms of consumption of petroleum and petroleum derivatives, Mexico in 1982 consumed 523,775 thousand barrels, or 35.4 percent of the total for Latin America. Mexico was followed by Brazil (25.2 percent), Argentina (11.4 percent), Venezuela (10.1 percent), and Colombia (3.8 percent).

The Big Five countries together consumed 85.9 percent of the petroleum in Latin America. These data demonstrate the following: Latin America is a petroleum-dependent region, where petroleum con-

sumption is dominated by the Big Five nations; Brazil is the nation most dependent on imported oil; and Mexico and Venezuela are the primary oil exporters.<sup>3</sup>

### *Energy and Development*

Nazli Choucri's *Energy and Development in Latin America* is the only cohesive and comprehensive treatment of energy in Latin America. Its organization and framework of analysis are excellent. While it is oriented toward the economist or energy specialist, it is also accessible to the general reader. The only problem is that a book like this becomes dated quickly as events and new data force the reader to adapt the text to a changing reality.

Choucri begins by making the critical link between energy and development. "Energy use is everywhere tied to population growth, industrialization, expansion of urban centers, and development of industrial and infrastructure facilities" (p. 3). He defines *development* as including the interrelated processes of economic growth, structural change, social equity and welfare, and institutional development (p. 5). None of these facets of development can be examined without recognizing its vital relationship to energy.

Choucri's initial focus is on the nature of energy supplies and uses in Latin America, with emphasis on the transportation sector. For example, in 1979 with respect to primary energy in Latin America, petroleum represented 66.2 percent, natural gas 13.7 percent, coal 5.1 percent, and hydroelectric power 14.5 percent. In terms of sectoral use of energy in Latin America, industry used 40 percent of fossil fuels, transportation 35 percent, electricity 15 percent, and households 10 percent. The vital role of transportation in development and energy usage is characterized by Choucri accordingly: "Latin America's energy problems in the transportation sector signify a series of general structural problems that influence broader issues of public and energy policy, notably regional development, industrial policy, and infrastructure planning, in addition to energy consumption" (p. 95).

Choucri also surveys the basic experience in Latin America with macroeconomic problems related to the oil price "shocks" of the 1970s. The basic problems of inflation, balance of payments deficits, and increasing borrowing are well documented. For oil exporters like Venezuela and Mexico, Choucri explains their unique macroeconomic problems, which are related to the adjustment problems of huge export earnings. These problems are then compared to those of a nation like Brazil, which suffers from its dependence on oil imports. Choucri concludes his survey by stating that "there is no single story to tell for all of Latin America." In fact, "the striking phenomenon is that oil exporters

are not significantly better off than importers" (p. 110). As will be shown, Choucri researched his book before the debt crisis raised its ugly head in 1982.

Due to his conviction that energy is vital to the development process, Choucri appears frustrated because more nations are not fully involved in linking the energy sector to the overall process of development planning. The experience thus far is that it "remains for fully developed energy policies to emerge" (p. 137). Only in the major exporting nations—Mexico, Ecuador, and Venezuela—is the petroleum sector a target for policies, and only in the giants—Brazil, Chile, and Argentina—is the energy sector considered in its entirety. Nevertheless, Choucri notes, "In all states . . . the public sector is assuming a greater role in energy policy planning and execution" (p. 137). Experience has revealed that strong state enterprises are central to planning in the energy sector, and Choucri details the development and experience of Latin America's major energy corporations: Mexico's PEMEX (founded in 1940), Ecuador's CEPE (Corporación Estatal Petrolera Ecuatoriana, 1973), Venezuela's Petroven (1976), Brazil's Petrobras (1950), Argentina's YPF (Yacimientos Petrolíferos Fiscales, 1922), Colombia's Ecopetrol (1951), and Peru's Petroperú (1934).

It is this part of Choucri's book that complements well the work of George Philip, *Oil and Politics in Latin America*. Philip's book is an excellent and comprehensive analysis of the transformation of Latin America's petroleum sector from one previously dominated by international oil companies into one now dominated by the main state oil companies. In addition, Philip analyzes the ways in which these main oil companies have operated. *Oil and Politics* contains individual country experiences of oil nationalizations and the performance of these state-run companies. The experience in Latin America, while not uniform, suggests that in most cases, nationalization resulted from a combination of political pressure from the urban middle class and the perceived economic weakness of the oil companies themselves. He argues that nationalization generally resulted from a government's desire for control over oil rather than for maximum income from it. "If we consider the various nationalisations that have taken place, we find that only those carried out in Brazil, Chile, Uruguay, and possibly Venezuela were motivated by a desire to increase returned value from oil. Conversely those of Bolivia (twice), Mexico, Ecuador, Peru, Argentina (in the 1930s and also in 1963) and Cuba were deliberately designed to foster political objectives even at the price of some short-term loss of national income" (p. 313). In summarizing the experience of state oil companies, Philip concludes that "while it is likely, however, that some of the hopes which lay behind the creation of state oil companies could never be fulfilled, it remains true that in the right circumstances a state

oil company will prove a valuable instrument in the hands of a government that has a clear and realistic idea of its strategic objectives" (p. 493). The Latin American experience has demonstrated as well the reality of state oil companies characterized by fraud and corruption to such an extent that even governments with the best of intentions are unable to control companies like Mexico's PEMEX. Indeed, the role of the state sector is perhaps the most critical issue in the energy future of Latin America. Let us now examine two examples of the role of the state in energy outside of the petroleum sector.

### *Nuclear Power and Energy from Alcohol*

There are several significant examples of the role of state governments in the energy sector, such as the Brazilian hydroelectric project with Paraguay on the Paraná River (Itaipu) and the Colombian coal project with Exxon on La Guajira peninsula (El Cerrejón). Also available are the experiences of nuclear power and the production of energy from alcohol on a large scale. I will examine each of these last two in greater detail by discussing James Katz and Onkar Marwah's book *Nuclear Power in Developing Countries*. Although not specifically devoted to nuclear power in Latin America, it does include case studies from Argentina, Brazil, Mexico, Venezuela, and Cuba. The authors confess at the outset that their work is intended to reflect a diversity of opinion and not to address the important issues of nuclear proliferation and weapons.

Argentina, for example, has the most advanced nuclear power program in the region. The long history of the development of nuclear power in Argentina begins with the formation of the Comisión Nacional de Energía Atómica (CNEA) in 1950. Argentina's first reactor was completed in 1974 and named Atucha, a 344-megawatt unit. A second reactor was ordered from Canada in 1973 and started up in 1983. In January of 1979, a comprehensive plan for four new 600-megawatt units was proposed and an agreement was reached with the German company Kraftwerk Union (a subsidiary of Siemens) to build Atucha II, a 693-megawatt unit. Atucha II was begun in 1981. To date, Argentina has neither signed the nonproliferation treaty nor accepted the International Atomic Energy Association's safeguards. In light of the pressing economic crisis, fueled by a huge debt burden, it is unlikely that Argentina's ambitious nuclear power program will be completed.

In 1969 Brazil bought a Westinghouse pressurized water reactor with a capacity of 624 megawatts, which was named the Angra dos Reis. Soon after, Brazil reached an agreement with Germany for eight additional reactors. Only two of these reactors, Angra dos Reis II and

III, look certain to be completed because in January of 1983, the construction of the third and fourth reactors was postponed indefinitely.

What is most interesting about the experience with nuclear power in these two examples is that strong state governments acting with nationalist fervor committed their respective nations to developing nuclear power for what seem in retrospect to be reasons less related to energy need than to political objectives. Indeed, both Argentina and Brazil are rich in conventional energy resources, particularly in hydroelectric power. "The available evidence strongly suggests that in both countries no contribution from nuclear power is necessary to meet electricity demands in the foreseeable future."<sup>4</sup> It would appear that neither Argentina nor Brazil can justify nuclear programs on the basis of a pending shortage of energy. Thus the military aspect of nuclear development has to be viewed as one of the central factors in explaining Argentine and Brazilian nuclear policies. In both countries, conclusive evidence exists that active steps are being taken to acquire the capability to produce an atomic bomb.<sup>5</sup>

Setting aside the issue of attempting to develop nuclear power for political or security related purposes, is nuclear power an attractive alternative for Latin America? Ian Smart's contribution to the Katz and Marwah work presents an excellent analysis of the factors that any nation must seriously consider in order to answer this question. Because nuclear power produces electricity, a country must be able to assess the place of electricity in the energy system and economy. As Smart argues, "Only when an extremely detailed and generally convincing analysis of probable electricity demand over a future period of some 30–40 years is available can the consideration of supply options reasonably begin" (p. 24). Other issues surrounding the consideration of nuclear power are the availability of investment capital, external technological dependence, supply inflexibility, and institutional gravity. The nuclear power option also involves other critical questions related to scale, location, and cost.

*Nuclear Power in Developing Countries* was written before the debt crisis emerged in 1982–83. In view of the cost of merely building a nuclear power plant (even in a developing nation), it would appear that any rational assessment of this cost would automatically eliminate nuclear power as a viable energy option, especially given the scarce capital resources in the region. Comparing the cost of producing electricity with nuclear power to other competing supply sources (such as hydroelectricity or even fossil fuels) in terms of efficiency and end use would further eliminate nuclear power as an option. Thus I would tend to disagree strongly with Katz and Marwah's final conclusion that "nuclear power, if it is well-planned and well-managed, can make a positive and uniquely important contribution to future welfare" (p. 39).

I am more inclined to agree with Amory and Hunter Lovins, who maintain that “efficiency improvements and available soft technologies can displace oil and meet energy needs better than nuclear power.” They argue further that this approach is strongest in developing countries, where capital delivery systems, infrastructure, and income are most limited. “By enhancing resilience, self-reliance, and economic strength, a soft path aids national security.”<sup>6</sup> Such a soft-energy path is based upon the use of renewable energy and appropriate technology. Brazil’s experience in making alcohol provides such an example.

*Energy from Alcohol: The Brazilian Experience* by Harry Rothman, Rod Greenshields, and Francisco Rosillo Calle is the first full account of Brazil’s development of the alcohol fuel industry. The book examines the process of production of alcohol from biomass, carefully explains the technical dimensions of this process, and explores the management of the program by the state sector. Brazil’s Programa Nacional de Alcool (PNA) has been responsible for developing this program. Brazil’s goal has been to produce ethanol by fermenting biomass (organic plant matter) in order to reduce oil imports in 1985 to 0.5 million barrels per day and limit overall oil consumption to 1.5 million barrels per day. Alcohol production would reach 90,000 barrels per day. Substitution of alcohol for petroleum is imperative given Brazil’s dependency on imported petroleum and the magnitude of its fuel needs, especially in the transportation sector. The government’s alcohol program is designed to modify (that is, to reduce) petroleum consumption.

The PNA program depends totally on government support. This support is generated by market guarantees for all ethanol produced, by administered prices pegged to gasoline prices, and by subsidized loans (p. 47).

The program has had an impressive employment impact. PNA will have created an estimated 420,000 jobs in the agricultural sector and another 42,000 in the alcohol industry between 1980 and 1985. The short-term goal of the program is to have 4 million vehicles fueled by alcohol, of which 2.1 million will run on pure alcohol, out of a total of 13 million vehicles, all by 1985. In light of the recession in the early 1980s and the petroleum glut, these goals are unlikely to be met. The mechanism of increasing prices and increasing imports will not be able to force the substitution of fuel sources based on cost competitiveness unless the government increases its subsidy of the program. Given the debt crisis, this outcome is also highly unlikely.

While the alcohol program has been impressive, some serious and fundamental problems remain inherent. The major issues concern food production and the environmental consequences of this kind of

alternative energy strategy. What are the advantages and disadvantages of this alcohol program?

The major criticisms related to the issue of food production are as follows: first, the production of alcohol competes with food crops for agricultural land; second, the production of alcohol competes with agricultural investment that could be used to increase food crop yields; third, by-products from the production of alcohol are used for industrial feedstock rather than as food for people and animals; fourth, the production of alcohol competes with scarce water supplies because the fermentation process requires sixteen liters of water for each liter of alcohol. In response to these criticisms, proponents of the program list the following advantages: first, energy crops can be produced without necessarily reducing the production of food crops; second, the fermentation process yields high-protein by-products that can be used as animal feed or a protein supplement for humans; and third, energy crop programs reduce oil import bills and save foreign exchange, which could buy food in international markets.

The authors of *Energy from Alcohol* conclude that "little serious study has been done to resolve these questions." Brazil has been expected to convert 10 percent of its crop land to energy production by 1985. The authors believe this development will increase the price of food and food imports. They support this argument by recalling that in recent years, "Brazil was forced to import black beans from Mexico because bean crop land in the south had been turned over to sugar for alcohol production." The authors also argue strongly that "energy crops compete with agricultural investment, capital, water, fertilizers, farm management skills, agricultural credit, technical advisory service and other scarce resources." They conclude, "We are not aware of any attempt to examine this impact and develop policies to counter deleterious effects" (p. 134). Furthermore, the environmental impacts from this program are serious. The effluent from the alcohol distilleries is enormous (each liter of alcohol yields twelve to fourteen liters of stillage with a high biochemical oxygen demand). "The problem is that in a country like Brazil, as well as other LDCs, environmental considerations play a secondary role" (p. 136).

What lessons does Brazil's experience offer to other nations? The authors conclude that it is "too soon to draw any final conclusions," but they draw some preliminary conclusions. "The development and innovation of biotechnology to utilize biomass resources is likely to be an appropriate energy option for many tropical and sub-tropical states. Ideally, future Third World biomass programmes should be based upon realistic planning in accordance with satisfaction of basic needs and carried out in a manner which envisages and allows greater socio-eco-



conomic and structural changes, together with greater consultation and participation of the parties most directly affected than was the case in the Brazilian Alcohol Program" (p. 151).

*Energy Alternatives in Latin America*

Argentina's Fundación Bariloche completed a study of the non-conventional energy sources in Latin America and concluded that an instituted plan could save three billion barrels of oil by 1995 and that 11 percent of the region's energy could come from renewable energy resources with positive environmental benefits. In light of these attractive prospects, researchers have begun to explore ways in which Latin America's resource endowment might be best utilized to promote renewable energy in the context of rural agricultural development.

Norberto Quezada and Cristián Reyna, editors of *Consulta del Caribe sobre energía y agricultura*, have produced a collection of articles based on papers presented at a conference in the Dominican Republic on energy and agriculture. The book provides an overview of the topic, the links between energy and agriculture, biological energy sources (biomass), and physical energy sources (solar, wind, and water). The actual experience of developing and implementing renewable energy is documented as well as its future potential. The focus is on the economic, financial, and managerial aspects of renewable energy as well as on policy, planning, and future research priorities. One cannot help but be excited about the current progress and future prospects of renewable energy after reading this book. What has been happening with renewable energy since this work was published in 1980?

Francisco Szekely has edited a recent book entitled *Energy Alternatives in Latin America*. This collection is probably the most stimulating book on energy in Latin America in existence. In the introduction, Szekely distinguishes between the energy problem of developed nations and that of developing nations. He charges that while developed nations seeking to maintain a high level of consumption of energy, particularly fossil fuels, do not question their style of development, each of the Latin American nations must reflect seriously upon the style (model) of development that they are attempting to achieve and examine the energy realities of that particular mode of development. Once this task is done, Szekely argues, the fundamental problem will be crystal clear. "In Latin America, the fundamental problem is how to provide for the energy needs of millions of people who are deprived of adequate resources. Efforts should thus be directed not towards achieving the levels of over-consumption seen in the developed countries . . . but rather towards obtaining consumption for all the inhabitants of the Latin American region that will bring about a marked improvement in

the quality of life" (pp. 1–2). The questions are: energy for whom and for what tasks?

How to proceed and what are the solutions? Szekely makes the case for developing and applying appropriate technologies for the use of conventional and renewable sources of energy and immediately implementing conservation measures. To achieve these goals will require changes in the present style of development (capital-intensive and fossil fuel-intensive) such that satisfying the population's basic needs will become the central goal of the development process.

For any nation to address adequately the potential of renewable energy, it must first assess its potential. Thus the goal of *Energy Alternatives in Latin America* is "limited to the assessment of the region's potential for using the following sources of energy: direct solar, wind, plant material, biogas and small waterfalls and water flows." The book contains case studies on Argentina, Brazil, Chile, Colombia, Costa Rica, Guatemala, Mexico, Peru, and Trinidad-Tobago. This study also focuses entirely on the rural sector. As Szekely argues, "as a result of the style of development prevailing in Latin America, energy has been used largely to satisfy the requirements of industry and the domestic needs of the middle and upper classes of society" (p. 7). As a consequence, the majority of the population, who are poor and live in rural areas, have been ignored. One of the most important conclusions of the Szekely collection is that "almost all of the studies that have been made on the possibility of increasing the use of renewable sources of energy agree that an essential requisite in so doing is government support that can be translated into implementing the policies formulated for this purpose" (p. 72).

What can government policies do? They can implement the following activities: first, increase the level of penetration of renewable energy; second, promote the technological development of equipment using renewable sources of energy; third, increase the economic viability of equipment using renewable energy; and fourth, develop policies directed toward diminishing resistance to innovation (pp. 75–76). For a country to be able to implement a program in renewable energy, it must undertake a number of projects: it must determine the amount of energy resources existing in the various geographic areas; it must have access to a critical mass of scientists and researchers; it must design and produce equipment of a cost and quality that can transform these renewable resources into usable energy; it must promote widespread distribution and commercialization of such equipment; it must promote publicity and educate the public about these alternatives; and finally, it must provide financial support on a large scale (p. 77).

For this policy to be possible, the political problem of changing the style of development must be addressed. Thus the overwhelming

logic of the attractiveness of renewable energy must be emphasized. As Amory and Hunter Lovins have argued, "Heroic diversions of national resources for pitiful ends may comfort nuclear bureaucrats, but not a finance minister facing massive oil debts, a district commissioner fighting deforestation, or a prime minister whose people still cannot cook their rice. Clay stoves, biogas plants, and cogeneration may lack sex appeal for technocrats, but a practical politician has more to gain from thousands of small successful projects than from a single ribbon-cutting."<sup>7</sup> Lovins further maintains that "whether at the scale of virtually zero-cost clay stoves that quadruple or quintuple the efficiency of burning scarce firewood, sailing pumps, solar driers and cookers, or sophisticated efficiency boosting and solar technologies in major urban areas, a soft path has just the strengths a developing country seeks. It can save capital and foreign exchange, use abundant local resources, retard urbanization, provide clean energy equitably at relatively low cost, protect soil fertility, avoid the clutches of technological colonialism, and nurture indigenous innovation."<sup>8</sup>

### *Energy and Development: The Challenge*

Richard Barnet, author of *The Lean Years*, has persuasively argued that "when a society buys an energy system, it is also buying a particular path of development."<sup>9</sup> As one examines the recent history of modern Latin America, it becomes self-evident that the region's path of development has conformed to a particular style (model) described thus by Osvaldo Sunkel: "industrial development, which was intimately associated with subsidiaries of transnational corporations, concentrated mainly on the development of automobile and petrochemical industries and the production of consumer durables, electromechanic and electronic products, and pulp and paper products. This type of industrial development utilized highly capital and energy [oil] intensive technology characteristic of the industrial societies and entailed a heavy reliance on imports."<sup>10</sup>

Given the long-term energy reality of the Latin American region, can this style of development be maintained? If so, at what cost? If not, what should be the proper course of a transition toward becoming a region less dependent on fossil fuels and more self-reliant on renewable energy resources? These are difficult questions; yet they must be addressed even if they cannot be fully answered.

Joy Dunkerley has argued in *Energy Strategies for Developing Nations* that "the development of a comprehensive energy strategy has now become an imperative for developing country governments—not as an isolated exercise, but as an integral part of their general economic management."<sup>11</sup> Her position is an endorsement for the expansion of

systematic planning of the energy and economic sectors of a country. This approach requires a nation to reconsider seriously the vital role of the state sector, the private sector, and foreign capital. The experience of the petroleum sector, as discussed, has set the historical precedent for the active participation of the state in the energy sector. It must now be expanded to develop the potential of renewable energy. In recent years, much has been written of a general nature (not country specific) about energy planning and management in developing nations. For example, Neu and Bain have edited *National Energy Planning and Management in Developing Nations*. This work is a compendium of articles that were delivered as lectures at a management training seminar at the Joint Research Centre in Ispra, Italy, in May of 1982. Of particular relevance for Latin American nations are two articles by Pierre Vernet. In the first, he describes a method for creating and using energy balances as a planning tool. This method has been adopted by the Organización Latinoamericana de Energía (OLADE). His second article deals with the problems involved in gathering accurate energy information in developing nations and is based on his experience in Ecuador.<sup>12</sup> Another resource is the book edited by Pradip K. Ghosh, *Energy Policy and Third World Development*.<sup>13</sup> The mere emergence of such books is a vital sign of the transition that is already well underway. The issue that needs to be confronted about the process of planning in the context of an energy transition is expressed in the words of R. S. Ganapathy: "systemic planning is inherently normative and political in nature. It is not a technical exercise."<sup>14</sup>

### *Latin America's Energy Future*

Looking at the experience of the last two decades, one can agree with Choucri's conclusion that "on balance, Latin America's energy profile holds favorable and optimistic possibilities. The diversification options are clearly available, and the region's capacity to adjust to changing energy conditions has been impressive" (p. 185). The adjustments to rising petroleum prices as well as the development of indigenous energy sources and institutions designed to promote regional cooperation have been demonstrated. This process of adjustment has been accompanied by "destabilizing tendencies on the domestic scene, with attendant social and political costs" (p. 168). Choucri further concludes that the "critical issue for public policy is that the energy situation in all sectors requires a reassessment of national economic objectives and of production possibilities" (p. 188). Thus the reality of a necessary energy transition from a hard path, based upon the husbanding of scarce fossil fuel and the increased use of renewable energy sources, again forces the issue of development strategy and style.

Oswaldo Sunkel has attempted to sketch the basic characteristics of an alternative development style for Latin America that would be compatible with the satisfaction of the basic needs of the majority and with the preservation and enhancement of the resource base and the environment. He argues that such an alternative development style would have to achieve five goals: first, gradually reduce dependence on fossil sources of energy (particularly oil); second, utilize more renewable and less polluting sources of energy; third, develop more labor-intensive and resource-appropriate technologies; fourth, include more recycling of wastes; and fifth, manage natural resources according to ecologically based knowledge and technologies. Sunkel further specifies that such a model would of necessity require administrative and political decentralization emphasizing local self-reliance and management. Lastly, such a transition model must contain the human overconcentration and production in gigantic cities.<sup>15</sup>

This agenda being the long-term goal, the prospects in the short run are indeed mixed. The economic stagnation of the early 1980s, in spite of the drop in oil prices and temporary decrease in oil consumption, has created a climate of uncertainty and regionwide austerity. The debt crisis hangs like a huge black cloud over the region, inhibiting the ability of nations to engage in farsighted planning for their national welfare. Dangers lurk everywhere. The region's untapped reservoir of natural resources attracts foreign investors, given the inability of most nations to allocate the necessary financial resources to develop these indigenous resources themselves. Consequently, the control over resources emerges as a vital concern, as Michael Tanzer has warned in his case study of mineral development in Brazil.<sup>16</sup> Latin American nations are more vulnerable than ever before to the often well-intentioned, yet ultimately self-serving, interests of foreign capital in the natural resource sector.

An issue related to the role of foreign capital is the nature of transferred technology and the danger of fostering technological dependence. This issue of technology related to energy policy is complex, as is evidenced by a recent debate in the economics literature examining the complexities of energy policy and strategy related to the adoption of modern technology and the institutional complexities of this technology.<sup>17</sup>

The question of financing the transition is crucial. It is apparent that the necessary financial resources do not exist. Multilateral institutions in recent years, under the Reagan administration and in light of the petroleum glut and falling prices, have decided to reverse their previous emphasis on loans and aid projects directed at expanding domestic energy supplies.

Yet on a more optimistic note, and despite these harsh realities, I

have reviewed here some past successes and failures as well as a direction for the future. It is clear that viable and attractive short-run and long-run alternatives exist. Latin America's energy and economic future will be determined by the ability of each nation to forge the political will required for this historic transition, and all the while the geological time clock will be unsympathetically ticking away.

## NOTES

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2. Inter-American Development Bank, *Economic and Social Progress in Latin America: Economic Integration* (Washington: IADB, 1984), 201.
3. *Ibid.*, 468–72, tables 66–69.
4. Clivia M. Sotomayor Torres and Wolfgang Rudig, "Nuclear Power in Argentina and Brazil," special issue on energy of the *Review of Radical Political Economy* 15, no. 3 (Fall 1983):67–82.
5. *Ibid.*, 74.
6. Amory B. and Hunter Lovins, *Energy War: Breaking the Nuclear Link* (San Francisco: Friends of the Earth, 1980), 128.
7. *Ibid.*, 130.
8. *Ibid.*, 134.
9. Richard Barnett, *The Lean Years* (New York: Simon and Schuster, 1980), 98.
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11. Joy Dunkerley, William Ramsay, Lincoln Gordon, and Elizabeth Cecelski, *Energy Strategies for Developing Nations* (Baltimore: Johns Hopkins University Press, 1981), 241.
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13. *Energy Policy and Third World Development*, edited by Pradip K. Ghosh (Westport, Conn.: Greenwood, 1984).
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15. Osvaldo Sunkel, "Development Styles and the Environment," 109.
16. Michael Tanzer, "Stealing the Third World's Nonrenewable Resources: The Lessons from Brazil," *Monthly Review* 36, no. 11 (April 1984):26–35.
17. See Dilmus James and James Street, "Technology, Institutions, and Public Policy in the Age of Energy Substitution: The Case of Latin America," *Journal of Economic Issues* 17, no. 2 (June 1983):521–28; Stephen C. Stamos, Jr., "A Critique of James and Street's 'Technology, Institutions, and Public Policy in the Age of Energy Substitution: The Case of Latin America,'" *Journal of Economic Issues* 17, no. 3 (Sept. 1983): 745–50; and James Street, "Rejoinder to S. C. Stamos's Critique of 'Technology, Institutions, and Public Policy in the Age of Energy Substitution: The Case of Latin America,'" *Journal of Economic Issues* 17, no. 4 (Dec. 1983):1120–25.