CARL J. BAUER*

Dams and Markets: Rivers and Electric Power in Chile**

ABSTRACT

How are river systems governed under market-oriented water and electricity policies? How are competing water and energy uses coordinated in a context of markets and privatization? I answer these questions by studying hydropower in Chile as an example of the water-energy nexus: that is, analyzing hydropower along the two different axes of water law and electricity law. Chile is a world leader in applying neoliberal policies in both water and electricity sectors, and the national electricity system depends heavily on hydropower. Because hydropower is both a use of water and a source of electricity, it plays a different yet essential role in each sector. Hydropower dams are governed by both water and electricity laws, but the two laws treat water differently and value it for different purposes. I conclude that Chilean electricity law has granted de facto property rights to water to the owners of hydropower dams, and that electricity law trumps water law in rivers with hydropower development. This situation is bad news for water sustainability and governance. In the context of climate change, the interactions between water and energy are more complex and critical than in the past, and we need more studies of hydropower's dual roles in the two systems.

I. INTRODUCTION: HYDROPOWER AS WATER-ENERGY NEXUS

> *Electricity—carrier of light and power—devourer of time and space—bearer of human speech over land and sea—greatest servant of man—itself unknown.*
>
> —Carving on exterior of train station building, Union Station, Washington, D.C., ca. 1908

Editors' note: The *Natural Resources Journal* was not able to verify the foreign language sources used in this article.

* Carl Bauer is Associate Professor, School of Geography and Development, University of Arizona, Tucson, Ariz., where he also directs the Graduate Certificate in Water Policy. Bauer has a Ph.D. from the University of California–Berkeley Law School, an M.S. in Geography from the University of Wisconsin–Madison, and a B.A. in Geology from Yale University.

** I am grateful to Resources for the Future, the Weeden Foundation, and the University of Arizona (including the Water Resources Research Center) for financial support of this research. I thank Ronnie Fischer, Juan Pablo Orrego, Hugh Rudnick, and Alejandro Vergara in Chile for their comments on earlier drafts, and Dustin Garrick, Manuel Prieto, and David Tecklin for their comments and research assistance. Thanks to Monica Stephens for the map.

Hydropower is booming in Chile, driven by a perceived national energy crisis and favored by international concerns about global warming and fossil fuels. Chile's economic growth has been weakened by chronic shortages of electric power over the past decade—triggered by a severe drought in 1998 that caused blackouts in Santiago and worsened by the decline of Argentina's natural gas exports to Chile.[1] The fact that a drought helped to cause blackouts shows the country's dependence on hydropower. The Chilean government and business sector have responded to these problems by making new power development an urgent priority. Investors and power companies, both Chilean and foreign, have proposed building dozens of new hydropower dams on rivers throughout central and southern Chile.[2] Other projects involve modifying existing dams and canals in order to increase their power generation. The projects range in size from small to large, and many are under way or already finished. Investors and power companies have also proposed and built a variety of new thermal power plants.[3]

The proposed dams in Patagonia have gotten the headlines and caused the most public conflict, both within Chile and internationally.[4] Patagonia is the rugged and remote region shared by Chile and Argentina at the southernmost end of South America that is legendary for its dramatic landscapes, harsh weather, and unique wildlife and ecosystems.

---

1. *See infra* Part V.

2. Christián Viancos, *Hidroeléctricas Retoman Fuerte Protagonismo en Inversiones*, EL MERCURIO (SANTIAGO), Aug. 29, 2005, at B1, *available at* http://diario.elmercurio.cl/detalle/index.asp?id=%7B51f15806-c770-48ca-9f2b-62845bb85c96%7D [hereinafter Viancos, *Hidroeléctricas Retoman Fuerte Protagonismo*]; Christián Viancos, *23 Nuevos Proyectos Avivan Oferta Eléctrica*, EL MERCURIO (SANTIAGO), Aug. 29, 2005, at B9, *available at* http://diario.elmercurio.cl/detalle/index.asp?id=%7B51f15806-c770-48ca-9f2b-62845bb85c96%7D [hereinafter Viancos, *23 Nuevos Proyectos*]; Christián Viancos, *La Millonaria Agenda Eléctrica*, EL MERCURIO (SANTIAGO), May 21, 2006, *available at* http://diario.elmercurio.cl/detalle/index.asp?id=%7B44eb2b74-088d-4d83-a645-bcbdf23e1b82%7D [hereinafter Viancos, *La Millonaria Agenda Eléctrica*].

3. In Chile thermal power generation uses coal, natural gas, and oil, nearly all of which are imported. *See* Comisión Nacional de Energía, El Sector Eléctrico en Chile (1996) [hereinafter Comisión Nacional de Energía, El Sector Eléctrico].

4. The following environmental magazine cover story gives a flavor of the international debate: "Patagonia Under Siege: Will Chile's Booming, Energy-Hungry Economy Lay Waste to the Country's Last Untamed Frontier? A Global Parable." *See* George Black, *Patagonia Under Siege: Will Chile's Booming, Energy-Hungry Economy Lay Waste to the Country's Last Untamed Frontier? A Global Parable*, ONEARTH, Fall 2006, at 15, *available at* http://www.nrdc.org/OnEarth/06fal/patagonia.pdf. More recently the *New York Times* published an editorial, "Patagonia Without Dams," with similar rhetoric. *See* Editorial, *Patagonia Without Dams*, N.Y. TIMES, Apr. 1, 2008, at A22, *available at* http://www.nytimes.com/2008/04/01/opinion/01tue3.html (the April Fool's Day date appears to be a coincidence).

The Andes Mountains, a range running north-south, separates Argentina and Chile. The Argentine side has much greater land area and drier climatic conditions (due to the mountains' rain shadow, because the region's weather systems generally move from west to east). In contrast, Chilean Patagonia is a narrow and rainy strip of land along the Pacific coast (much like the Pacific Northwest coast of North America). The rivers on the Chilean side are short and steep, running west from the mountains to the sea and are still wild and undammed.[5]

An alliance of Spanish and Chilean power companies has planned a series of large hydropower dams on rivers in Chilean Patagonia.[6] The Chilean government has generally supported the dams, as well as the 1200-mile transmission line that would be built to central Chile, with the basic argument that the economic benefits outweigh the environmental costs. For purposes of future hydropower development, Region XI (Aysén) is by far the most important in Chile; this single region, with less than 1 percent of the nation's population, has more than 30 percent of its total precipitation, runoff, and hydropower potential.[7] Environmental organizations and eco-tourism interests in Chile, the United States, Canada, Europe, and elsewhere have been strongly opposed to building dams in this region.[8] Within Chile there is also growing interest in building a greener model of regional economic development in Patagonia—a model based on eco-tourism and environmental amenities, rather than

5. *See* map *infra* Part IV.B. "Patagonia" is a term used loosely in Chile and Argentina. In general it refers to the southernmost regions of both countries that are sparsely populated and with a harsh climate; however, there is no official definition. In Argentina, Patagonia is often considered to be everything south of the Colorado River, in the Province of Neuquén (roughly 39 degrees south latitude). In Chile, Patagonia generally means the area south of the city of Puerto Montt in Region X, which marks the southern end of "mainland" Chile (roughly 42 degrees south latitude). Hence Chilean Patagonia consists of the country's two administrative regions that are farthest south, Regions XI and XII (also called the Regions of Aysén and Magallanes, respectively), as well as part of Region X. For historical background, see HANS STEFFEN, PATAGONIA OCCIDENTAL (2009).

6. The Spanish company, ENDESA España, was recently bought by an Italian power company, ENEL, in 2007 with no apparent effect on its operations in Chile. *See* "ENEL, Acciona Acquire Endesa with $60 bn Bid," THE FINANCIAL EXPRESS, Oct. 5, 2007, *available at* http://www.financialexpress.com/printer/news/225195/.

7. Francisco Riestra, Hydrography of the Aysén Region, Address at the Pan-American Advanced Studies Institute (Jan. 2005); Luis Court, *La Hidroelectricidad en Chile*, 143 Revista de Ingeniería Chilena, 1994, at 26 [hereinafter Court, *La Hidroelectricidad en Chile*]; Comisión Nacional de Energía, El Sector Energía en Chile (1989) [hereinafter Comisión Nacional de Energía, El Sector Energía I]. As discussed *infra* Part IV, Chilean engineers have recognized this potential for many decades, but until recently the region's great distance from the country's central electricity grid has made it too expensive to build any dams in the region.

8. *See* sources cited *supra* note 4. R

the pattern of exploitation and export of natural resources that characterizes the rest of the country—and one campaign for a greener model of economic development adopted the slogan: "Aysén—Life's Reserve" (*Reserva de la Vida*).[9]

A. Three Global Trends in Water and Energy Policies

The proposed dams in Patagonia make the current hydropower boom unprecedented in Chilean history. Beyond the national context, the Chilean case reflects global trends in water and energy policies that have converged in recent years. The interactions between water and energy policies are shaping the future sustainability of ecosystems and economic systems around the world. Trends and conflicts in three areas will determine the future role of hydropower in water and energy systems: (1) climate change; (2) privatization and markets; and (3) ecosystem services. Focusing on hydropower, as discussed below, offers a unique window into how all these issues interact.

The first global trend is the link between hydropower and climate change. Hydropower development has been boosted around the world by growing concerns of global warming and the need to reduce carbon emissions.[10] Because hydropower does not pollute the environment or emit carbon, it is an essential part of discussions about moving to clean and renewable energy systems. But hydropower's problems are serious; the negative environmental and social impacts of dams are now widely recognized.[11] Moreover, the changing climate shows the importance of the many interactions and feedback loops between water and energy sys-

---

9. *See, e.g.*, Ecosistemas, Home Page, http://www.ecosistemas.cl (last visited July 13, 2009); Patagonia Chilena ¡Sin Represas!, Home Page, http://www.patagoniasinrepresas.cl (last visited July 13, 2009); Aisén Reserva de Vida, http://www.aisenreservadevida.com/ (last visited July 13, 2009); Coalición Ciudadana por Aisén Reserva de Vida, http://aysenreservadevida.blogspot.com/ (last visited July 13, 2009). In 2008, a large coffee-table book with beautiful photographs was published in Chile by many of these activists. *See* PATAGONIA CHILENA ¡SIN REPRESAS! (Patricio Rodrigo & Juan Pablo Orrego eds., 2008).

10. *See* World Bank, Water Resources Sector Strategy: Strategic Directions for World Bank Engagement (2004), at 17–18 [hereinafter World Bank, Strategic Directions]. For recent overviews of hydropower in South America and the global context, see Luiz Barroso et al., *Creating Harmony in South America*, IEEE POWER & ENERGY MAGAZINE, July/Aug. 2006, at 32; Hugh Rudnick et al., *A Delicate Balance in South America,* IEEE POWER & ENERGY MAGAZINE, July/Aug. 2008, 22 [hereinafter Rudnick et al., *A Delicate Balance in South America*].

11. PATRICK MCCULLY, SILENCED RIVERS: THE ECOLOGY AND POLITICS OF LARGE DAMS (1996) [hereinafter MCCULLY, SILENCED RIVERS]; WORLD COMMISSION ON DAMS, DAMS AND DEVELOPMENT: A NEW FRAMEWORK FOR DECISION-MAKING (2000), *available at* http://www.internationalrivers.org/en/africa/dams-and-development-new-framework-decision-makers [hereinafter WORLD COMMISSION ON DAMS, DAMS AND DEVELOPMENT]; SANDRA POSTEL &

tems. Water is needed to produce energy and energy is needed to make water available. These interactions are sometimes called the "water-energy nexus" (or the "energy-water nexus").[12]

The second trend has been the wave of policies favoring markets and privatization since the 1980s that have transformed water and electricity systems in many countries. These policies are often called "neoliberal" and are referred to as the "Washington consensus," although different countries have adopted different versions of them.[13] More recently there has been a backlash against free markets in most national and international policy debates, which has begun to favor stronger government regulation in many areas, including electricity and finance. Nevertheless, some basic principles of market economics, such as the need to make trade-offs and increase efficiency in allocating resources, will continue to influence water and energy policymaking in almost any political context. The key question, in a nutshell, is how to find the right balance between markets and regulation.[14] In a world whose changing climate means that water-energy interactions are more critical than before, very few people have yet analyzed the water and energy sectors together.

The third global trend is the growing policy emphasis on ecosystem goods and services as a way to think about sustainable development. There are various analytical approaches to these issues—with the Millennium Ecosystem Assessment probably the largest and best-known study—but all share the common goal of combining ecology and economics in some holistic, interdisciplinary way.[15] In the case of rivers and freshwater ecosystems, protecting an environmental flow regime is the

---

BRIAN RICHTER, RIVERS FOR LIFE: MANAGING WATER FOR PEOPLE AND NATURE (2003) [hereinafter POSTEL & RICHTER, RIVERS FOR LIFE].

12. The water-energy nexus has begun to attract more policy analysis both internationally and within the United States. *See, e.g.*, RONNIE COHEN ET AL., ENERGY DOWN THE DRAIN: THE HIDDEN COSTS OF CALIFORNIA WATER SUPPLY (2004); UNITED NATIONS INDUST. DEV. ORG., *Water and Energy*, *in* 2ND UNITED NATIONS WORLD WATER DEV. REPORT 305 (2006).

13. There is a vast literature about neoliberalism and the Washington Consensus. *See, e.g.*, PEDRO-PABLO KUCZYNSKI & JOHN WILLIAMSON EDS., AFTER THE WASHINGTON CONSENSUS: RESTARTING GROWTH AND REFORM IN LATIN AMERICA (2003).

14. John Besant-Jones, *Reforming Power Markets in Developing Countries: What Have We Learned?*, Energy and Mining Sector Board Discussion Paper 19 (2006) [hereinafter Besant-Jones, *Reforming Power Markets*].

15. *See* The Millennium Ecosystem Assessment, http://www.millenniumassessment.org/en/Index.aspx (last visited July 13, 2009) (noting many publications resulting from this massive international effort); *see also* Frances Irwin & Janet Ranganathan, Restoring Nature's Capital: An Action Agenda to Sustain Ecosystem Services (2007). On freshwater ecosystem services in particular, see Bruce Aylward et al., *Freshwater Ecosystem Services*, *in* 3 ECOSYSTEMS AND HUMAN WELL-BEING: POLICY RESPONSES 213 (2005) [hereinafter Aylward, *Freshwater Ecosystem Services*]; Kate Brauman et al., *The Nature and Value of Ecosystem Ser-*

critical factor in long-term sustainability. Hydropower development, by its nature, changes and controls a river's previous flow regime.

These three broad trends—climate change, markets, and ecosystems—conflict in at least one essential way; markets in natural resources require that specific parts of an ecosystem be defined and treated as separate, tradable goods known as commodities. Ecosystems, however, weaken and function poorly when some of their component parts are removed or when key relationships are undermined. This conflict turns on different notions of *value* and *property ownership*, and raises some specific questions: By what rules, norms, and practices should economic and ecological value be determined and measured?[16] Who owns water and energy resources, and in what ways? And, finally, what are the key features of ownership, its powers, and its limits? These questions can be boiled down to one critical issue: *What property rights, rules, and institutions can allow market approaches to water and energy use without destroying long-term environmental sustainability?*

B. Focusing on Hydropower to Understand the Water-Energy Nexus

In this article, I argue that hydropower offers a special perspective on how to answer this question because hydropower is a physical nexus between water and electricity systems. Hydropower plays a fundamental role in each of these systems separately but simultaneously. As material substances, water and electricity are so physically different that they cannot be marketed in the same ways or to the same degrees, yet, in hydropower, they are stuck together. They are both resources that *circulate* through larger social and ecological systems and they require separate infrastructures for that circulation.[17] These different systems of circulation lead to a variety of problems that are important in their own right and are illustrative of the broad question posed above.[18]

The key in answering this question is to analyze hydropower along the two different axes of water and electricity.[19] In the context of

---

vices: An Overview Highlighting Hydrologic Services, 3 ANNUAL REVIEW OF ENVT. & RESOURCES 67 (2007).

16. *See, e.g.*, James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 (2000).

17. For a political economic argument that relates the circulation of water to the circulation of value and power, see ERIK SWYNGEDOUW, SOCIAL POWER AND THE URBANIZATION OF WATER: FLOWS OF POWER (2004) [hereinafter SWYNGEDOUW, SOCIAL POWER].

18. The legal and economic complexities of treating water as energy have a long history. *See, e.g.*, Carol Rose, *Energy and Efficiency in the Realignment of Common Law Water Rights*, *in* PROPERTY AND PERSUASION, 163–96 (1994) [hereinafter Rose, PROPERTY AND PERSUASION].

19. *See infra* Parts III, IV, V.

energy, greater dependence on hydropower is more risky in a changing climate. Climate change will make water supplies more uncertain, more variable, and scarcer in many regions, which will undermine power generation. These water supply problems will also affect thermal power plants because they use a large amount of water in creating steam and in cooling.[20] Under changing climatic conditions, it will be critical for the electricity sector to better coordinate hydro and thermal power with their different technical features, trade-offs, and political and economic interests.[21] It will also be important to better understand the relationship between large and small hydropower projects, and between dams with reservoir storage and dams without it (i.e., run-of-the-river dams).[22]

In the context of water, hydropower has always affected other water uses—including agricultural, urban, and environmental uses—in the same river basin, and such effects are inevitable when a dam changes a river's flow regime. Some effects on other water users have been positive and some have been negative depending on the design and operation of a given dam. Today, however, in the context of global water crisis, the relations among different water uses are increasingly critical. There are growing demands and competition for water at a time of more erratic and extreme hydrological conditions, which will increase water's economic value and the intensity of social and political conflicts. A new hydropower boom will raise new challenges for water governance and for integrated water resources management (IWRM)—the current international standards for water reform[23]—and current progress toward water sustainability is likely to suffer.

These energy and water problems exist in any legal and regulatory context but they take particular forms when markets are dominant. Markets mean that property rights and economic value are defined and measured by the logic of commodities—that is, abstract and quantified by a common numerical standard. It takes non-market institutions of law and politics to resolve conflicts over values that are qualitatively different.[24] This contrast prompts the specific research questions examined in this article: How are rivers governed under market-oriented water and

---

20. DAVID GILLILAN & THOMAS BROWN, INSTREAM FLOW PROTECTION: SEEKING A BALANCE IN WESTERN WATER USE 64–70 (1997).

21. *See infra* Parts IV, V.

22. *See infra* Parts IV, V.

23. *See, e.g.*, CARL J. BAUER, SIREN SONG: CHILEAN WATER LAW AS A MODEL FOR INTERNATIONAL REFORM (2004) [hereinafter BAUER, SIREN SONG]; KEN CONCA, GOVERNING WATER: CONTENTIOUS TRANSNATIONAL POLITICS AND GLOBAL INSTITUTION BUILDING (2006); World Bank, Strategic Directions, *supra* note 10; POSTEL & RICHTER, RIVERS FOR LIFE, *supra* note 11. R

24. CARL J. BAUER, AGAINST THE CURRENT: PRIVATIZATION, WATER MARKETS, AND THE STATE IN CHILE (1998) [hereinafter BAUER, AGAINST THE CURRENT]; Carl J. Bauer, *Slippery*

electricity policies? How has the privatization and restructuring of the electricity sector affected water uses? How are different water and energy uses coordinated in a market framework, and what are the implications for water governance and sustainable development?

I will try to answer these questions by analyzing hydropower in Chile along the two different axes of water and electricity. The two axes intersect at hydropower, a nexus between water and energy, and therefore hydropower is regulated from two different directions and for different purposes. Because hydropower is both a use of water and a source of electricity, it is governed by the laws and regulations of the water sector and the energy sector. In Chile, as in many other countries, the two sectors' laws and regulations are generally not well integrated; they have different histories, objectives, and subject matter.[25] For specific purposes such as hydropower, however, the integration is strong.

An anecdote from my fieldwork may help explain what I am worried about in this article. I have argued in previous work that Chile's water law and institutional framework have done a poor job handling multiple water uses or river basin conflicts.[26] In the mid-1990s I was doing research in the Maule River basin in central Chile, interviewing people about how different dams and reservoirs coordinated their regulation and storage of river flows. My angle was water rights, and I was studying certain features of Chile's free-market water law that made it harder to resolve water conflicts—such as conflicts between farmers and hydropower companies, as well as conflicts between different power companies. To my surprise, the managers and professional staff in the competing power companies were not concerned about the water rights problems. They relied instead on Chile's electricity law to coordinate the many dams there and they were basically satisfied with how that worked.[27]

At the time, I mainly understood this observation as evidence that Chilean water management institutions were weak, and I still think that argument is true as far as it goes. But in the decade since then, I have come to worry more about the electricity angle in Chile and around the world. How does electricity regulation affect water uses and water management? What does it mean for electricity law to govern rivers when water law fails?

Property Rights: Multiple Water Uses and the Neoliberal Model in Chile, 1981–1995, 38 NAT. RESOURCES J. 109 (1998) [hereinafter Bauer, *Slippery Property Rights*].

25. PHILIP RAPHALS, RESTRUCTURED RIVERS: HYDROPOWER IN THE ERA OF COMPETITIVE MARKETS (2001).

26. BAUER, AGAINST THE CURRENT, *supra* note 24, at 79–110; Bauer, *Slippery Property Rights*, *supra* note 24, at 109; BAUER, SIREN SONG, *supra* note 23. R R

27. BAUER, AGAINST THE CURRENT, *supra* note 24, at 106. R

Why study Chile? Chile is an excellent case to study these questions because Chile has been an international leader and paradigmatic case of neoliberal law and economics since the late 1970s.[28] These characteristics are true both at the macro level and in the specific sectors of water and electricity. Chile is also a paradigmatic case of national economic dependence on the export of natural resources, making the country especially dependent on ecosystem goods and services in the future. Finally, Chile's national electricity system has long depended on hydropower as a primary energy source so the country has a lot of historical experience with these issues before the current hydropower boom.

In Part II, I describe my analytical framework and approach in a bit more detail. Parts III and IV then examine hydropower along the two axes of water and electricity and I discuss, in depth, how each sector's laws and regulations affect hydropower development and operation. Part III focuses on the relationship of hydropower to other water uses, while Part IV focuses on the relationship of hydropower to other forms of generating electricity. Part V brings the two sectors together by looking at key examples of how the sectors and their policies have interacted in recent years, especially since Chile returned to democratic government in 1990. Both Parts IV and V emphasize the perspective of electricity issues, with the relationship between hydropower and thermal power in the electricity sector as a central organizing theme. Part VI offers concluding remarks.

Because electricity is the primary focus of this article, I look at hydropower in Chile from the perspective of electricity law and policy with the goal of explaining this perspective to people who are not electricity experts. This electricity focus also complements my past work, in which I have analyzed Chilean hydropower from the perspective of water law and policy.[29] In other words, I aim to add the energy half of the water-energy nexus to my analysis. The reader should bear in mind that I am a water expert trying to understand electricity, which is no easy task. My experience in different countries has been that energy experts know remarkably little about water issues and water experts know remarkably little about energy issues. The two groups speak different technical languages that are daunting to outsiders and they rarely talk to each other.

Some readers may be surprised that I do not examine Chilean environmental law in this article. The reason is that I think the environmental law has had very little impact on the issues I discuss here. This is by

28. BAUER, AGAINST THE CURRENT, *supra* note 24, at 1–9; BAUER, SIREN SONG, *supra* note 23. R R

29. *See* sources cited *supra* note 26. R

design; Chile's environmental regulatory framework is intentionally weaker than the sectoral laws that it is supposed to coordinate. Other than changing some details, even the country's Environmental Impact Assessment process has made little difference for hydropower projects—although in exceptional cases the process has offered an arena for public opposition.[30]

II. FRAMEWORK: GEOGRAPHY, LAW, AND POLITICAL ECONOMY

Besides my analysis of hydropower as a water-energy nexus along the two axes of water and electricity, my general framework and approach draw on several disciplines. Because some of these are interdisciplinary fields in themselves, I will describe them very briefly before getting into the meat of the article. These fields include geography, law, and political economy, with a strong historical emphasis running through all of them. By "historical emphasis," I mean both the study of specific empirical cases and also the study of how things change over time. Property is where these fields overlap most closely, and I focus on property as a way to bring the fields together and ground them in land, the natural environment, and water.[31]

First, geography: The relationship between humans and nature is one of the oldest and central themes of geography as a discipline. This relationship, of course, has many aspects and can be studied from the many angles of bio-physical sciences, social sciences, and humanities. For me, geography helps to ground the other humanities and social sciences in land and the physical world. A geographic perspective explains my focus on the different physical characteristics of water and electricity, and how they influence law and political economy. Geography also sup-

30. *See* BAUER, SIREN SONG, *supra* note 23, at 61–62; Manuel Prieto, El Modelo Chileno de Gestión Hidroeléctrica: Una Approximación desde la Sustenabilidad Profunda (Nov. 2007) (unpublished M.A. thesis, Pontificia Universidad Católica de Chile) (on file with Lo Contador Library, Pontificia Universidad Católica de Chile) [hereinafter Prieto, El Modelo Chileno]; Manuel Prieto & Carl Bauer, Hydroelectric Power Generation in Chile: An Institutional Critique of the Neutrality of Market Mechanisms (unpublished paper) [hereinafter Prieto & Bauer, Hydroelectric Power]; David Tecklin et al., Making Environmental Law for the Market: The Emergence, Character, and Dilemmas of Chile's Environmental Regime (unpublished paper) [hereinafter Tecklin et al., Making Environmental Law]. R

31. I have discussed my theoretical framework and methods in somewhat more detail in BAUER, AGAINST THE CURRENT, *supra* note 24, at 6–9; BAUER, SIREN SONG, *supra* note 23, at 8–16. R

ports my focus on the regional contexts and landscapes of rivers and river basins.[32]

By law, I mean both law in formal legal terms and also law in social context—as understood in the broad academic field known as law-and-society studies. Part of this analysis is strictly legal and focuses on the "law on the books," as if law were autonomous from society. The rest of the analysis includes politics, economics, society, and history and aims to understand the "law in action."[33] This article is structured around two specific Chilean laws, each of which I discuss in legal, political, economic, and institutional terms. The two laws are the 1981 Water Code and the 1982 Electric Law.[34] The geographic angle is especially evident within this analysis because the subject matter of these laws involves land, environment, and natural resources.

By political economy, I simply mean the combination of politics and economics, which is based on the premise that the two spheres cannot be separated either in the real world or in theory.[35] Political economy overlaps with law-and-society since both fields share a focus on legal and political institutions in social, economic, and historical context. In particular, I draw on the related fields of institutional economics and law-and-economics.[36] All these perspectives are needed to understand markets, property rights, and regulation. Legal rules, social norms, political decisions, and institutional arrangements determine how different markets work and how economic values are defined. The geographic an-

---

32. Within geography there have been a variety of approaches to studying water resource management, along the spectrum from bio-physical sciences to social sciences and humanities. Some important examples focused on water policies and political economy include Karen Bakker, *Neoliberalizing Nature? Market Environmentalism in Water Supply in England and Wales*, 95(3) ANNALS OF THE ASSOCIATION OF AMERICAN GEOGRAPHY 542 (2005) [hereinafter Bakker, *Neoliberalizing Nature?*]; KAREN BAKKER, AN UNCOOPERATIVE COMMODITY: PRIVATIZING WATER IN ENGLAND AND WALES (2003) [hereinafter BAKKER, AN UNCOOPERATIVE COMMODITY]; SWYNGEDOUW, SOCIAL POWER, *supra* note 17; James L. Wescoat Jr., *Water Policy and Cultural Exchange: Transferring Lessons from Around the World to the Western United States*, *in* IN SEARCH OF SUSTAINABLE WATER MANAGEMENT: INTERNATIONAL LESSONS FOR THE AMERICAN WEST AND BEYOND 1 (2005); Gilbert White, *A Perspective of River Basin Development*, 22 LAW & CONTEMP. PROBS. 157 (1957). R

33. *See* The Law and Society Association, http://www.lawandsociety.org (last visited July 14, 2009). *See also* sources cited *in* BAUER, SIREN SONG, *supra* note 23, at 138 n.17. R

34. *See infra* Parts III, IV. I do not discuss the 1994 Environmental Law in this article because it is secondary to the other laws, nor do I discuss the 1980 Constitution, which I have analyzed in previous publications. BAUER, AGAINST THE CURRENT, *supra* note 24, at 11–31; Carl J. Bauer, *Derecho y Economía en la Constitución de 1980*, 2(1) PERSPECTIVAS EN POLÍTICA, ECONOMÍA Y GESTIÓN 23 (1998) [hereinafter Bauer, *Derecho y Economía*]. R

35. There are of course many different schools of thought in political economy, but it is not necessary to sort them all out here.

36. *See* BAUER, SIREN SONG, *supra* note 23, at 138 n.11. R

gle within this context involves the relationship between political economy and the natural environment.

Property is where all these fields come together, and where social and institutional matters are grounded in land and nature. "Property," in the words of C.B. Macpherson, "is an enforceable claim to some use or benefit of something."[37] Property rights and duties determine the basic institutional and regulatory framework for markets. These aspects are especially critical when the things being bought, sold, and traded are natural resources or ecosystem goods and services. How property rights are defined and enforced is key in several ways: they determine how people use, control, and allocate natural resources; they reflect legal, social, political, economic, and historical factors; they both determine and reflect the distribution of costs and benefits of resource use—that is, who gains and who loses; and they establish the rules of the game for markets and other economic activities.[38]

When discussing specific political and economic forces that have shaped the Chilean experience of water and electricity markets, my analysis of Chile's water and electricity laws reflects the country's broader historical trends and context. Critical international factors have included the geopolitics of energy in the Southern Cone and the role of foreign capital in both water and energy sectors.[39]

A. Historical Background in Chile: Political and Economic Context

A brief summary of recent Chilean political and economic history may be useful for some readers.[40] Chilean society underwent radical and violent changes from the 1960s to the 1990s. A moderate reformist government in the 1960s (led by the Christian Democratic Party and President Eduardo Frei Montalva) was followed by a more revolutionary left-wing government (led by the Popular Unity Coalition and President Salvador Allende) from 1970–73. These trends, and the right-wing opposition they triggered, contributed to extreme social and political polarization that eventually led to a military coup in 1973. The military government (led by General Augusto Pinochet) held power for more than 16 years, during which time it thoroughly transformed Chilean social, political, and economic systems. The regime depended on many ci-

---

37. PROPERTY: MAINSTREAM AND CRITICAL POSITIONS 3 (1978).

38. There is, of course, a vast literature about property rights. I have cited and discussed some of it. *See* BAUER, AGAINST THE CURRENT, *supra* note 24; BAUER, SIREN SONG, *supra* note 23. *See also* Rose, PROPERTY AND PERSUASION, *supra* note 18; PROPERTY: MAINSTREAM AND CRITICAL POSITIONS, *supra* note 37. R R R

39. *See* discussion *infra* Part V.

40. *See* BAUER, AGAINST THE CURRENT, *supra* note 24, at 3–5, and citations therein. R

vilian advisors to design and implement laws and policies. The military was careful to institutionalize these changes in new legal arrangements and a comprehensive Constitution in 1980.

In economic terms, the military government adopted strongly free-market policies espoused by Milton Friedman and the University of Chicago Economics Department, where many of the military's Chilean economic advisors had studied. Chile became world-famous as a pioneering, and extreme, example of neoliberalism.[41]

In 1990, Chile finally returned to an elected democratic government. Since then, the country has been governed by a coalition of center-left political parties known as the *Concertación*, whose members were political opponents of the military regime. Despite these dramatic political advances, however, the four successive governments of the *Concertación* have had to maintain core elements of the institutional legacy of military rule—in particular the 1980 Constitution and the neoliberal economic model. Although these core elements have been modified over the last 20 years, their basic structure and principles are still intact. In the 1980s, the *Concertación* committed to play by the Constitution's rules as a condition for peaceful democratic transition and all four governments since 1990 have honored that commitment. The *Concertación* has also had little room to change economic policies but, in this case, the coalition chose to stick with a model that they came to consider largely successful and only attempted to reform it around the edges.[42]

This background helps to explain crucial aspects of contemporary political debate in Chile over water, electricity, and environmental policy issues. Political and economic powers are highly concentrated in Chile. Right-wing political parties and private business interests have a great deal of power and influence, cemented by the country's legal and institutional framework.[43] In economic and regulatory matters, the government's authority is quite constrained. Any significant policy reform must be agreed between the *Concertación* and its political opponents. These constraints should be kept in mind as I now turn to the specifics of water and electricity law and policy.

As I will argue in Parts III and IV, the laws and policies governing the water and electricity sectors in Chile share the general neoliberal principles of markets and privatization. Their specific regulatory

---

41. BAUER, AGAINST THE CURRENT, *supra* note 24, at 11–31. R

42. On the political and economic features of the 1980 Constitution, see BAUER, AGAINST THE CURRENT, *supra* note 24, at 11–31; Bauer, Derecho y Economía, *supra* note 34. R The four Presidents of the *Concertación* have been Patricio Aylwin (1990–94), Eduardo Frei Ruiz-Tagle (son of former President Eduardo Frei Montalva) (1994–2000), Ricardo Lagos (2000–06), and Michelle Bachelet (2006–10).

43. BAUER, AGAINST THE CURRENT, *supra* note 24; BAUER, SIREN SONG, *supra* note 23. R

frameworks, however, are quite different; the water rights framework is more laissez-faire than the electricity framework. The two sectors use water for different purposes and, therefore, define property rights to water in different and sometimes contradictory ways—de facto or de jure.

B. Chile's Physical Geography

Chile's physical geography is unusual and has major consequences for water resources. The country is long and skinny, stretching along the southwest coast of South America; it is more than 2,500 miles long from north to south (not including Antarctica, of which Chile claims a piece) and averages about 100 miles wide from east to west. The Andes Mountains run down the entire eastern border of the country and the Pacific Ocean is on the west, which means that Chile has many short, steep rivers that run west from the mountains to the sea. Because of the country's extreme latitudinal range, the climate changes gradually from very dry in the north to very wet in the south. The central third of the country lies between these extremes, with a Mediterranean-type climate, which is characterized by dry summers and rainy winters. For people familiar with the geography of North America, Chile can be compared to a 100-mile-wide strip of the Pacific Coast, running from Baja California to southeast Alaska—but upside down. Central Chile's climate, where 90 percent of the population lives, is akin to Central California.[44]

III. HYDROPOWER AND WATER RIGHTS IN CHILE

Chile's 1981 Water Code is the world's leading example of a free-market approach to water law and economics—the textbook case of treating water rights not merely as private property but also as a fully marketable commodity. Other countries have recognized variations of private property rights to water but none have done so in such an unconditional and deregulated a manner as Chile. In the field of international water policy, the Chilean Water Code has become a paradigmatic example of free-market reform.[45]

---

44. *See* map *infra* Part IV.B.

45. The Water Code was dictated as Decree with Force of Law 1,122, on October 29, 1981. Much of this Part (III) is adapted from previous works that have more complete references, extended discussions of the Chilean Water Code, and its international significance. *See* BAUER, AGAINST THE CURRENT, *supra* note 24, at 33–50; BAUER, SIREN SONG, *supra* note 23, at 31–50; Carl J. Bauer, *In the Image of the Market: The Chilean Model of Water Resources Management*, 3(2) INT'L J. WATER 146, 146–65 (2005) [hereinafter Bauer, *In the Image of the Market*]. For studies of Chilean water markets that do not focus on hydropower or river basin management, see Carl Bauer, *Bringing Water Markets Down to Earth: The Political Econ-*

Chile's approach is notable because water has unusual physical characteristics that make full private ownership and commoditization hard to enforce. As a resource, water is both highly mobile—it is often called "fugitive"—and frequently changes its physical state among the three different phases of solid (ice), liquid, and gas (water vapor). The global hydrological cycle works because of water's unique ability to take all three physical forms under the range of physical conditions common on the Earth's surface.[46] These dynamics mean that natural water supplies are inherently variable and uncertain over time, as well as from one place to another, which weakens the security of private property rights. Moreover, water uses and transactions inevitably cause impacts on third parties (also called externalities in economic terminology) because water systems are so physically interconnected. These constraints on water commoditization are widely recognized in different fields of law and the social sciences.[47]

I will summarize the Water Code's essential features before focusing on the specific category of "non-consumptive" water rights, which were created in 1981 and applied to water use for hydropower. I review the legal and policy problems that have been raised by non-consumptive rights, especially since Chile returned to democratic government in 1990. I then conclude by looking at Chile's recent reform of the Water Code in 2005 and the reform's likely impact on hydropower in the future.

A. Water Code of 1981: Privatization, Markets, and Institutional Consequences

Chile's current Water Code is a classic example of what in Latin America is often called the "law of the pendulum"; that is, the historical tendency to swing from one extreme to the other in political and economic affairs without finding a point of balance somewhere in the middle.[48] From the Spanish colonial period through the mid-twentieth century (over 400 years), water legislation in Chile recognized private rights to use water under some circumstances, even though these rights were subject to a good deal of public regulation. In 1967, a reformist

---

omy of Water Rights in Chile, 1976–1995, 25 WORLD DEV. 639 (1997) [hereinafter Bauer, *Bringing Water Markets Down to Earth*], and Carl Bauer, *Results of Chilean Water Markets: Empirical Research since 1990*, 40 WATER RESOURCES RES. 9 (2004).

46. PHILLIP BALL, LIFE'S MATRIX: A BIOGRAPHY OF WATER 27 (2001).

47. *See, e.g.*, Bakker, *Neoliberalizing Nature?*, *supra* note 32; Michael Hanemann, *The Economic Conception of Water*, *in* CRISIS: MYTH OR REALITY? (2006); Joseph Sax, *The Constitution, Property Rights, and the Future of Water Law*, 61 U. COLO. L. REV. 257 (2000). R

48. BAUER, AGAINST THE CURRENT, *supra* note 24, at 33–50; BAUER, SIREN SONG, *supra* note 23, at 31–50. R R

Chilean government swung the pendulum toward greatly expanded governmental authority over water use and water management—at the expense of private property rights—by passing a new water law as part of an ambitious agricultural land reform. In 1981, the military regime swung the pendulum to the opposite, free-market extreme, where it remains to this day.[49]

The 1981 Water Code in its original form was in force until certain aspects were modified in 2005. The 1981 Water Code was written at the high point of the political influence of a group of radical neoliberal economists. In general terms, the law greatly strengthened private property rights, increased private autonomy in water use and management, and favored free markets in water rights to an unprecedented degree. The Water Code fully separated water rights from land ownership for the first time in Chilean history and declared them to be freely tradable; they could be bought, sold, mortgaged, inherited, and transferred like any other real estate. As a corollary, the Water Code sharply reduced the government's role and authority in water resources management, regulation, and development.[50]

The Water Code's essential philosophy was laissez-faire because it did not directly mandate or establish a market in water rights but, instead, set up the legal rules and preconditions for such a market to emerge spontaneously as a result of private initiative. The law's basic principles and institutional framework are both reflected and protected by Chile's current Constitution, which was adopted in 1980 by the same military government that wrote the Water Code. Both the Water Code and Constitution have remained in effect since Chile's return to democratic government in 1990.[51]

In formal legal terms, the Water Code declares that water resources are inalienably public property (*bienes nacionales de uso público*) to which the national government may grant private parties the exclusive rights to use. The government water rights agency is the *Dirección General de Aguas* (DGA), or General Water Directorate, which is located within the Ministry of Public Works. Despite this formal definition, the law actually strengthens private control over water rights and weakens government authority when compared with previous Chilean legislation. Applicants for new rights do not have to specify or justify their

---

49. The legislative reform in 2005 changed relatively little, as discussed below. *See infra* Part III.C.

50. BAUER, AGAINST THE CURRENT, *supra* note 24, at 33–50; BAUER, SIREN SONG, *supra* note 23, at 31–50. R R

51. BAUER, AGAINST THE CURRENT, *supra* note 24, at 11–31; Bauer, *Derecho y Economía*, *supra* note 34; BAUER, SIREN SONG, *supra* note 23, at 35, 36. R R

intended water uses to the DGA, and the agency is required to grant new rights free of charge if there is water physically available and legally unclaimed.[52]

The Water Code does not establish any legal priorities among different kinds of water uses, such as domestic or agricultural uses, because such determinations are left to private individuals and the free market. If there is not enough water to satisfy simultaneous applications for new rights, the DGA has no power to choose among competing applicants.[53] Instead, the law requires the agency to hold a public auction and sell the new rights to the highest bidder, though such auctions have been rare in practice.

Once they have been granted, water rights are governed by private civil law rather than public administrative law; they are included in the general system for registering real estate titles and they are explicitly guaranteed as private property under the Constitution. Moreover, the current Water Code recognizes and protects all water rights acquired under legislation prior to 1981. The owners of water rights can freely change how they use those rights without notifying the DGA or asking for its administrative approval (with certain minor exceptions). Water rights owners do not pay any taxes or fees to the government—in this respect, water rights are *not* like other real estate. Owners have no legal obligation to actually use their water rights and, until 2005, they faced no legal or financial penalty for lack of use. In other words, there is no legal doctrine requiring a "beneficial use"—popularly known as the "use it or lose it" doctrine in the western United States and other countries. This unconditional nature of private water rights differs from all previous legislation in Chile and also differs from the water laws of all other countries around the world. Taken together, these provisions allow unrestricted private speculation in water rights, which has been one of the Water Code's most controversial and criticized features.[54]

The DGA has very little regulatory authority over private water use and has no power to settle conflicts between water users. The agency cannot cancel or restrict existing water rights except by expropriating them under the Constitution's property articles, which would require specific legislation and payment in cash.[55] Nearly all decisions about water use and management are made by individual water rights owners

52. Some of these provisions were modified in 2005, although the changes apply only to new rights granted after the recent reform took effect. *See infra* Part III.C.

53. Under exceptional circumstances, the President of Chile can intervene to make such a choice. *See generally* Bauer, *Bringing Water Markets Down to Earth*, *supra* note 45. R

54. BAUER, AGAINST THE CURRENT, *supra* note 24, at 33–50; BAUER, SIREN SONG, *supra* note 23, at 31–50. R R

55. To my knowledge this has never happened.

or, in the case of irrigated agriculture, by private associations of canal users. The DGA retains some important technical and administrative functions, such as gathering and maintaining hydrologic data, inspecting larger dams and canals, and enforcing the rules governing the operation of private canal associations. The agency can also prepare studies, reports, and policy recommendations, but these have little or no regulatory force. The Water Code does not address issues of water quality or environmental protection although, in recent years, the DGA has begun to work in these areas.

The Water Code's laissez-faire principles are especially clear in the areas of river basin management, coordination of multiple water uses, and resolution of water conflicts. The military government's primary concern about water law in the 1970s had to do with irrigation rights, which were a critical part of rolling back the agricultural land reform that had taken place between 1967 and 1973. As a result, the Water Code says very little about other non-agricultural water uses or about how to coordinate them.[56] Dealing with these broader water management issues depends on the Water Code's general free-market principles and institutional framework rather than on specific provisions; in other words, these issues are to be handled by private bargaining among the owners of water rights. When private bargaining fails, the only alternative is to go to the ordinary civil courts. This institutional framework reflects the 1980 Constitution, as well as the Water Code.[57]

Like most legislation, even legislation adopted by a military government behind closed doors and without public discussion, Chile's 1981 Water Code was a product of political negotiation.[58] This negotiation was especially important in determining the specific rules defining property rights and, therefore, the economic incentives affecting water use and allocation. In most respects, the neoliberal economists who dominated the drafting of the Water Code got what they wanted: a legal framework that privatized water rights and favored a free market. They had to yield on one key point, however, which was the proposed creation of annual water rights taxes. Although the economists argued that such taxes were essential to creating the appropriate economic incentives and price signals for efficient water use, agricultural interests marshaled enough political resistance to block the proposal in 1981. Farmers and agricultural

56. The one exception was the creation of non-consumptive water rights, discussed below. *See infra* Part III.B.

57. BAUER, AGAINST THE CURRENT, *supra* note 24, at 79–123; Bauer, *Slippery Property Rights*, *supra* note 24; BAUER, SIREN SONG, *supra* note 23, at 96–117. R R

58. BAUER, AGAINST THE CURRENT, *supra* note 24, at 33–40; BAUER, SIREN SONG, *supra* note 23, at 31–50. R R

landowners refused to pay new taxes, regardless of the economic arguments in favor of doing so. Since 1990, however, Chilean politicians and policymakers have repeatedly debated these legal rules and economic incentives.[59]

B. Non-Consumptive Water Rights: Monopoly, Speculation, and Multiple Water Uses

The Water Code created a new kind of water right, the "non-consumptive" right. These new rights were intended to foster hydropower development in the upper parts of river basins—in the mountains and foothills—without harming farmers downstream in the valleys who had preexisting water rights. A non-consumptive right allows its owner to divert water from a stream or river and use that water to generate electric power, provided that the water is then returned unaltered to its original channel—though not to the original point of diversion. In this way, the water continues to flow downstream for use by other water rights holders.[60]

By the time the Water Code was enacted in 1981, most of the surface waters in central and northern Chile had already been fully allocated for irrigation as "consumptive" water rights.[61] Hence, the invention of non-consumptive water rights aimed to intensify the uses of water resources without having to compensate the owners of existing vested rights and, in theory, without damaging them. Non-consumptive rights are not strictly limited to hydropower but other non-consumptive water users have rarely tried to acquire them for uses such as fishing, recreation, or environmental flows. This issue will probably become more important in the future as these other non-consumptive water users try to assert their interests.

Non-consumptive water rights have caused at least three important political and economic problems in Chile. First, these rights have been concentrated in the hands of relatively few owners who have enjoyed significant monopoly powers. These owners have been involved with the electricity sector and political debates over water rights have

---

59. *See* BAUER, SIREN SONG, *supra* note 23, at 51–73; Bauer, *In the Image of the Market*, *supra* note 45. R R

60. For more detailed legal analysis of non-consumptive rights, see BAUER, AGAINST THE CURRENT, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24; BAUER, SIREN SONG, *supra* note 23. R R

61. The legal term "consumptive" was not used before 1981 because *all* water rights were assumed to be consumptive. This reflects the historical predominance of agriculture in Chilean water use. *See* sources cited *supra* note 59. R

been closely tied to debates over electricity regulation.[62] This concentration of ownership was partly due to the fact that, until the 1980s, nearly all hydropower water rights—as defined under previous legislation—belonged to the state-owned National Electricity Company (*Empresa Nacional de Electricidad Sociedad Anónima*, or ENDESA). Those rights were included when the military government sold the company to private investors in the late 1980s.[63] Another factor was that, in the 1980s, there were few people who understood or had the resources to act on the new Water Code's opportunities for acquiring non-consumptive rights, which were free for the asking. Since they were a new kind of property right, non-consumptive rights were available for rivers throughout the country and insiders were able to accumulate these rights at little cost and hold onto them for later development or sale.

The second problem, speculation, has been closely related to the problem of private monopoly power. The Water Code deliberately fostered speculation in several ways: it granted water rights free to private applicants; it did not require water rights owners to actually use their rights; and it did not impose any taxes or fees on water rights ownership. As a result, people who knew how to work the system were able to accumulate unused rights and then wait indefinitely for water's value to increase. This practice blocked, delayed, or made more expensive the development of some hydropower projects.

The two problems of monopoly and speculation dominated Chilean political debate about reforming the Water Code for more than a decade[64] and both problems mattered primarily because of their impact on the national electricity sector.[65]

The third problem has involved multiple water uses and river basin governance.[66] The relationship between consumptive and non-consumptive water rights—that is, between agricultural and hydropower water users—has been more difficult and conflictive than the Water Code's drafters had expected. Due to the physical mobility and interconnectedness of water in general, conflicts between upstream and downstream water users lie at the heart of river basin management.

The legal rules governing the new category of non-consumptive rights were few and poorly defined. The Water Code established the existence and basic legal definition of these rights, but said little about how

---

62. *See infra* Part V.B.

63. *See infra* Part IV.

64. BAUER, SIREN SONG, *supra* note 23, at 51–73; Bauer, *In the Image of the Market*, *supra* note 45. R R

65. *See* discussion *infra* Part V.

66. BAUER, AGAINST THE CURRENT, *supra* note 24, at 79–123; Bauer, *Slippery Property Rights*, *supra* note 24; BAUER, SIREN SONG, *supra* note 23, at 96–117. R R

exactly they could be exercised or what duties were owed to the owners of consumptive water rights. In the 1990s, a series of water conflicts between irrigators and hydropower companies revealed the Code's flaws and incompleteness. These conflicts were over how to manage dams and reservoirs to regulate the flows of shared rivers—a question of how to coordinate different water uses. Farmers and power companies have conflicting seasonal demands for water in Chile; farmers want to store water during the rainy winter for use during the dry summer growing season, while power companies want to store water during the summer to meet high national electricity demands in winter.

These conflicts posed a serious challenge for Chile's legal and institutional framework. That framework consisted not only of the Water Code and the DGA, but also the national court system and the Congress in the broader context of the Chilean Constitution. The framework's response to the problem was so partial and inadequate that it triggered major criticisms about Chile's institutional capacity for integrated water management and governance.[67] The Chilean Supreme Court eventually ruled in 1993 that the owners of non-consumptive rights could regulate river flows without the agreement of consumptive rights-holders and without owing those rights-holders any compensation for damages caused.[68] That legal principle is still in force today, although it has been widely criticized by Chilean lawyers and Chilean irrigators continue to challenge it in court.

The important point here is that hydropower has enjoyed preferential treatment in the Chilean water rights system. A recent Chilean study has demonstrated this preferential treatment in several contexts that include water and electricity legislation, land use controls, and a comprehensive analysis of judicial decisions.[69] Moreover, in times of drought and for the sake of national electricity supplies, the Public Works Ministry has managed several reservoirs that it controls to benefit hydropower over irrigation.

---

67. *See* sources cited *supra* 59; *see also* the discussion *infra* Part IV; Carl J. Bauer, *The Experience of Chilean Water Markets* (2008) (presentation at Expo Zaragoza, Water Tribune, Thematic Week on Economics and Financing: The Role of Market Instruments in Integrated Water Management) [hereinafter Bauer, *The Experience of Chilean Water Markets*]. R

68. *See* Orrego v. Empresa Eléctrica Pangue (Corte Suprema, May 8, 1993) (Recurso de Protección (Chile)). This case is discussed in detail in BAUER, AGAINST THE CURRENT, *supra* note 24, at 100–10; Bauer, *Slippery Property Rights*, *supra* note 24. R

69. Prieto, El Modelo Chileno, *supra* note 30. R

C. Water Code Reform in 2005

Chile's legislature finally approved some changes to the Water Code in 2005, after nearly 15 years of political debate and stalemate.[70] The debates were ideologically charged, revolving around fundamental issues such as the nature of private property, the institutional framework for markets, and the limits of government regulation. Since Chile returned to democracy in 1990, three successive governments of the Concertación coalition tried to moderate the neoliberal approach of the Water Code. Over that period, the scope of the government's proposed reforms narrowed steadily in response to strong political opposition from conservative political parties and private sector business interests. At the same time, the government's own position on water markets gradually became more favorable.[71]

The 2005 reform consists mainly of incremental improvements in water law and administration designed in response to specific problems identified in the operation of the 1981 Water Code.[72] Some important examples are the provisions to improve water rights title information and record-keeping, to strengthen management of groundwater, to strengthen the DGA's regulatory authority over future grants of water rights (but *not* over existing rights), and to begin to address the problem of minimum ecological flows. The latter two examples bear directly on future hydropower development.

The most important and controversial change was the establishment of "fees for non-use" (*patentes por el no uso*), which must be paid to the government annually by any water rights owner who has not yet put his or her new rights to concrete use. The goal of these fees is to prevent private speculation, hoarding, and monopoly of water rights. The fees were also explicitly designed to apply to non-consumptive water rights primarily—reflecting the high priority placed on hydropower development—and to effectively exempt most consumptive water rights for irrigation.[73]

In the bigger picture and from an international perspective, however, the 2005 reform was decidedly modest.[74] It tinkers with the existing legal rules and institutional framework but barely touches the core principles of private property rights, market forces, and a weak state. River

---

70. Ley 20,017 (2005) (approving modifications to the *Código de Aguas*) (Chile).

71. For a detailed analysis of the politics of the Chilean reform, see BAUER, SIREN SONG, *supra* note 23, at 51–73, 118–31; Bauer, *In the Image of the Market*, *supra* note 45. R

72. Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R

73. BAUER, SIREN SONG, *supra* note 23, at 51–73, 118–31; Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R R

74. Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R

basin governance and coordination of multiple water uses are similarly untouched. Hence, the reform does very little to improve the capacity for integrated water management. In fact, when the reform was finally passed, it was partly because of Chile's ongoing electricity crisis, not because of broad political consensus about water policy. The urgent need to stimulate hydropower development helped to overcome the political opposition to modifying the water law. Whether the reform will have much concrete impact on the water rights system or on water governance remains to be seen.[75]

Since 2005, I have argued that any additional water law reforms would be politically unlikely in Chile for years to come, notwithstanding the ebb and flow of political rhetoric.[76] Recently several Chilean politicians have spoken out for a more complete reform, sometimes called the "nationalization" of water, and some government officials have drafted a constitutional amendment to strengthen the public nature of water. Much of this debate was due to the national election campaigns in 2009; the practical importance of these newer proposals is dubious.[77]

IV. HYDROPOWER AND THE ELECTRICITY SECTOR IN CHILE

In this Part, I look at hydropower along the axis of electricity instead of water. I begin with a brief description of the physical characteristics of electricity and the problems they pose to law and policy. I also compare and contrast the key technological features of hydropower and thermal power. Next, I summarize the historical development of hydropower in Chile, consisting of three phases of technological and geographic expansion from the 1930s to the present. Finally, I refer to the role of thermal power development in this context.

With that background in mind, I turn to the current legal and regulatory framework. I discuss the 1982 Electric Law and its associated regulations—which are still in effect—including the overall structure and operation of the electricity sector and its different markets and subsectors. Hydropower is so fundamental to the Chilean electricity sector that electricity law covers it in detail, although the water issues are addressed only in terms of fuel for power generation. I will also summarize the privatization of ENDESA and the rest of the electricity sector in the

75. For a more positive view of the 2005 reform by the former head of the DGA who pushed it through, see Humberto Peña, *Taking It One Step at a Time: Chile's Sequential, Adaptive Approach to Achieving the Three Es*, *in* INTEGRATED WATER RESOURCES MANAGEMENT IN PRACTICE 153–68 (2009) [hereinafter Peña, *Taking It One Step at a Time*].

76. Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R

77. *See infra* Part V.F.

late 1980s in order to describe the situation in 1990, when Chile returned to a democratic government.

A. Water as Fuel: Basic Features of Electricity, Hydropower, and Thermal Power

As a physical thing, electricity is as strange as water. In a sense, electricity is not a material substance at all but a form of energy, intimately tied to magnetic forces. It is a secondary form of energy because it is produced from other primary sources (such as falling water or the chemical bonds in fossil fuels).[78]

One of the critical facts about electricity is that there is currently no technology for storing it on a large scale. Because electricity cannot be stored, supply and demand must be kept in balance at all times in a particular power system or grid. Maintaining this balance at all times—in the face of continual changes in supply and demand—is the principal task of electricity management. The task is technically difficult and involves large-scale, complex, and dangerous technology and infrastructure.[79]

There is one exception: *electricity can be stored as water*. Reservoirs hold water at elevations higher than generating stations and can generate power instantly by releasing water downhill. Thus, as long as they have water, reservoirs can function like huge batteries .

The electricity sector in all countries consists of three subsectors: generation, transmission, and distribution of power. This three-part division reflects the technology of electricity rather than a particular regulatory approach. Different countries have chosen different approaches to whether the three subsectors can be owned and regulated separately or whether they are vertically integrated—owned and controlled by the same company.[80]

---

78. For an example of the mysterious, awe-inspiring nature of electricity as it appeared in the early decades of its emergence as a modern technology, see the quotation from Washington's Union Station, *supra* Part I.

79. For an overview of electricity technology and regulation, see Timothy Brennan et al., *A Shock to the System: Restructuring America's Electricity Industry*, *in* RESOURCES FOR THE FUTURE (1996) [hereinafter Brennan et al., *A Shock to the System*]. For more historical accounts, see DAVID BODANIS, ELECTRIC UNIVERSE: THE SHOCKING TRUE STORY OF ELECTRICITY (2005); Brian Bowers, *Electricity*, *in* AN ENCYCLOPEDIA OF THE HISTORY OF TECHNOLOGY 350–87 (1990); LOUIS HUNTER & LYNWOOD BRYANT, 3 THE TRANSMISSION OF POWER (1991).

80. In this section I draw on several publications by Chilean energy economists and engineers: Carlos Díaz et al., *La Crisis Eléctrica de 1998–1999: Causas, Consecuencias y Lecciones*, ESTUDIOS PÚBLICOS 149–92 (Primavera 2000) [hereinafter Díaz et al., *La Crisis Eléctrica*]; Ronald Fischer & Pablo Serra, *Regulating the Electricity Sector in Latin America*, 1(1) ECONOMÍA 155 (2000) [hereinafter Fischer & Serra, *Regulating the Electricity Sector*]; RICARDO

Hydropower is a form of generating electricity and, therefore, it is in the generation subsector that hydropower's distinctive features are most important. Once the power has been generated, it enters the transmission grid and, from there to its final distribution, it is the same as electricity generated by other means, such as thermal power. In many countries, however, there is a key distinction between hydropower and thermal power in the transmission subsector because the two kinds of generators may be located at different distances from the centers of consumption. In Chile, for example, hydropower plants are often located relatively far from the centers of consumption and must transmit for longer distances than thermal plants.

Hydropower and thermal power are different technologies for generating electricity.[81] I analyze four key differences, focusing only on hydro and thermal power as they completely dominate the Chilean electricity sector. In Chile, alternative sources of electrical energy—such as wind or solar—have not been developed until quite recently, despite years of criticism by environmental activists. Nor does Chile have nuclear power (which is also a form of thermal generation, using nuclear instead of fossil fuels). Both renewable and nuclear alternatives have gotten much more political attention in Chile in the last few years, as the conflicts over large new dams in Patagonia have intensified.[82]

The first key difference is that the supply of hydropower's "fuel" is naturally more variable and uncertain. Hydropower depends on water supplies, which depend on rainfall and snowfall and vary over time—from wet season to dry season, and from wet year to dry year.[83] Building dams and reservoirs can reduce this natural hydrological variability by

---

PAREDES & JOSÉ MANUEL SAPAG, FORTALEZAS Y DEBILIDADES DEL MARCO REGULATORIO ELÉCTRICO CHILENO: PROPUESTAS PARA UN CAMBIO (2001) [hereinafter PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES]. For more on international trends in electricity regulation, see Besant-Jones, *Reforming Power Markets*, *supra* note 14; Brennan et al., *A Shock to the System*, *supra* note 79; Rudnick et al., *South American Reform Lessons*, IEEE Power & Energy Magazine, July/Aug. 2005, at 49 [hereinafter Rudnick et al., *South American Reform Lessons*]. Rudnick et al., *A Delicate Balance in South America*, *supra* note 10; Hugh Rudnick & Juan M. Zolezzi, *Electric Sector Deregulation and Restructuring in Latin America: Lessons to be Learnt and Possible Ways Forward*, 148(2) IEE PROCEEDINGS—GENERATION, TRANSMISSION, AND DISTRIBUTION 180–84 (2001) [hereinafter Rudnick & Zolezzi, *Electric Sector Deregulation*]. Some analysts consider the commercialization of power to be a fourth subsector, distinct from distribution. In this article, however, and reflecting the practice in Chile, I include commercialization in the distribution subsector. R R R

81. *See, e.g.*, Fischer & Serra, *Regulating the Electricity Sector*, *supra* note 80; PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80; Rudnick et al., *A Delicate Balance in South America, supra* note 10. R R R

82. *See infra* Part V.F.

83. In the case of melting glaciers, these water supplies depend on snowfall in previous years or centuries.

regulating and storing the flow of rivers, but some uncertainty is unavoidable. "Run-of-the-river" dams (*centrales de pasada*) have little or no storage capacity, which means they have much less impact on a river's flow regime and are more vulnerable to flow variability. In short, hydrological variability is an essential feature of hydropower, and part of the appeal of hydropower development in Chilean Patagonia is that that region's rivers have had less variability than those farther north in Chile.

Thermal power plants, in contrast, burn fossil fuels—coal, oil, and natural gas—to generate electricity. These fuel supplies are less variable than water over time, at least in physical terms. Their availability depends on political and economic conditions, however, which are especially uncertain and hard to control if the fuels are imported from other countries. Chile has learned this the hard way in importing natural gas from Argentina.[84] In the cases of coal and oil, international markets are sufficiently well-developed that supplies have been fairly reliable, although prices vary significantly.

A second difference is the relationship between fixed and variable costs. Hydropower generally has high fixed costs and low variable costs, while thermal power is the reverse. Building a dam takes a long time and requires major capital investment up front. Once it is built, however, the water resources that drive the turbines are renewable and often cost little or nothing to the dam's owner or operator.[85] Thermal plants, in contrast, tend to be less expensive to build but their operators must pay for the fuel they consume throughout the life of the project. As with the cost of water, it is law, policy, and accounting practices that determine which costs are considered fixed and which are considered variable. It is not always obvious how to draw the line between fixed and variable costs and, in Chile, this ambiguity has sometimes led to legal and policy conflicts.[86]

A third difference is the security of power supply. Because uncertainty of supply is a built-in feature of hydropower, electricity systems that rely on it must plan accordingly. Law and policy determine what level of security of supply is required (if any), how much reserve supply should be maintained, how both hydro and thermal power generation can help to meet those requirements, and how costs and risks are allocated between them. For example, hydropower plants can provide security in the immediate term because they can be turned on more quickly

84. *See infra* Part V.A.

85. Whether or not hydropower operators pay some price for their use of water depends on the relevant law and policy; it is not inherent in the technology. In Chile they pay nothing. *See supra* Part III.

86. *See, e.g.*, PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80. R

than thermal plants—in this way, hydro is well suited for producing peaking power. Thermal plants, on the other hand, can provide more medium to long-term security because they are much less vulnerable to drought. Policies regarding the roles and relative contributions of hydro and thermal power generally include rules about how the different generators will be compensated for their services, under what circumstances, and by whom. All of these issues have high stakes and controversial among technical experts, if not the general public.[87]

The fourth difference involves environmental impacts and politics. Hydropower dams affect river flows and cause major impacts on aquatic ecosystems and related land areas. The global debate about large dams is now decades old and their many benefits and costs—including social, economic, and environmental impacts—are well known.[88] Dams do not generally cause pollution, although they often affect water quality by changing water temperature or the transport of sediments. Hydropower is often assumed to not contribute to carbon emissions or global warming, although some reservoirs release carbon from rotting vegetation. Thermal power plants, on the other hand, cause a great deal of air pollution and carbon emissions and are a major cause of global warming. They also consume a lot of water for making steam or cooling machinery.

These different environmental impacts have different political consequences. Hydropower and thermal power affect different groups of people and economic interests, often located in different places. For instance, large dam projects have been matters of national and international controversy, while large thermal projects have typically provoked more local conflict. On the other hand, thermal power plants have become widely recognized as a major cause of global warming, which may mobilize a different set of public opponents.

In summary, in a mixed hydro-thermal power system, the two kinds of generation have different strengths and weaknesses and different functions to play. The key trade-off, as one Chilean expert put it, is that "hydropower is more efficient but thermal power is more secure."[89] "Efficiency" is mainly understood here in engineering terms rather than economic terms. The critical policy issue is how to combine the two and, in this context, hydropower reservoirs are an essential strategic factor.

---

87. *See, e.g.*, Díaz et al., *La Crisis Eléctrica*, *supra* note 80; Fischer & Serra, *Regulating the Electricity Sector*, *supra* note 80; PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80; Rudnick et al., *A Delicate Balance in South America*, *supra* note 10. R R R

88. *See supra* note 11.

89. Interview with José Manuel Sapag, Consultant and Research Assoc., Univ. of Chile, Santiago, Chile (Mar. 2, 2003).

These differences between hydro and thermal power have consequences for politics, economics, and regulatory governance. Electricity companies that have different degrees of dependence on hydro and thermal power have different interests in certain aspects of how the overall sector works. These different interests apply regardless of whether the companies are public or private, and they apply to the transmission and distribution, as well as generation of electricity.

B. Historical Development and Geographic Expansion of Hydropower

We can divide the historical development of Chilean hydropower into three periods: the 1940s to 1960s; the 1960s to 1990; and the 1990 to present. The overall story is one of steady expansion and integration of a national electricity system, moving from central Chile southward. The trend of hydropower development has been steadily increasing for many decades, without being affected much by the dramatic changes in national political and economic history.

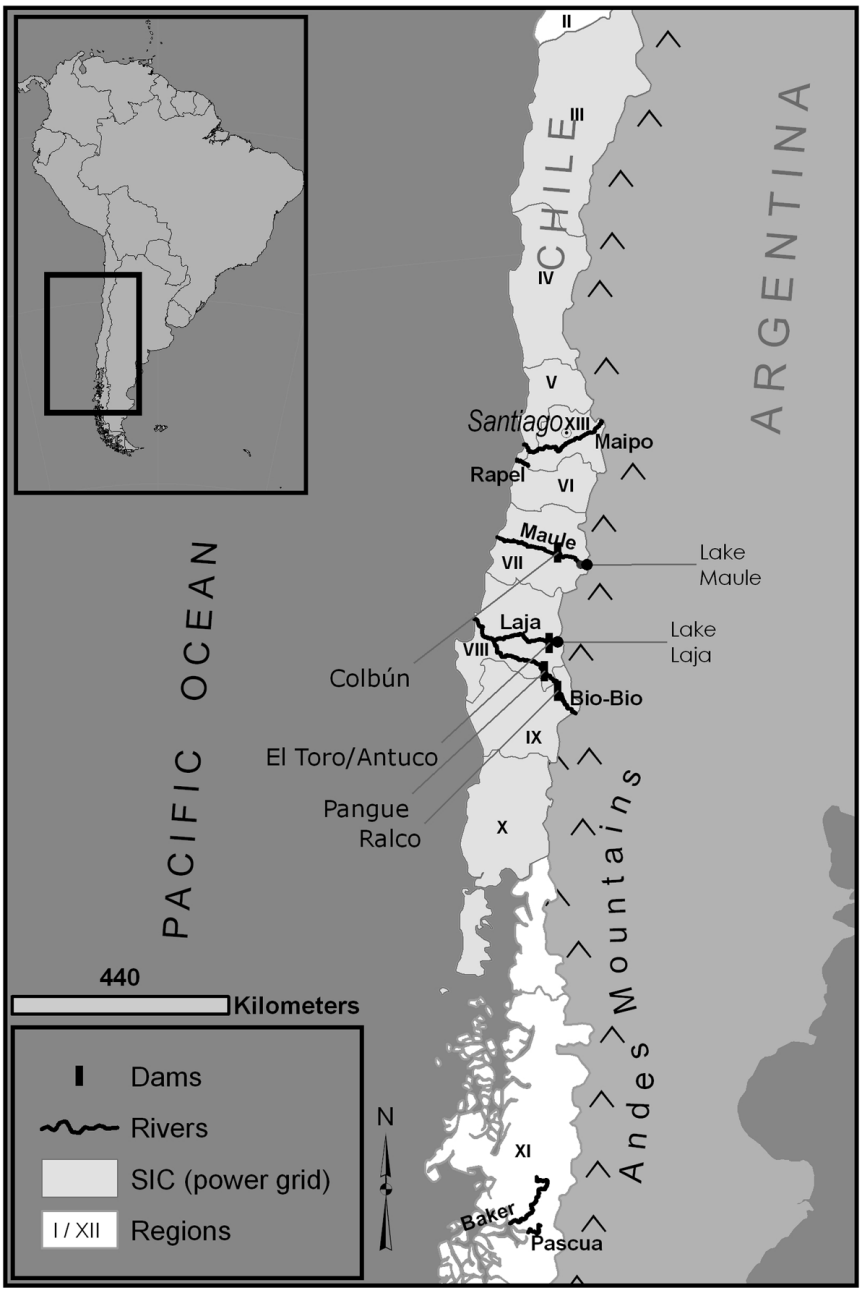
In the first phase, the Chilean government created the National Electricity Company in 1943 and gave it the long-term mission of carrying out a plan for national electrification. The company, ENDESA, was proposed by a group of prominent Chilean engineers in the 1930s as a means of boosting national economic development out of the stagnation of the worldwide depression.[90] ENDESA was a state-owned enterprise for the next 45 years.[91]

Hydropower has been at the core of Chile's national electricity system since the 1940s. The national electrification plan was based on two key ideas: to rely heavily on hydropower and to build a transmis-

---

90. In the 1930s the country's electricity supplies were limited and new power development had stalled. The infrastructure consisted of small and isolated local systems centered on key cities and industries. The electricity sector was dominated by private companies, some of them were owned, in part, by foreign capital. In 1940, total national capacity was 484 megawatts (MW) of which hydropower produced 32 percent and thermal power the remaining 68 percent. Public service accounted for 38 percent of the total and 62 percent was produced by industries for their own use. The urban areas of Santiago, Valparaiso, and Aconcagua (all in central Chile) accounted for 75 percent of the public service. *See* Comisión Nacional de Energía, El Sector Energía en Chile 70 (1993) [hereinafter Comisión Nacional de Energía, El Sector Energía II]; Instituto de Ingenieros de Chile, *Política Eléctrica* 29–30 (1988) [hereinafter Instituto de Ingenieros de Chile, *Política Eléctrica*].

91. ENDESA was a part of CORFO, the National Development Corporation, which the government established in 1939 after a major earthquake in central Chile caused severe damage. CORFO played a major role in stimulating economic development in Chile for decades afterwards.


II
III
IV
V
VI
VII
VIII
IX
X
XI
XIII
CHILE
ARGENTINA
PACIFIC OCEAN
Andes Mountains
Santiago
Maipo
Rapel
Maule
Lake Maule
Laja
Lake Laja
Colbún
Bio-Bio
El Toro/Antuco
Pangue
Ralco
Baker
Pascua
440
Kilometers
Dams
Rivers
SIC (power grid)
I / XII
Regions
N

sion grid that would unify the country.[92] These two ideas were closely linked because most of Chile's hydropower potential is located in the southern half of the country, while 90 percent of the population lived (and still lives) in the central third. A national grid was necessary to move electricity from where it was produced to the centers of consumption. This grid would become known as the Central Interconnected System (*Sistema Interconectado Central*, or SIC). (See Map, above.)

ENDESA followed the national plan for half a century. In its first two decades, the company focused on building small and medium hydro projects on rivers in central and southern Chile—the area that would be covered by the SIC.[93] The most important of these projects were the first dams built on the Maule and Laja rivers, two rivers in south-central Chile that would be the workhorses of national hydropower for decades to come.[94] Local industries and other power companies also built a few small hydro projects and, in the 1960s, all of these companies began to build thermal (coal-burning) power plants as well.[95]

At the same time, ENDESA steadily expanded and connected local transmission lines in central and southern Chile. By the early 1960s, ENDESA linked these regional systems together in the grid that formed the core of the SIC.[96] At that point, the SIC's total thermal power capacity was less than one third of total hydropower capacity.[97] ENDESA continued to expand the grid in later years.

---

92. The following summary of the national plan is synthesized from Comisión Nacional de Energía, El Sector Energía I, *supra* note 7; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90; Court, *La Hidroelectricidad en Chile*, *supra* note 7; Instituto de Ingenieros de Chile, *Política Eléctrica*, *supra* note 90; Revista de Ingenieros, *ENDESA: 1943–1993*, 132 Revista del Colegio de Ingenieros de Chile 9 (1993) [hereinafter Revista de Ingenieros, *ENDESA: 1943–1993*]. R R R

93. These early projects were essentially run-of-the-river power plants. The first dam to be completed was Pilmaiquén in 1944, in Region X. Its generating capacity was small but its location showed that ENDESA was paying attention to southern Chile from the beginning.

94. In the upper parts of each of these two river basins, ENDESA modified natural mountain lakes so that they worked as reservoirs. Both Lake Maule and Lake Laja have been managed for the dual purposes of hydropower and irrigation under rules of operation and water allocation that date from 1947 and 1958, respectively, and are still in force today. *See* Bauer, Against the Current, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24; Bauer, Siren Song, *supra* note 23. R R

95. *See* Comisión Nacional de Energía, El Sector Energía I, *supra* note 7. R

96. *See* Comisión Nacional de Energía, El Sector Energía II, *supra* note 90, at 72; Instituto de Ingenieros de Chile, *Política Eléctrica*, *supra* note 90, at 30; Revista de Ingenieros, *ENDESA: 1943–1993*, *supra* note 92. R R R

97. By 1962, for example, the SIC had 12 hydro plants with a total capacity of 549 MW, compared to two thermal plants with a total capacity of 155 MW. *See* Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 98–99 tbls.4-6 & 4-7. R

Chilean hydropower development entered a second phase in the late 1960s. Over the next 20 years, ENDESA built the country's first large hydropower dams in order to meet the steadily growing national demand for electricity.[98] ENDESA was still following the original national electrification plan; the dams were located in areas of central and south-central Chile that already had some existing hydropower development, particularly the Maule and Laja rivers, while the far south (Patagonia) remained untouched. Most of the new projects included some amount of short-term reservoir storage and all of them were connected to the SIC from the beginning.

The five biggest dams more than tripled the SIC's hydropower capacity in less than 20 years.[99] The Maule and Laja river basins produced the lion's share of that capacity; almost 70 percent in 1987.[100] ENDESA managed to build all these projects despite a great deal of national political and economic instability throughout this period. ENDESA and Chilectra—another power company[101]—also built more thermal power plants, particularly in the 1970s. The SIC's overall proportions of hydropower to thermal power thereby remained about the same throughout this period; approximately 70 percent hydro and 30 percent thermal.[102]

The SIC had nearly 75 percent of the nation's total installed capacity in the late 1980s.[103] Most of the rest was in the separate northern

98. In Chile a "large" power plant, whether hydro or thermal, means about 300–500 MW, which by international standards would probably be considered medium-sized.

99. The first of these projects was Rapel Dam on the Rapel River in Region VI, which was finished in 1968–70 and had a capacity of 350 MW. Next were El Toro and Antuco dams in the Laja basin, which were built at and just below the outlet of Lake Laja. They were finished in 1973 and 1981, respectively, and added 400 MW and 300 MW. After that came the adjoining Colbún and Machicura dams on the Maule River, which were finished in 1985 and totaled 490 MW (of which 400 MW were from Colbún Dam). The Colbún reservoir was required to store some water seasonally for local irrigators, according to a month-by-month calendar of guaranteed releases, but hydropower was Colbún's major purpose. *See* BAUER, AGAINST THE CURRENT, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24. Machicura is a smaller reservoir located just below Colbún, which helps to regulate the flows released downstream. R R

100. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 98–99. R

101. Chilectra had been a private utility located mainly in central Chile but was taken over by the left-wing Chilean government in 1970. Like many such nationalized enterprises, Chilectra remained in government hands after the military took power in 1973.

102. In drought years the proportions shifted to about 50/50, as the lack of water forced an increase in thermal power generation. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 98–99. R

103. Nearly all of the SIC's production went to public service. Industries produced about 10 percent of the SIC's total for their own use in equal shares of hydro and thermal. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 98–99. R

power grid, the Northern Interconnected System (*Sistema Interconectado del Norte Grande*, or SING).[104]

This was the situation when the military government privatized the electricity sector in the late 1980s before the transition to democracy in 1990, which begins the third phase of national hydropower development.[105] Chile's economic growth continued to be strong after 1990 and both hydropower and thermal power development expanded fast. During the 1990s, hydro capacity nearly doubled and thermal capacity tripled in the SIC.[106] By 2005, ENDESA and other companies had built 15 new hydro projects on rivers throughout the SIC's area of influence, from Santiago to as far south as Region X. Four of these dams were added in the Maule River basin alone.[107] ENDESA also built the first two dams on the upper Bío Bío River, called Pangue and Ralco, which have triggered international controversies over the environment and indigenous rights. Ralco Dam in particular has large reservoir storage and contains the country's largest power plant.[108]

---

104. The SING differs from the SIC in several fundamental ways. First, the SING is much smaller, producing and consuming about 20 percent of the total of the SIC. Second, the mining industry is by far the largest consumer of electricity in northern Chile, and most of the mining companies have generators to produce their own power. The population in northern Chile is relatively small. Third, generation depends almost entirely on thermal power plants rather than hydropower. Northern Chile is a desert and rivers are too small to offer much hydropower potential. In 1988 the SING's total capacity was 596 MW. Mining companies had 500 MW of this (84 percent)—all of it thermal power. *See* Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 101–03. In contrast, the SIC's capacity at the time was 3,221 MW, nearly 80 percent of which was produced by hydropower. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 98–99. In 1992 the SING had expanded to 876 MW of installed capacity, with thermal power accounting for all of the expansion. The SIC's capacity, meanwhile, had grown to 4,123 MW, nearly 75 percent of which was hydropower. *See* Comisión Nacional de Energía, El Sector Energía II, *supra* note 90, at 58 tbls.4.14, 4.15. R R R

105. I will return to privatization and the political economic context in Part IV.C.

106. *See* Comisión Nacional de Energía, El Sector Energía I, *supra* note 7. R

107. *See* Centro de Despacho Económico de Carga-Sistema Interconectado Central, *Centrales del SIC*, http://www.cdec-sic.cl/centrales (last visited Mar. 3, 2006). *See also* discussion *infra* Part IV.C.

108. The Bío Bío River was an obvious target for hydropower development; it is the longest river in Chile and has the country's second-largest hydropower potential, surpassed only by the Baker River in Patagonia. ENDESA had studied the Bío Bío for decades as a state enterprise before starting construction as a private company in the early 1990s. *See* BAUER, AGAINST THE CURRENT, *supra* note 24; Court, *La Hidroelectricidad en Chile*, *supra* note 7; ENDESA, RECURSOS HIDROELÉCTRICOS DE LA CUENCA DEL BÍO-BÍO (1989); Rodolfo Von Bennewitz, *Recursos Hidroeléctricos de la Cuenca del Bío Bío*, *in* 18 LA REGIÓN DEL BÍO BÍO, COLECCIÓN NOSTRA 83–130 (1990). The Frei government pushed for hydropower development in Patagonia in 1995–96; *see also* Héctor Vera, *Disputa Austral*, Qué Pasa, June 7, 1999, *available at* http://www.quepasa.cl. R R

Thermal power development boomed in the 1990s as well, thanks to new generation technology (called "combined-cycle") that burned natural gas. Argentina had natural gas to export and Chilean energy companies, with foreign partners, built pipelines across the Andes Mountains. In spite of the boom in hydropower, thermal power's share of the SIC increased from 26 percent in 1989 to 42 percent in 2005.[109] The amount of power generated by gas, however, will go down in the future, as Argentina has cut its exports and Chile's attention has returned to coal and hydropower.[110]

In summary, hydropower in Chile has grown steadily and often rapidly from modest beginnings in the 1930s. ENDESA increased hydropower development gradually during its first two decades, and then picked up the pace by building a series of larger projects from the 1960s to 1980s. At that point, hydropower accounted for two-thirds to three-quarters of the central grid's power supplies. Hydropower's growth went hand-in-hand with the geographic expansion of the national transmission grid, which grew to unite the central third of the country.[111] After 1990, new hydropower development continued but was partially eclipsed by the rapid expansion of thermal power plants fueled by natural gas imported from Argentina. For a few years in the late 1990s, it seemed that the era of hydropower's dominance in the Chilean electricity sector was at an end. Since 2002, however, Argentina has cut back its gas exports to Chile, while Chile's demand for electricity has kept growing. As a result, hydropower has entered a new boom period.[112]

C. Hydropower and the 1982 Electric Law: Electricity Markets and the Value of Water

During the 1980s, the military government transformed Chile's electricity sector in two steps. The first major legal change was the 1982 Electric Law, which restructured the national electricity sector according to market principles but did not remove ENDESA from government ownership.[113] The second change was the privatization of ENDESA and

---

109. Thermal capacity increased from 743 MW in 1989 to 2,289 MW in 1999, with 72 percent of the increase due to gas. Centro de Despacho Económico de Carga Sistema Interconectado Central, *Centrales del SIC*, http://www.cdec-sic.cl/centrales (last visited Mar. 3, 2006) (compiled by author).

110. *See infra* Part V.

111. The two southernmost regions in Chile are too far away to be connected to the SIC. Regions XI and XII each have small, separate electric systems. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 103; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90, at 59. R R

112. *See infra* Part V.

113. Decreto con Fuerza de Ley No. 1 [DFL 1] (1982) (Chile).

other electricity companies in the late 1980s. Both changes fit together and were fundamental aspects of the military government's neoliberal economic reforms. I will summarize the privatization process at the end of this section, because it happened after the enactment of the Electric Law and the sequence was intentional; however, the reader should assume a privatized electricity sector in the following description of the regulatory framework.[114]

The 1982 Electric Law is pro-market but not laissez-faire. In this sense, it is less dogmatic and deregulatory than the 1981 Water Code, which is both pro-market and laissez-faire.[115] Because the technology of electricity is complex, dangerous, and capital intensive, an effective regulatory framework is essential for the overall system to work. The Chilean electricity model shows both sides of the coin: innovative policies to promote market forces and private enterprise, tied to legal and institutional arrangements in which government regulation is key, especially in setting some prices. Chile's Electric Law was the first reform of its kind in the world, pioneering a pro-market path that was later taken by many other countries, governments, and international organizations.[116] But the model also illustrates that basic insight of institutional economics: rules come before markets and, therefore, law plays a critical role in determining economic value.[117]

Many specific aspects of Chile's electricity law have been modified since 1982,[118] but most of its core principles remain in place.[119] The

---

114. In other words, this description applies to the situation from 1990 on, unless otherwise specified.

115. *See supra* Part III.A. The 2005 reform slightly reduced the Water Code's laissez-faire characteristics. *See supra* Part III.C.

116. According to Hernán Büchi, former Finance Minister in the military government:

> Here Chile was a pioneer . . . The challenge consisted of generating a system of prices and organization in the electric sector whose price regime would function 'as if' there were competition. It was an exclusively intellectual creative labor, whose core was used later in the systems of telecommunications and drinking water supply.

HERNÁN BÜCHI, LA TRANSFORMACIÓN ECONÓMICA DE CHILE: DEL ESTATISMO A LA LIBERTAD ECONÓMICA 79 (1993) (author's translation). *See* Comisión Nacional de Energía & Departamento de Ingeniería Industrial, Institucionalidad Regulatoria en el Sector Energía (1996); Fischer & Serra, *Regulating the Electricity Sector*, *supra* note 80; Rudnick et al., *South American Reform Lessons*, *supra* note 80; Rudnick & Zolezzi, *Electric Sector Deregulation*, *supra* note 80 (comparing the Chilean model with later generations of electricity reform in other countries, especially in Latin America). *See also* Brennan et al., *A Shock to the System*, *supra* note 79 (providing an overview of electricity restructuring that focuses on the United States but applies more broadly); Besant-Jones, *Reforming Power Markets*, *supra* note 14 (for a World Bank perspective). R R R R

117. *See* BAUER, SIREN SONG, *supra* note 23, at 10–30, 131–36. R

118. Some examples are discussed *infra* Part V.

first of these principles is that markets are the best system for allocating resources and, for markets to work efficiently, prices must reflect the real costs of producing and distributing electricity. Price signals should reflect market conditions of supply and demand, and should not be distorted by so-called "political" decisions. Economic differences between different sources of electricity, such as the contrasting characteristics of hydropower and thermal power, are assumed to result from "technological neutrality" rather than political choices and, hence, the price signals about which source to use are assumed to be neutral.[120] If the government chooses to subsidize electricity use in some situations, the subsidies should be designed in such a way that they do not distort market price signals.[121] A related principle is that the law should provide incentives for private investment to maintain and expand the existing system so that government investment is not needed. In this way privatization is tied to markets although the two policies are distinct.[122]

The Chilean electricity model applies these principles differently in each of the three subsectors: generation, transmission, and distribution. Because the three subsectors have different economic characteris-

---

119. I will generally refer to the "electricity law," although many of the technical details have been defined in subsequent regulations rather than in the legislation itself. This section is synthesized from multiple sources. *See La Regulación del Sector Eléctrico: La Experiencia Chilena*, *in* DESPÚES DE LAS PRIVATIZACIONES: HACIA EL ESTADO REGULADOR 281 (1992) [hereinafter Blanlot, *La Regulación del Sector Eléctrico*]; Comisión Nacional de Energía, El Sector Energía I, *supra* note 7; Díaz et al., *La Crisis Eléctrica*, *supra* note 80; Ronald Fischer & R
Alexander Galetovic, *Regulatory Governance and Chile's 1998–1999 Electricity Shortage* (World Bank Policy Research, Working Paper No. 2704, 2001) [hereinafter Fischer & Galetovic, *Regulatory Governance*]; Fischer & Serra, *Regulating the Electricity Sector*, *supra* note 80; PAREDES R
& SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80; ALEJANDRO VERGARA, DERECHO ELÉC- R
TRICO (2004) [hereinafter VERGARA, DERECHO ELÉCTRICO]. In addition to these references, I rely here on interviews in recent years with a half-dozen prominent Chilean energy experts, including academics, government advisors and officials, and private consultants.

120. *See supra* Part IV.A. *Cf.* sources cited *supra* note 119. R

121. For example, if the government wants to help poor people with their electricity bills, it should transfer funds to pay the bills at the going rate, rather than lowering prices. This is the policy that Chile has followed for drinking water supply.

122. Alejandro Vergara, a Chilean expert on water and electricity law, has disagreed with my statement that the Water Code is more laissez-faire than the Electric Law. He thinks it is the reverse because decision-making in the electricity sector depends on private initiative and capital, and cannot be ordered by government regulators: "The hand of state authority is more distant in the electric sector than in water." A. Vergara, comments at author's lecture, Diego Portales Univ. Law School, Santiago, Chile (July 20, 2009). His point is well taken, but I think he is underestimating the political nature of the basic legal rules of the game, particularly the fact that regulation determines prices much more than is the case for water rights.

tics, each can be regulated or deregulated to different degrees.[123] Generation is the subsector that is most amenable to markets and competition, while both transmission and distribution are natural monopolies that require stronger government regulation. Generation is also the subsector in which hydropower is the most important and, in this context, key aspects of electricity policy have been designed around hydropower, including assumptions about the value of water.

The Electric Law established three distinct markets for buying and selling electricity, which are called the "regulated," "unregulated," and "spot" markets.[124] Each of these markets plays different roles in the overall operation of the electricity sector and, according to the law, each market's prices are determined in a different way. The law also established a centralized power pool to coordinate all of the generating plants that are part of the central grid—the SIC. This pool includes both hydro and thermal power plants.[125] A basic tenet of the Electric Law is that the SIC, as a whole, has to minimize its short-term marginal costs of generation—that is, the cost of producing an additional unit of electricity.

The new system of prices and markets was accompanied by a new regulatory framework. This framework involved transferring some of ENDESA's traditional powers and duties to three new organizations: the National Energy Commission (*Comisión Nacional de Energía*, or CNE); the Regulator of Electricity and Fuels (*Superintendencia de Electricidad y Combustibles,* or SEC); and the Economic Load Dispatch Center (*Centro de Despacho Económico de Carga,* or CDEC). The CNE, located in the Ministry of Economy, is the lead agency that is in charge of doing studies, setting some prices according to specific formulas, resolving certain kinds of conflicts, and proposing new rules and policies. The CNE, however, has no regulatory power over a private company's actions or investments. The SEC is the government's enforcement arm; it is responsible for monitoring electric companies' compliance with the law and can impose fines. The CDEC operates the SIC's power pool, according to regulations, but is *not* a government agency. Instead, the CDEC's directors represent the

123. In 1982 this approach was an international innovation. Nearly all other countries operated and regulated the electricity sector as a vertically integrated system, as was the case with ENDESA. *See* sources cited *supra* note 113. R

124. *See, e.g.*, Díaz et al., *La Crisis Eléctrica*, *supra* note 80; Fischer & Serra, *Regulating the Electricity Sector*, *supra* note 80; PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80; Rudnick et al., *A Delicate Balance in South America*, *supra* note 10. *See also* sources cited *supra* note 119. R R R

125. The power pool is a crucial part of the system, intimately tied to the spot market, and I discuss them in more detail in Part IV.C.1.

principal power companies. The CDEC's legal status is unusual, as it is an autonomous, public/private hybrid organization.[126]

The regulated and unregulated electricity markets involve transactions between generators and distributors; distributors then deliver power to consumers—or end users. The unregulated market consists of the larger consumers of electricity, such as industries and major infrastructure. In the original 1982 legislation, these "large clients" were defined as those using more than two megawatts (MW) per year. Large clients negotiate prices directly with generators. The assumption is that these clients have enough bargaining power to protect their own interests without the need for additional government intervention.

The regulated market is based on regulated prices called "node prices" (*precios de nudo*), which apply uniformly throughout the entire SIC.[127] In this market, which includes smaller consumers and the general public, the CNE sets the prices that generators can charge distributors. Thus, distribution companies buy power from generators through medium-term to long-term contracts at the established node prices. The CNE sets node prices every six months by calculating the overall system's average marginal cost of producing electricity over the following four-year period. The CNE's methods are specified by law, so the power companies can also calculate the node prices by the same means.

The four-year period was chosen in order to smooth out the seasonal and annual variations of hydropower production since these variations have a major impact on the system's costs of operation. The CNE's calculations include some factors that are uncertain and must be estimated—for example, the future variability of water supplies and the production of future power plants—even if these are not yet under construction. The prices do *not* include environmental costs.[128]

The CNE's ambivalent position is one of the curious aspects of the Chilean model. In certain specific areas the CNE's power is strong—as in setting node prices—but, in general, its discretionary authority and free-

126. The CDEC was created by regulations in 1985 in order to implement this aspect of the 1982 legislation. *See* Hugh Rudnick, *Un Nuevo Operador Independiente de los Mercados Eléctricos Chilenos*, 101 ESTUDIOS PUBLICOS 1 (2006). The websites of all three organizations are useful as well.

127. Node prices are much less important in the SING because most power consumption in the SING is by large clients, hence unregulated, rather than the public. *See* sources cited *supra* note 107. R

128. *See, e.g.*, Díaz et al., *La Crisis Eléctrica*, *supra* note 80; Fischer & Serra, *Regulating the* R
Electricity Sector, *supra* note 80; PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80; R
Rudnick et al., *A Delicate Balance in South America*, *supra* note 10. *See also* sources cited *supra* R
note 119. R

dom to move are strictly limited.[129] For example, the CNE prepares and maintains an official list of "planned projects" (*plan de obras*) that includes their expected power generation and the timetable for starting operation, which, as noted above, the CNE incorporates into its calculation of node prices. However, the CNE's list is not binding. Private companies are free to decide whether and when to build any of the planned projects, or other projects that are not on the list. These are strategic corporate decisions and are an important part of companies' political leverage over the government. Companies know how the CNE calculates node prices and, therefore, they can figure out what impact a particular project will have on those prices; for example, the SIC's overall marginal costs go down for awhile after a large new hydropower plant begins operation.

1. The Spot Market and the Power Pool

The spot market is the third of the electricity sector's three markets. The spot market is essential to operating the power pool, which itself is essential to the day-by-day operation of the entire national grid. The spot market involves generators only. Unlike the two markets described above, between generators and distributors, in the spot market different generators buy and sell power among themselves at a spot price, which is set to equal the marginal cost of operating the system as a whole at a given time. Generators buy or sell on the spot market depending on whether they have less or more power than they need to supply their own clients at that time.[130] Both the spot market and the power pool are administered by the pool operator, the CDEC.

As I mentioned above,[131] the Electric Law requires the SIC to minimize its overall short-term marginal costs of power generation. The SIC is required to minimize these system-wide costs regardless of the impacts on particular generators, and the CDEC is the organization responsible for implementing this policy. The CDEC monitors the costs of operating each generating plant, as well as the costs of operating the grid as a whole. As the SIC's demand for electricity increases, the CDEC orders additional generators to produce power in order of their marginal costs—their operating costs at that moment. The generator with the lowest marginal cost is the first to produce, up to the limits of its capacity, and then generators with successively higher marginal costs are brought

129. This is very similar to the DGA in the field of water rights, as discussed *supra* Part III.

130. *See* sources cited *supra* note 128. *See also* sources cited *supra* note 119. R

131. *See supra* text accompanying note 119. R

on line one by one, as needed to meet the increasing demand. The sequence is reversed when demand goes down.[132]

In issuing these dispatch orders, the CDEC may not consider which companies own the different generating plants or what their contractual obligations to their clients might be. This means, that at any given time, some companies produce more power than they need to supply to their own clients and other companies produce less than they need. The purpose of the spot market is to let companies sort out the discrepancies, while maximizing the efficiency of the system as a whole. In theory, this should be to everyone's benefit; for companies whose generators are less efficient, it is cheaper to buy surplus power from more efficient generators than to produce their own.

2. Coordinating Hydropower and Thermal Power in the Pool

Operating the power pool is tricky in a mixed hydro-thermal system like Chile's because of the shifting range of costs.[133] Run-of-the-river hydropower plants have the lowest operating costs. Since the water flowing by or through them cannot be stored, it must be used or it is lost. As a result these generators are always operating whenever there is water. They provide part of the SIC's baseline power supplies. Under Chilean water law, there is no cost for this water,[134] although in some cases the dam-owner may have had to buy water rights from another private party or in a DGA auction.

Thermal generators are the next to be brought on line if demand goes up, ranked in order of their costs of operation. These costs depend on the cost of different fuels and on the generators' technical efficiency in burning them. Natural gas has generally been the cheapest fuel, followed by coal, and oil or diesel is the most expensive.

The key to the whole system, however, is the third type of generator: hydropower dams that have reservoir storage. These dams can replace thermal generation under certain circumstances. At any given time, these dams can either produce power with their stored water or store water for power production in the future. When they produce power, their operating costs are low and they replace some of the SIC's thermal generation; when they store water instead, the SIC must use more thermal generation and total costs go up. In this way, how to manage reservoirs is a crucial strategic decision for the country's electricity sector.[135]

---

132. *See* sources cited *supra* note 128. R

133. *See* sources cited *supra* note 80; Rudnick et al., *A Delicate Balance in South America*, *supra* note 10. *See also* sources cited *supra* note 119. R R

134. *See supra* text accompanying note 85. R

135. *See supra* note 133. R

The CDEC's decisions about how to operate such reservoirs are not autonomous or discretionary. Instead they depend on a mathematical model, specified by law and regulations, which includes a number of variables. Some of these variables are inherently uncertain because they involve estimates about what will happen in the future. The major variables include: how much water is available in the reservoirs; whether it is a wet year or a dry year; whether wet or dry conditions are expected in the future; what are the operating costs of thermal power (both present and future); and what new power plants are planned for the future. Many of these same factors, of course, also affect how the CNE determines node prices.[136]

For example, in a wet year when water is abundant, run-of-the-river dams produce more power and the CDEC orders more generation from the dams with storage. This additional hydropower generation lowers the system's overall marginal cost and, hence, lowers the price on the spot market. This trend takes the more expensive thermal plants out of production and the companies with dams sell their surplus power to thermal plants on the spot market. In dry years it is the reverse, more thermal generation is required and hydropower generators must make up their deficit by buying power from thermal generators. According to one estimate, hydro can supply 100 percent of the SIC's demands in wet years, 80 percent in normal years, and 40 percent in dry years.[137]

These relationships have often caused conflicts between different power companies—especially in drought years. Different companies have different economic interests according to their relative dependence on hydro or thermal power generation, and they have taken different legal positions about who should compensate whom, under what circumstances, and at what price.[138]

Hydropower's strategic importance in Chile has also been codified in the SIC's day-to-day operations through the management of Lake Laja in south-central Chile. This lake is the source of the Laja River, the largest tributary of the Bío Bío River, which is itself the country's longest river with the second-highest hydroelectric potential.[139] Lake Laja is by far the largest reservoir in Chile and the only one big enough to store water from more than one year's river flow, which makes it the "reserve battery" for the entire central grid. It is also the center of the electricity

136. *See supra* text accompanying notes 127, 128 (explaining how the CNE determines node prices). R

137. Díaz et al., *La Crisis Eléctrica*, *supra* note 80, at 155. R

138. *Id.*; PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80. I return to these issues of regulatory governance *infra* Part V. R

139. *See supra* note 104 and accompanying text. R

price system because the CDEC uses a mathematical model of the lake's water levels to calculate the SIC's overall marginal costs—including estimates of the trade-offs (opportunity costs) involved in using water now versus storing it for later. These marginal costs in turn determine the timing and amount of thermal generation.[140]

3. Summary: Water and the Electricity Law

Two points should be clear from this review of Chilean electricity law and regulations. The first is that the electricity law pays close attention to water resources as a critical input into the national electricity system. The second is that this close attention is focused entirely on generating electricity—for which water is fuel—and does not consider other aspects of water rights or water management.

From the perspective of integrated and sustainable water management, these two points have both positive and negative sides. The positive side is that the CDEC as a whole, as well as individual dams and reservoirs, could readily adjust their operations to fit new rules of water use. Such adjustments will obviously have some impact on power production, but the engineers who run the country's electricity system are fully capable of executing different rules of operation. In practice, that is what they already do in the cases of Lake Laja and Lake Maule; each lake is managed according to decades-old legal agreements that specify how the waters can be used for both hydropower and irrigation, and the CDEC takes these agreements as given when it orders different power plants to turn on and off.[141] In theory, new rules for environmental flows or other purposes could work the same way.

The negative side is that the electricity sector's narrow consideration of water issues is built deeply into the current system. A good illustration is how water's economic value is determined—that is, how water is given a price. For the calculations of the CNE and CDEC, the value of water is defined as the opportunity cost of water stored in reservoirs, compared to other costs of power generation. In times of drought, this opportunity cost increases to equal the cost of producing an additional unit of electricity by thermal power. If there is no drought, however, the opportunity cost of stored water goes down and is defined as the cost of

140. For more technical explanations of this model, see Comisión Nacional de Energía, El Sector Energía I, *supra* note 7, at 368–72; Díaz et al., *La Crisis Eléctrica*, *supra* note 80, at 157–61. For more background on Lake Laja, see BAUER, AGAINST THE CURRENT, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24. R R

141. In both cases these agreements are decades older than the current water and electricity laws, but they have been grandfathered in. *See* BAUER, AGAINST THE CURRENT, *supra* note 24. R

producing an additional unit by hydropower.[142] The price of water, in other words, depends on the costs of energy and on hydrological estimates, but it does not reflect other demands or uses for water. This omission is remarkable in a country famous for the market economic principles of its water rights system.[143] Institutional economics can help us understand this problem, since it is evidently legal rules and political decisions that have shaped market price signals by determining which costs are included and who pays them.[144]

4. Privatization of the Electricity Sector and Situation in 1990

Privatization was the final step of the military government's restructuring of the electricity sector. The market-oriented framework described above was designed and implemented when the Chilean government still owned the entire sector, including generation, transmission, and distribution. Only when the sector had been restructured, in the mid- to late-1980s, did the military government privatize ENDESA and Chilectra—although privatization had always been part of the overall plan for reform. The military government was careful to complete the process before leaving office in 1990.

The privatization was done in several stages over a period of several years.[145] The government first divided ENDESA and Chilectra into a number of different companies and subsidiaries, which were again divided among the three subsectors of generation, transmission, and distribution. Ownership shares in these companies were then sold separately to a combination of different buyers.[146] These new owners and managers

142. Interviews with Eduardo Saavedra, Universidad Alberto Hurtado, in Santiago, Chile (July 2003).

143. *See supra* Part III.

144. I return to this argument in the Conclusion, *infra* Part VI.

145. For more detailed accounts of the process of electricity privatization, see Eduardo Bitrán & Raúl Sáez, *Privatization and Regulation in Chile*, *in* THE CHILEAN ECONOMY: POLICY LESSONS AND CHALLENGES (1994) [hereinafter Bitrán & Sáez, *Privatization and Regulation in Chile*]; Blanlot, *La Regulación del Sector Eléctrico*, *supra* note 119; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90, at 74–76; DOMINIQUE HACHETTE & ROLF LÜDERS, LA PRIVATIZACIÓN EN CHILE 216–33 (1992); CARLOS HUNEEUS, EL REGIMEN DE PINOCHET 437–98 (2000); Revista de Ingenieros, *ENDESA: 1943–1993*, *supra* note 92. See also HUGO FAZIO, MAPA ACTUAL DE LA EXTREMA RIQUEZA EN CHILE (1997) for a more critical view from the left. R R R

146. The new owners included private investors, institutional investors (that is, Chile's privatized pension funds), groups of ENDESA's employees, and members of the armed forces. Despite the diversity of shareholders, the new companies were controlled by a small group of investors by means of rather intricate arrangements of stock ownership. *See* Bitrán & Sáez, *Privatization and Regulation in Chile*, *supra* note 145; Blanlot, *La Regulación del Sector Eléctrico*, *supra* note 119; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90; HACHETTE & LÜDERS, *supra* note 145; HUNEEUS, *supra* note 145; FAZIO, *supra* note 145. R R R

had strong political ties to the military government. Many of them had worked in that government as civilians and had helped to design and implement the electricity sector reforms—including the privatization process. During this early phase, the role of foreign investors was limited.

By 1990, three private companies dominated the generation subsector. The newly private ENDESA owned all of the company's hydropower facilities throughout Chile, with the sole exception of the adjoining Colbún and Machicura dams on the Maule River.[147] In addition, ENDESA's private assets included all the water rights, technical studies, and hydrological data that the company had accumulated during its 45 years as a government enterprise. Colbún and Machicura dams had about 15 percent of the SIC's generating capacity and were owned by a separate company named Colbún.[148] Colbún remained in government ownership for the time being. The idea was to privatize Colbún a few years later but to keep it independent from ENDESA in order to promote more competition within the electricity sector.[149] Chilectra was divided into a generation company, Chilgener,[150] which owned most of the SIC's thermal power plants, and two distribution companies. Since Chilgener was sold to different investors from those who bought ENDESA, the two private companies became major competitors in the generation market.

Each of the three competing companies has had different shares of the generation market and different degrees of dependence on hydropower and thermal power, although the proportions changed somewhat over the course of the 1990s. ENDESA is by far the largest of the three, with over 50 percent of the SIC's installed capacity, and it is also the most dependent on hydropower, which has produced about 90 percent of its electricity. Colbún had about 15 percent of the SIC's capacity during the 1990s. At first, all of Colbún's power generation came from its two dams but by the end of the decade the company had built a large gas-fired thermal plant that reduced its dependence on hydropower to

147. ENDESA owned the three dams that were supplied by Lake Laja, which had more total generation capacity than Colbún-Machicura, as well as much greater reservoir storage. *Supra* note 94 and accompanying text. In addition, in 1990, ENDESA was building Pehuenche Dam upstream from the Colbún dam, and would soon start building Pangue Dam on the Bío Bío. *Supra* note 104 and accompanying text. R R

148. I will use Colbún to refer to the company, and not the Colbún and Machicura dams, throughout the rest of the article.

149. The *Concertación* government eventually sold its majority stake in Colbún later in the 1990s.

150. Chilgener was renamed Gener later in the 1990s and then renamed AES-Gener after the U.S. utility AES acquired a major stake.

two-thirds. Gener, formerly Chilgener, was the contrasting case as its generating capacity was only slightly larger than Colbún but it depended heavily on thermal power. Gener had over 20 percent of the SIC's capacity in the 1990s, and 70–80 percent of the company's power was generated by coal and natural gas.[151]

The SIC's transmission grid belonged to a new company named Transelec, which was a regulated monopoly under Chilean electricity law. ENDESA owned this company, too, until Chile's Anti-Monopoly Commission[152] recommended that ENDESA sell Transelec in the late 1990s. The buyer was the large Canadian power company Hydro Quebec.

In short, when the *Concertación* government took office in 1990, Chile's electricity sector had been restructured, divided into separate components, and privatized. Much of this was done according to principles of market economics and competition, but the military government allowed some exceptions that led to large areas of private monopoly power. In practice, ENDESA and its new owners continued to control many of the sector's separate components, particularly in generation and transmission. Although ENDESA was no longer a government enterprise, it remained quite vertically integrated, and the new owners and managers had strong political ties to the military government.

V. NEXUS OF WATER AND ELECTRICITY POLICIES SINCE 1990

In this final part, I return to the idea of hydropower as a nexus between water and electricity[153] by describing several examples of the relationship between water and electricity policies. It is important to note that the first real test of the military government's electricity reforms came *after* the military had returned to the barracks. Although the reforms of the early 1980s had foreseen and prepared for the sector's eventual privatization, the new regulatory framework had never dealt with large private electricity companies until the return to democratic government. Thus, a sharp increase in private economic power coincided with a marked weakening of the central government's political authority.

---

151. The data for the SIC's installed capacity refer only to public service and do not include industry's power generation for its own consumption. In the SIC, however, public service accounts for 90 percent of power consumption. Comisión Nacional de Energía, El Sector Energía I, *supra* note 7; Comisión Nacional de Energía, El Sector Electrico, *supra* note 3. R R

152. *See* Fiscalía Nacional Económia, http://www.fne.cl/?content=antimonopolio (last visited Apr. 28, 2010).

153. *See supra* Part I.

A. The Rise and Fall of Argentine Natural Gas, the Fall and Rise of Chilean Hydropower

The *Concertación* government was in a difficult energy situation in the early 1990s. Many people in the *Concertación* disagreed with the military government's electricity policies either because of those policies' neoliberal principles or because of how the policies had been carried out. The privatization of ENDESA was especially controversial. Many Chileans were proud of the company's past accomplishments as a public enterprise working for national development, and objected to its becoming a source of private profit—particularly on terms so advantageous to the new owners. For many of these people, privatization was a bitter pill to swallow because of its strongly political flavor—ENDESA's new owners and managers were closely tied to the military.[154] On the other hand, the *Concertación* had committed itself to respecting the legal and political rules as well as the economic model that the military and their right-wing allies had put in place. That was the price of a peaceful democratic transition. The new government prized political stability and economic growth very highly; this meant that its room to maneuver in electricity policy was quite limited.[155]

In the early 1990s, therefore, ENDESA was flying high. The company was earning record profits in Chile and had started to expand internationally, buying electricity companies in neighboring Argentina and other Latin American countries that were then privatizing their own government-owned electricity sectors.[156] Gener was less dominant but was also investing internationally, including buying large shares in both thermal and hydropower plants in Argentina. Chile's new government was concerned about ENDESA's monopoly powers and vertical integration—and, hence, the lack of competition—but the government was still studying the situation and had not yet decided on its strategy for reform.[157]

By the mid-1990s, the Chilean government was attempting legal and regulatory actions to limit ENDESA's market power—actions that were largely unsuccessful. At the same time, the government also strongly supported the importation of natural gas from neighboring

---

154. *See* Bitrán & Sáez, *Privatization and Regulation in Chile*, *supra* note 145; Blanlot, *La Regulación del Sector Eléctrico*, *supra* note 119; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90; HACHETTE & LÜDERS, *supra* note 145; HUNEEUS, *supra* note 145; FAZIO, *supra* note 145. R

155. *See supra* Part II.A.

156. Revista de Ingenieros, *ENDESA: 1943–1993*, *supra* note 92. R

157. *See* Blanlot, *La Regulación del Sector Eléctrico*, *supra* note 119; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90. R

countries as a tool to increase competition and supplies in the energy sector. This was a new alternative and, thanks to recent advances in the technology of turbines, thermal power plants could use natural gas to generate electricity more efficiently than before. Moreover, Argentina had restructured and privatized its own national energy sector in the early 1990s under the government of President Carlos Menem. This restructuring created incentives for companies in Argentina to increase the production and export of natural gas to Chile.

To export this gas, pipelines across the Andes Mountains from western Argentina to several locations in northern, central, and southern Chile had to be built. The governments of Chile and Argentina signed an international treaty in 1995 to encourage these projects as part of the integration of the two countries' energy sectors. There was fierce competition among different Chilean energy companies, each with different foreign and multinational partners, over which pipelines and where they would be built.

For several years this strategy worked well and Chile seemed to have entered a new era of declining reliance on hydropower. Chile's thermal power generation capacity tripled during the 1990s and continued to grow faster than hydropower after 2000.[158] The natural gas boom lowered prices in both the regulated and unregulated electricity markets. Most new hydropower projects could not compete in this context. ENDESA and other companies postponed their plans for new hydro projects, the largest of which were in southern Chile, although ENDESA continued to build Ralco Dam on the Bío Bío River. Chilean energy experts agreed that other hydro projects would likely remain on hold for at least the next 10 years. In 1997, for example, the head of the CNE said that "the introduction of natural gas . . . is going to change the economic structure of our country."[159]

The new era turned out to be short. Argentina's government and economy collapsed in December 2001, President Fernando De la Rúa resigned in the crisis, and the national currency was devalued to one-third of its previous value—vis-à-vis the U.S. dollar. This crisis soon had an impact on the Chilean energy sector as the new Argentine government began to restrict the export of natural gas. The Argentine government's priority was to safeguard supplies of gas for domestic consumption, with

158. *See* Comisión Nacional de Energía, El Sector Energía I, *supra* note 7. R

159. Interview with Alejandro Jadresic, *El Racionamiento Era el Último Recurso*, EL MERCURIO, June 17, 1997.

Argentine consumers paying in devalued pesos.[160] Since 2002, Argentina's gas exports have declined in volume and have become much less reliable. Chile has been scrambling to replace them ever since and Chilean protests that Argentina was violating their 1995 international treaty have been unsuccessful.

Argentina's crisis meant that hydropower development in Chile shifted from low priority back to high priority abruptly. Plans for hydro projects that had been shelved were dusted off in a hurry, suddenly reappearing on center stage with a new sense of urgency. In retrospect, the natural gas boom was a brief and exceptional interlude rather than the start of a long-term trend.

Beyond Argentina, the geopolitics of energy in South America did not favor Chile. Both Bolivia and Peru, Chile's other neighbors, have abundant natural gas and a history of poor relations with Chile that dates back to the nineteenth century. For political reasons, therefore, both countries have rejected the idea of exporting gas to Chile, in spite of Chilean power companies' willingness to pay a world market price for it.

B. Water Rights and Monopoly Power

The natural gas boom affected water rights issues as well. ENDESA's concentrated ownership of water rights for hydropower has been widely criticized—even by people who supported the privatization—since the company was privatized.[161] The military government included ENDESA's water rights in the assets when the company was sold. Those rights not only included the water rights pertaining to existing dams, but also those rights that had not yet been used, such as potential dam-sites that were still undeveloped. Chilean governments, since the 1940s, had granted water rights to ENDESA as needed for its projects free of charge. Under the 1981 Water Code, while ENDESA was still government-owned, the company requested and was granted new non-consumptive rights for rivers throughout the country.[162]

Until 2005, the Water Code did not impose any costs or fees on the owners of water rights, nor did these owners have any legal obligation to use their rights.[163] Many Chilean energy experts criticized the Water Code for allowing the ownership of water rights to function as a barrier

---

160. Argentine energy companies would have preferred to keep selling their gas to Chile at international market prices—three times the price in Argentina—but they could export only the amounts that the government allowed.

161. *See, e.g.*, Instituto de Ingenieros de Chile, *Política Eléctrica*, *supra* note 90, at 48. R

162. *See supra* Parts III.A and III.B; BAUER, AGAINST THE CURRENT, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24; BAUER, SIREN SONG, *supra* note 23. R R

163. *See supra* Part III.C.

to entry into the market for electricity generation—in other words, water rights were a tool for reducing competition and strengthening monopoly powers.[164] Because water rights owners and speculators could keep their rights indefinitely without using them or paying anything for them, other companies were blocked from building new hydropower projects. This barrier restricted electricity supply and raised prices to the benefit of existing generators, including ENDESA.[165] Most analyses of Chilean electricity regulation in the 1990s refer to the problem of water rights and monopoly power.[166]

Beginning in 1996, the Chilean government made this issue one of its core arguments for reforming the Water Code.[167] With the growing imports of Argentine natural gas, however, competing power companies could build new thermal power plants wherever there were gas pipelines, effectively making water rights a much less important barrier to competition in the electricity sector. This factor weakened the DGA's argument in favor of Water Code reform, apparently since the CNE no longer considered it important. During this period ENDESA was also embroiled in a long-running dispute with the DGA about new water rights. For years the DGA refused to approve ENDESA's requests for new rights in southern Chile, arguing that granting the rights would increase the company's dominance of the market for hydropower generation. ENDESA countered that the DGA had no authority over issues of market competition and monopoly since those areas were regulated by Chile's Anti-Monopoly Commission. That Commission ruled in favor of the DGA in a landmark decision in 1997.[168]

The Water Code reform was finally approved in the last year of President Ricardo Lagos's administration, at a time when there were declining gas supplies from Argentina. The government's right-wing opponents finally agreed to remove water rights speculation as a possible obstacle to rapid hydropower development.[169]

---

164. *See* Hugo Altomonte, *Síntesis del Estudio de Caso sobre Chile*, *in* PROYECTO OLADE/CEPAL/GTZ: ENERGÍA Y DESARROLLO EN AMÉRICA LATINA Y EL CARIBE (1996); Blanlot, *La Regulación del Sector Eléctrico*, *supra* note 119; Bitrán & Sáez, *Privatization and Regulation in Chile*, *supra* note 145; Comisión Nacional de Energía, El Sector Energía II, *supra* note 90. R R

165. Recall that node prices went down temporarily throughout the SIC each time a new hydropower project began operation because it lowered the system's overall marginal costs. *See supra* Part IV.C.

166. *See supra* note 164. R

167. BAUER, SIREN SONG, *supra* note 23, at 51–73. R

168. *Id.* at 64.

169. *See supra* Part III.C; BAUER, SIREN SONG, *supra* note 23; Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R R

C. The 1998–99 Drought Crisis and Political Responses

While Argentine natural gas was still abundant, hydropower in Chile was dealt another blow by a drought in 1998–99. It was Chile's most severe drought of the twentieth century. The lack of rain and snow reduced hydropower generation so much that the SIC suffered electricity shortages and frequent blackouts for months, causing serious economic losses for many people and organizations. The emergency revealed the drawbacks of the central grid's dependence on hydropower in dramatic fashion. Political reactions and proposed reforms followed immediately.

Although the lack of rain was a major factor, the electricity crisis also revealed flaws in Chile's legal and regulatory framework. The worst of these flaws involved how prices were set, how risks and costs were allocated among different parties, how conflicts were resolved, and how reservoirs were managed. The government responded by proposing reforms to the Electric Law. This was the first time the *Concertación* had tried to change the legislation after nearly a decade in office. Until then, the government had tried to reform electricity policies through administrative regulations and the Anti-Monopoly Commission.

The government's proposals triggered five years of heated political and policy debates. What had gone wrong in Chile's electricity sector and how should it be fixed? The debate about these questions dragged on as the government tried to negotiate a reform—in a process similar to the Water Code reform—that right-wing political parties and private sector interest groups would accept. The process stretched over two administrations of the *Concertación*, as President Ricardo Lagos succeeded President Eduardo Frei in March 2000. During this period the government proposed a series of alternatives, most prominently the *Ley Larga*,[170] which was defeated in 2001, and the *Ley Corta*,[171] which was finally passed in 2004 (and then amended by the *Ley Corta* II[172] in 2005).[173] Beginning in 2002, the crisis in Argentina put additional strain on the Chilean energy sector.

The government's basic priorities throughout this period were to steadily increase electricity supplies while keeping prices to consumers as low as possible. These had also been the government's priorities earlier in the 1990s but they became much more pressing during and after the drought crisis. The two priorities were somewhat contradictory in a market-oriented system like Chile's; increasing supplies depended on

170. *See infra* note 184. R
171. Law no. 19,940 (Mar. 3, 2004). *See also* sources cited *supra* note 186, 188. R
172. Law no. 20,018 (May 19, 2005). *See also* sources cited *supra* note 186, 188. R
173. *See infra* Part V.D.

private investment to build new projects, but companies had little incentive to invest if the government kept electricity prices low or threatened the stability of the status quo. The government sought to overcome this dilemma by promoting greater competition within the electricity sector, arguing that this would both increase supplies and lower prices. However, the government had to walk a fine line between criticizing the power companies' behavior on one hand and encouraging them to keep investing on the other.[174]

The years of debate showed two major political and economic issues affecting hydropower in Chile. The first issue is that the relationship between hydropower and thermal power is complicated and sometimes contradictory; in some contexts the two forms of generation have conflicting interests, in other contexts their interests are complementary. Although some of the conflicts are due to technological differences, others are due to policy and regulation—particularly the legal allocation of different risks, costs, and benefits. Since the three largest generation companies rely on different combinations of hydro and thermal power, these companies often have quite different economic stakes in the operation of the electricity sector and the decisions of regulators.[175] Some of these conflicts also play out in the transmission subsector.

The second issue is that the Chilean electricity sector as a whole has suffered from problems of regulatory governance, particularly for resolving conflicts with high stakes. Many experts and stakeholders, of

---

174. In disputes with the government, the power companies' strongest leverage has often been to delay (or threaten to delay) new investments. *See supra* Part IV.C.

175. For example, the government managed to pass several changes to the Electric Law in June 1999 (fairly early in the debate), including the so-called "Article 99 bis" ("bis" refers to a modification added to a previous legal rule). The arrival of winter rains was finally ending the drought but the crisis atmosphere still dominated political debate. Article 99 bis referred to the required level of security of power supplies, in relation to hydrologic risk and uncertainty. The military government had added the original Article 99 bis in February 1990 (just before leaving office) as a result of an earlier drought in 1989. That 1990 amendment required generation companies to compensate their clients for any power shortages that occurred within the range of hydrological conditions that the CNE used to calculate node prices; the corollary was that generators had no obligation to compensate clients when conditions were more extreme. The drought in 1998–99 was so severe that it fell outside that established range of conditions, which relieved the generators of liability. The June 1999 reform responded by shifting the burden of liability onto the generators, obligating them to compensate clients for shortages no matter what, with no exceptions. The government's intention was to force the power companies to increase their generation capacity and reserve supplies. The wisdom of Article 99 bis was sharply criticized by many economists (and not only by the government's opponents) because of its perverse incentives for private investment. Many power companies were reluctant to invest in additional generators for fear of being held financially responsible for events outside their control. *See, e.g.*, PAREDES & SAPAG, FORTALEZAS Y DEBILIDADES, *supra* note 80. R

diverse political views, criticized the institutional framework for being ineffective, incompetent, or subject to political influences behind the scenes. Some of the criticisms were addressed in the *Ley Corta*, which created a panel of experts as a new means of resolving conflicts within the electricity sector.[176] Some of the conflicts have involved hydropower directly, such as in the operation of reservoirs, while in other matters hydropower issues have been indirect or not important.

These flaws of institutions and governance are critical in a system so dominated by neoliberal restructuring, in which Chilean government authority was weaker and more fragmented than it had been in the past. The arrival of large foreign capital added a new twist. In August 1997, ENDESA's management shocked the Chilean public by announcing the company's sale to ENDESA España, the large Spanish power company.[177] This deal turned out to be extremely controversial, and the ensuing legal battles and newspaper headlines went on for years. ENDESA España persevered and eventually succeeded in taking over ENDESA, albeit at a higher price than the original deal.[178]

The arrival of ENDESA España marked a turning point in the political economy of the Chilean electricity sector. Although in most respects ENDESA's operations in Chile did not change because of the new foreign ownership, there is no doubt that the political dynamics shifted. The shift has particularly affected the debate about hydropower in Patagonia, where there is a blurry line between foreign companies' plans and Chile's national interest.

These problems of regulatory governance are illustrated in an excellent article about the 1998–99 electricity crisis; the article was pub-

---

176. Many examples of these arguments can be found in presentations at the annual Conferences of Electricity Law and Policy (*Jornadas Eléctricas*) held at the Catholic University Law School in Santiago, several years following 2000. *See also infra* Part V.D.

177. The Spanish company had the same name and acronym as the Chilean company. In this article I use "ENDESA" to refer to ENDESA Chile, and "ENDESA España" for the Spanish company.

178. The Chilean managers, led by ENDESA's president José Yuraszcek, explained that the company had become so successful that it had outgrown the Chilean domestic market, but to undertake a new round of international expansion it needed much greater financial resources. The Spaniards, for their part, gained an entry point, a base of operations, and a strategic partnership for their expansion throughout Latin America. The deal would have paid the Chilean managers very well and they would have continued to play a leadership role in the new multinational enterprise. In Chile the initial public reactions were positive and ENDESA's managers were congratulated for having made the "deal of the century." Within a few weeks, however, as more details emerged, the deal was increasingly criticized for violating financial regulations, business ethics, or both. Soon it became known instead as the "scandal of the century," and Yuraszcek was forced to resign in October 1997. *See* Franco Parisi & Guillermo Yanez, *The Deal of the Century in Chile: Endesa España's Takeover of Enersis*, 9 INTERNATIONAL REVIEW OF FINANCIAL ANALYSIS 103 (2000).

lished by three Chilean economists soon after the crisis had ended but with the political debate about reforms well under way.[179] The authors examined the causes, effects, and lessons of the crisis. They argued that the crisis revealed several structural defects in Chile's electricity regulation, although they disagreed with the government's diagnosis of those defects. At the time, the government's argument was that the private utilities had not invested enough money to produce adequate supplies of electricity and, therefore, government regulation should be strengthened.

The authors, however, put hydropower at the center of their analysis. Their point of departure was that Chile's heavy dependence on hydropower meant that occasional power shortages were inevitable due to natural climatic and hydrologic variability. When there is a drought, therefore, the system must be able to adjust by reducing demand and reallocating scarce power supplies. In 1998–99, the authors argued, scarcity became a crisis as a result of regulatory and institutional failures.[180] Conflicts between hydro and thermal power were at the heart of each of these problems, which included: an overly rigid system of regulated prices (i.e., node prices that could not rise to reflect greater scarcity); a dysfunctional mechanism for coordinating transfers of energy and money between generators (i.e., the spot market administered by the CDEC); and flawed arrangements for managing the water stored in reservoirs like Lake Laja and Lake Maule.[181]

The authors argued that the water stored in reservoirs was used up quickly and inefficiently during 1998 without any accompanying measures, such as raising prices or rationing supplies, to reduce demand for electricity. This meant that reserve hydropower capacity was very low when the drought went on longer than expected. Another unexpected problem was the mechanical breakdown of Colbún's Nehuenco power plant, a large new thermal generator that would have supplied much of the electricity deficit. The decision to draw down the reservoirs early was partly due to conflicts within the CDEC or between the different utilities that were CDEC's members. The conflicts were about how much compensation the different utilities would have to pay and to whom. Those conflicts lingered unresolved for months because of problems in the CDEC's internal governance and also because of the passivity and delay of government regulators, particularly, the Ministry of the Economy. The decision was also influenced by utilities lobbying the government. The Ministry of Public Works controlled the water stored for irrigation purposes in the reservoirs and the evidence indicates that

179. Díaz et al., *La Crisis Eléctrica*, *supra* note 80. R
180. *Id.*
181. *Id.*

that water was transferred to hydropower—mainly to ENDESA—at a low price and without conditions on its use.[182]

The study concluded that the critical reforms needed were to make the price system more flexible and to reduce—not strengthen—the regulators' authority to resolve conflicts between private companies. Their critique of the regulators is well supported, although one can also sympathize with the regulators who were in a difficult situation with tight political constraints. Moreover, the authors did not identify any plausible alternative institutional arrangements for conflict resolution. In any case, the important point for purposes of hydropower is that the management of Chile's largest reservoirs was strongly affected by political and governance mechanisms that were complex and out of the public eye.

D. "Long" and "Short" Laws

During the year 2000, the CNE developed an ambitious and comprehensive proposal for legislative reform, which became known as the *Ley Larga* or "long law." This was a priority issue for the new government of President Ricardo Lagos.[183] The proposal was made public in September and sent to Congress in October. It contained significant changes in the regulations affecting all three electricity subsectors, while continuing to rely mainly on price incentives and market competition. The new law "should regulate the sector for the next 20 years" according to the head of the CNE[184] although few of the proposed changes addressed hydropower directly.

The proposed reform met strong opposition from private business interests and conservative politicians mainly because of its ambitious scope. By mid-2001, the government had to withdraw the proposal as politically unviable. The government responded by scaling back its approach and trying to select a smaller number of issues about which there might be more consensus for reform. This next round of proposals was

182. *Id. See also* BAUER, AGAINST THE CURRENT, *supra* note 24, at 79–118 (detailing a similar episode in the early 1990s). R

183. In January 2000, the outgoing administration of President Eduardo Frei briefly floated a proposal that would have introduced rules to restrict the concentrated ownership and vertical integration that characterized the electricity sector. *See Nueva Ley Eléctrica Enfatiza Desconcentración de Propiedad*, EL MERCURIO, Jan. 26, 2000, *available at* http//www.elmercurio.cl. The incoming administration of President Ricardo Lagos, however, took office in March and named a new head of the CNE, Vivianne Blanlot, who then developed a new proposal for the *Ley Larga*.

184. Alejandro Faine, *Gobierno Lanza Nueva Ley Eléctrica que Regulará los Próximos 20 Años del Sector*, LA SEGUNDA, Sept. 13, 2000, *available at* http//www.lasegunda.cl.

called the *Ley Corta* or "short law," since it was a shorter list than the previous round.[185]

The *Ley Corta* also proved politically contentious despite the proposal's narrower scope. It provoked more than two years of political debate both inside and outside the government. This included an extended, public dispute between the Minister of the Economy and the head of the CNE, who had different positions on some of the law's key issues. The dispute ended with the CNE head's resignation in July 2003.[186] The large electricity companies lobbied actively throughout the political process, often on different sides of particular issues, with the competing economic interests between hydropower and thermal power explaining most of those differences.

The most contentious issue was the cost of transmission; there was debate about how to set the fees for using the transmission grid, how to provide incentives to the private sector to invest more money in that grid, and how to allocate the costs between generators and consumers. Although distribution companies had to pay some of these costs, they were eventually passed on to consumers. Much of the policy debate was quite technical but the bottom line was that distance is an important factor in the cost of transmission, and most Chilean hydropower plants were located farther away from the centers of consumption than thermal power plants. As a result, the different alternatives for setting transmission fees affected the two kinds of generators to different degrees. Under the existing law, generators paid 100 percent of transmission fees, while the *Ley Corta* would transfer some of those fees to consumers.

The debate revolved around transmission costs for several reasons. Most obvious was the clash of economic interests between different power companies. Beyond that, however, there were broader implications for national energy strategy. How should Chile diversify its energy sources and increase the security of supplies? How important was future energy integration with Argentina and other South American countries? Was it important to connect the SIC—the central grid—with the SING in the north? Who would have to pay higher prices as a result? Policy decisions about electricity transmission were critical to such long-range plans, and the broader issues inevitably got tangled up in more immediate political and economic conflicts.[187]

---

185. A very similar process took place with the Water Code reform. *See* BAUER, SIREN SONG, *supra* note 23, at 51–73. R

186. *Vivianne Blanlot: La Batalla Continua en el Congreso*, SIETE+7, July 11, 2003, at 12–13.

187. One illustration of this problem was the clash between the Minister of Economy and the head of the CNE. *See supra* note 186 and accompanying text. The Chilean press R focused a lot of attention on the personal ties of these two people to Gener and ENDESA,

The *Ley Corta* was finally passed in early 2004. There were new incentives for private investment in the transmission grid and in additional generators. The law also created a "panel of experts" to help resolve conflicts. The power companies were initially satisfied because the rules of the game had been clarified after years of uncertainty. The spring of 2004 was also marked by another round of Argentine government restrictions of natural gas exports, triggering more discussion in Chile about the need to raise electricity prices in order to increase the security of supply. Many energy experts and utilities called for an end to the CNE's regulation of node prices, in favor of prices freely negotiated between buyers and sellers.[188]

The Electric Law was amended, yet again, in the spring of 2005, only one year after the *Ley Corta*. The government was worried that private investment in new infrastructure was falling short of expectations, which was especially troubling because of the several-year time lag between starting a project and producing new power supplies. As a result, the government proposed the *Ley Corta II* to allow higher prices and longer-term stability of prices. The new law made the CNE's calculation of node prices more flexible—to adjust more closely to changing market conditions—so that consumers would pay an estimated 12–20 percent more. The law also allowed utilities and their clients to establish long-term contracts that fixed prices for periods of up to 15 years. The *Ley Corta II* was quickly approved by the Congress.[189]

The *Ley Corta II* seems to have finally given investors the incentives and security they were waiting for. In 2005, Chilean electric companies announced more than 20 new projects to be built over the next decade—totaling more than 5,000 MW, for a total cost of US$4 billion—with some of these projects early in their planning stages. Hydropower dominates the list for new projects and, while ENDESA's projects in Patagonia were the largest, several other companies were also planning run-of-the-river dams in central and south-central Chile.[190] The Water Code

---

respectively, and hence their alleged representation of either thermal or hydropower interests.

188. Carola Rojas, *El Precio de la Seguridad*, QUÉ PASA, June 25, 2004.

189. *See Rodríquez-Empresas Eléctricas: La Soterrada Guerra por las Tarifas*, DIARIO ESTRATEGIA, Mar. 28, 2005, *available at* http://www.bcn.cl/carpeta_temas/temas_portada.2005-10-26.1398811570/archivos_prensa.2005-10-28.6273151645/articulos_prensa.2005-10-28.5990918217 (then follow the link to content) (last visited Feb. 9, 2010); Mariano Cubillos et al., *Congreso Aprueba Reforma Eléctrica que Incentiva Inversiones y Aumenta Precios*, LA TERCERA, May 4, 2005, http://www.quepasa.cl/medio/articulo/0,0,3255_5676_129710671,00.html (last visited July 14, 2009).

190. Viancos, *Hidroeléctricas Retoman Fuerte Protagonismo*, *supra* note 2; Viancos, *23 Nuevos Proyectos Avivan Oferta Eléctrica*, *supra* note 2; Viancos, *La Millonaria Agenda Eléctrica*, *supra* note 2. R R R

reform also passed at this time, reflecting a broad consensus about the need to boost new hydropower development as soon as possible.[191]

E. Hydropower Projects in Patagonia 2004–06

In June 2004, after the *Ley Corta* had passed, ENDESA announced updated plans for large-scale hydropower development in Patagonia. ENDESA's next planned hydro project was Neltume in Region X, at the northern end of Patagonia, with a capacity of about 400 MW. After that the company proposed four large dams in Region XI, two on the Baker River and two on the Pascua River. These four dams would have a total capacity of 2,800 MW, equally divided between the two river basins, at a time when the SIC's total hydropower capacity was then about 4,700 MW. The total cost of these projects was estimated at US$1.5 billion, plus an additional US$1 billion for the new transmission lines. ENDESA planned to do the detailed designs in 2005 and to begin construction about four or five years later. Moreover, the company requested additional new water rights to allow more projects in the future.[192]

After the *Ley Corta II* passed in 2005, this latest hydropower boom gained increasing momentum. ENDESA began to move forward aggressively with its Patagonia projects, sending dozens of technicians to Region XI to complete field studies and more detailed engineering designs. This was countered by a more active and higher-profile campaign by Chilean environmental NGOs and other opponents of the dams—including regional tourism interests and salmon farmers.[193] At this time, there were also conflicting reports about whether ENDESA might redesign some of the dam projects to reduce their environmental impacts, for example, by making the dams or reservoirs smaller.

In 2005, Colbún moved strongly into large-scale hydropower development as the Matte Group, one of Chile's largest and most powerful business conglomerates, acquired a controlling interest in the company. The Matte Group had been Colbún's main Chilean partner, in association with the European partner Tractebel (later re-named Suez Energy),

---

191. *See supra* Part III.C.

192. *See supra* Part I. *See also* Valeria Ibarra, *ENDESA Planea Construir Cinco Centrales en 15 Años por U.S. $2,800 Millones*, La Tercera, June 26, 2004, at 33.

193. *Supra* note 9 and accompanying text. *See also Ecologistas Preparan Ofensiva Contra Hidroeléctricas de Endesa en Aysén*, La Tercera, Sept. 29, 2005; Oriana Fernandez and Sebastian Vasquez, *ONG Extranjeras Apoyan Campaña Contra Centrales de Endesa en XI Región*, La Tercera, Oct. 6, 2005 (naming Carl Bauer as a foreign researcher supporting the campaign, based on the Chilean writers' mistaken assumption that Resources for the Future was an environmental advocacy group rather than a policy think-tank), *available at* http://www.icarito.cl/medio/articulo/0,0,3255_5666_163630605,00.html; Francisca Skoknic and Pablo Gazzolo, *Robert Kennedy: Apoyaré a Quienes Defienda los Ríos Chilenos*, Qué Pasa, Oct. 2005. R

since the company was privatized in 1996.[194] In mid-2005, the Matte Group bought more of Suez Energy's stake and added its own existing portfolio of small and medium hydropower dams in Regions V and X—eight dams totaling about 500 MW. A few months later, in December 2005, Colbún's new management reorganized the company and announced plans to invest US$800 million in new hydro and thermal power projects. In Chile that is a lot of money, similar in scale to a large foreign mining project.[195]

These moves set the stage for a big surprise in April of 2006: Colbún reached an agreement with ENDESA to join the projects in Patagonia. Colbún would contribute slightly under half of the capital needed for the four dams in ENDESA's proposal. The advantages for ENDESA were political as well as economic. In addition to freeing up some of the capital that ENDESA had committed to the projects, the agreement broadened national political support. The Matte Group has a great deal of political clout in Chile and ENDESA's opponents could no longer simply claim that Patagonia was threatened by a foreign corporation—ENDESA España. For Colbún the advantage was to increase its total generation capacity by 50 percent and to add more hydropower to its portfolio. Without ENDESA's Patagonia projects, Colbún did not have the water rights needed for large new hydro projects.[196] The new joint venture was named HidroAysén.

---

194. Colbún's financial situation improved after the 1998–99 electricity crisis, during which it had been the biggest loser of Chile's three major electric utilities. By 2003, Colbún was considered the healthiest, if still the smallest, of the three; compared to ENDESA and Gener, it was the most evenly balanced between hydro and thermal power and its assets were all in Chile, somewhat insulated from the economic problems of neighboring countries. *See* Juan Pablo Rioseco, *Viento a Favor de Colbún*, QUÉ PASA, Mar. 29, 2002, http://www.quepasa.cl; Solange Vega, *El Ojo Eléctrico de los Matte*, QUÉ PASA, Apr. 11, 2003; Alejandro Sáez Rojas, *Los Destellos de Colbún*, EL MERCURIO, Oct. 5, 2003, at B3, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={96b9ca9c-eb1e-460f-81a7-80b6c8951e7b}; Carola Rojas, *Colbún: Objeto de Deseo*, QUÉ PASA, Feb. 20, 2004.

195. *See* Valeria Ibarra, *Grupo Matte se Transforma en el Segundo Operador Eléctrico del País*, LA TERCERA, Aug. 4, 2005, *available at* http://www.icarito.cl/medio/articulo/0,0,3255_5676_152186673,00.html (last visited July 14, 2009); Sandra Rojas, *Nuevo Gerente Reorganiza Colbún y Anuncia Inversiones por U.S. $800 Millones*, LA TERCERA, Dec. 18, 2005, *available at* http://edelect.latercera.cl/medio/articulo/0,0,3255_5676_177567288,00.html (last visited July 14, 2009).

196. *See* Carla Alonso, *El Factor Matte: La Alianza Colbún-ENDESA y las Cifras Alegres del Negocio Hidroeléctrico*, LA NACIÓN, Apr. 17, 2006, http://www.mapuexpress.net/content/publications/print.php?id=308; *ENDESA y Colbún Acuerdan Fórmula para Alianza en Proyecto Aysén*, LA TERCERA, Apr. 27, 2006, *available at* http://www.icarito.cl/medio/articulo/0,0,3255_5676_203218517,00.html (last visited July 14, 2009).

F. Epilogue: Updating Events to 2009

Most of the research for this article was finished in mid-2006. In the three years since then, there have been many changes in the day-to-day details of relevant issues in Chile, although none of these changes significantly affect my analysis here. I have followed these issues as carefully as I can through Chilean news media, personal and professional contacts there, and regular travel, and in the following paragraphs I offer a brief summary update.

1. HidroAysén and Patagoniau

This national and international conflict has continued to be heated. In December 2006, the fourth consecutive government of the *Concertación*, led by President Michelle Bachelet, declared its continued support for hydropower development in the Aysén Region, while insisting that all projects would have to earn approval through the national System for Environmental Impact Assessment.[197] In 2007, a new actor entered the scene, Xstrata, a Swiss-owned company which had acquired the water rights from an earlier, now-abandoned project to build an aluminum smelter in Aysén. Xstrata presented its environmental impact study in January, while HidroAysén's was still in preparation.[198] Meanwhile the CNE began to include future Patagonian hydropower in its calculations of future node prices.[199]

HidroAysén suffered a setback in August 2007, when the government released two technical reports, with the DGA and the Minister of Environment criticizing aspects of the projects' original designs. The company responded by reducing the planned size of some of the reservoirs.[200] The DGA continued its challenge by asking Chile's Court for the

---

197. *See* Andrea Sierra, *El Gobierno Está Consciente de que los Recursos en Aisén Van a Tener que Usarse*, EL MERCURIO, Dec. 10, 2006 (interview with Public Works Minister Eduardo Bitrán), *available at* http://diario.elmercurio.cl/detalle/index.asp?id={fc4f7eb4-f8ea-4623-8d5b-bf2988f4cd67}; *CNE Defiende Plan Hidroeléctrico en Aisén*, EL MERCURIO, Dec. 12, 2006. On the System for Environmental Impact Assessment, see sources cited *supra* note 30 and accompanying text. R

198. José Miguel Jaque, *Central Río Cuervo Entró a Sistema de Evaluación de Impacto Ambiental*, LA NACIÓN, Jan. 3, 2007.

199. *Gobierno de Nueva y Potente Señal para Construcción de Centrales Eléctricas en Aisén*, EL MERCURIO, Mar. 20, 2007, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={07a4a7ec-b1fc-497c-9467-aeb68f9061bf}. *See also supra* text accompanying notes 129–131. R

200. *See* Carla Alonso & Darío Zambra, *Los Estudios que Doblaron la Mano a Endesa y los Matte*, LA NACIÓN, Aug. 5, 2007; José Miguel Jaque, *El Costo no lo Va a Pagar el Medio Ambiente*, LA NACIÓN, Aug. 10, 2007, *available at* http://www.lanacion.cl/prontus_noticias/site/artic/20070809/pags/20070809215456.html.

Defense of Free Competition[201]—formerly the Anti-Monopoly Commission—to rule on the question of whether HidroAysén, by combining ENDESA and Colbún, represented an excessive concentration of the ownership of water rights. In October, the Court decided in favor of the companies' joint venture but imposed several conditions to reduce their monopoly power. Most notably, the Court ordered the companies to sell some of their water rights and to withdraw pending requests for other rights located in specific rivers. The Court also made recommendations affecting the future transmission lines to central Chile and the internal governance of the CDEC.[202]

In October 2007, the Italian power company ENEL bought a majority stake in ENDESA España, with no apparent effect on the Spanish company's operations in Chile.[203] In August of 2008, HidroAysén finally presented its environmental impact study after years of work. To widespread surprise in Chile, considering the companies' political influence and the large sums spent on professional consultants, the report was criticized by numerous government agencies for providing inadequate information and poor quality analysis. The DGA was particularly critical and, in October 2008, the agency denied some of the companies' pending applications for new water rights that were part of the proposed redesign of the projects.[204] HidroAysén finally withdrew the environmental impact study in order to resubmit it in 2009. While the projects are certainly not dead, their approval has turned out to be far from the foregone conclusion that many people (including myself) had assumed.

---

201. *See* Tribunal de Defensa de la Libre Competencia, http://www.tdlc.cl/Portal.Base/Web/VerContenido.aspx?GUID=&ID=628 (last visited Apr. 28, 2010).

202. José Troncoso Ostornol, *Tribunal de la Competencia Aprueba Alianza entre Endesa y Colbún con Cuatro Condiciones*, EL MERCURIO, Oct. 20, 2007, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={88236b91-c1b8-443f-8d44-cac6c0792977}. *See also* Tribunal de Defensa de la Libre Competencia, Resolución No. 22/2007 (Oct. 19, 2007), *available at* http://www.tdlc.cl/DocumentosMultiples/Resoluci%C3%B3n_22_2007.pdf.

203. *See supra* note 6. R

204. *See* Antonio Valencia, *Duros Informes Fiscales Contra Proyecto HidroAysén*, LA NACIÓN, Oct. 9, 2008, *available at* http://www.lanacion.cl/prontus_noticias_v2/site/artic/20081008/pags/20081008215616.html; D. Bustamante & V. Moya, *DGA Rechaza Nuevos Derechos de Agua a Central de HidroAysén Pese a Respaldo Inicial de Gobierno*, EL MERCURIO, Nov. 5, 2008, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={d29401de-036e-462c-bca8-03ecbd792976}; Lorena Rubio, *Cortocircuito en HidroAysén*, REVISTA QUÉ PASA, *available at* http://www.quepasa.cl/medio/articulo/0,0,38039290_101111578_372972504,00.html; Darío Zambra, *HidroAysén se Hunde*, LA NACIÓN, Nov. 16, 2008, *available at* http://www.lanacion.cl/prontus_noticias_v2/site/artic/20081116/pags/20081116012421.html.

2. Other Hydropower Development

AES-Gener, a company that has traditionally depended heavily on thermal power generation, has proposed a large hydropower dam in the mountains near Santiago, on the upper Maipo River. The project has been opposed by environmentalists and local residents, and has also met problems with Aguas Andinas—the large multinational company that supplies water to the metropolitan region of Santiago.[205]

There are also two other foreign companies, based in Norway and Australia, that have been building small and medium hydropower projects in central and southern Chile. Both companies have focused on run-of-the-river projects, and have largely succeeded in avoiding environmental and other water conflicts.[206]

On a small to medium scale, a number of irrigators and canal-users' associations have also been retrofitting their irrigation canals to produce electricity in order to take advantage of rising prices. In some cases, this has apparently led to new alliances with power companies that were formerly adversaries.[207]

3. Electricity Policies

In the last two years, Chile's government has responded in two somewhat contradictory ways to the continuing threat of national electricity shortages and high prices. On one hand, there is powerful political pressure to approve and build large new projects as quickly as possible. These certainly include more hydropower dams, despite the unexpected delays in Patagonia, but they include an unabashed revival of coal-burning power plants as well. There is also increasing talk of the inevitability of nuclear power.[208] On the other hand, there have been several studies and reports about renewable and non-conventional sources of energy.

---

205. D. Bustamante & R. Barría, *Corema Aprueba Obras para la Hidroeléctrica Alto Maipo y Opositores Irán a Tribunales*, El Mercurio, Mar. 27, 2009, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={f7e52948-c309-4930-99e4-09356b2c1d98}.

206. *See* SN Power, http://www.snpower.no/; Pacific Hydro, http://www.pacifichydro.com.au/.

207. Personal Communication with Alejandro Vergara, July 2008 (on file with author); *see also* Comisión Nacional de Riego, Centrales Hidroeléctricas Asociadas a Obras de Riego: Manual para Organizaciones de Usuarios de Aguas (2008), *available at* http://www.cnr.gob.cl/opensite_20061215151203.aspx.

208. *See* Beatriz Mitchell & Alejandra Carmona, *Una Poderosa Carga Eléctrica: El Lobby para no Quedarse a Oscuras*, La Nación, Oct. 26, 2008, *available at* http://www.lanacion.cl/prontus_noticias_v2/site/artic/20081025/pags/20081025173530.html; Paula Comandari, *La Secreta Agenda Nuclear Chilena*, Qué Pasa, Apr. 2008, *available at* http://www.icarito.cl/medio/articulo/0,0,38039290_101111578_349412866,00.html; José Antonio Viera-Gallo, Minister of the Presidency, Remarks made to Chilean Chamber of Construction, La Energía: Debates y Decisiones (May 21, 2008).

Such alternatives have long been dismissed as naïve or unimportant by Chile's political and economic elite, but in the current context that attitude has started to change. In March 2008, the government passed a new law requiring generators to obtain 5 percent of the electricity they sell from renewable energy sources between 2010 and 2014, increasing to 10 percent in 2024.[209]

4. Water Rights Law and Policy

Despite the 2005 reform of the Water Code,[210] political and legal conflicts over water rights have continued to be fierce and it is too early to conclude much about the reform's concrete impacts. There is some evidence that the new fees for non-use have led to greater numbers of DGA auctions of water rights—especially non-consumptive rights—and, in at least one case, the resulting prices were high enough to send ripples through Chilean legal and business circles.[211] If that trend continues, it will meet the reformers' goals of shaking up the current situation of monopoly, speculative ownership, and barriers to new development.

Nonetheless, there seems to be growing social and political opposition to the neoliberal essence of the Water Code. A variety of left-leaning politicians, including members of the governing *Concertación*—along with many social and environmental activists, and the strong voice of the Catholic Archbishop of Aysén—have called for the "nationalization" of water resources.[212] Some of these arguments have displayed a poor understanding of the legal nuances of the current system, for example,

---

209. *See* STEPHEN HALL ET AL., ¿SE NECESITAN REPRESAS EN LA PATAGONIA? UN ANÁLISIS DEL FUTURO ENERGÉTICO CHILENO (2009); PROGRAMA DE ESTUDIOS E INVESTIGACIONES EN ENERGÍA DEL INSTITUTO DE ASUNTOS PÚBLICOS DE LA UNIVERSIDAD DE CHILE & NÚCLEO MILENIO DE ELECTRÓNICA INDUSTRIAL Y MECATRÓNICA, CENTRO DE INNOVACIÓN EN ENERGÍA DE LA UNIVERSIDAD TÉCNICA FEDERICO SANTA MARIA, APORTE POTENCIAL DE ENERGÍAS RENOVABLES NO CONVENCIONALES Y EFICIENCIA ENERGÉTICA A LA MATRIZ ELÉCTRICA, 2008–25 (2008), *available at* http://www.eula.cl/doc/chile_new_renewables.pdf; Beatriz Mitchell, *La Sorpresa Renovable: Estudio de Energía Sustentable Deja Chica a la Ley*, LA NACIÓN, Aug. 10, 2008, *available at* http://www.lnd.cl/prontus_noticias_v2/site/artic/20080809/pags/20080809190947.html.

210. *See supra* Part III.C.

211. This was the case with the Río Manso in Region X. *See Escasez y Alta Demanda por Derechos de Agua Disparan Precios*, ESTRATEGIA, June 26, 2008.

212. *See, e.g.*, *Proyecto de Ley Busca Nacionalizar el Agua*, LA NACIÓN, Mar. 20, 2008; Claudia Urquieta Chavarría, *Obispo de Aisén Lanza Dura Carta Medioambiental con Leonardo Boff*, EL MOSTRADOR, Aug. 25, 2008, *available at* http://www.defendamoslaciudad.cl/modulos.php?mod=noticias&fn=94e679ab46d568928ad91afb91a749bb&id=1037; Humberto Peña Torrealba & Pablo Jaeger Cousino, *¿Nacionalización del Agua?*, EL MERCURIO, Dec. 20, 2008, *available at* http://www.unesco.org.uy/phi/conaphi/chile/fileadmin/templates/conaphi.cl/documentos/Nacionalizacion_del_Agua_HP-PJ_20122208.pdf. *The New York Times* picked up the story of "the country's intensifying water wars." *See* Alexei Barrionuevo,

water is already public property in formal terms and many critics have overlooked the distinction between consumptive and non-consumptive water rights. The gist of the criticism is clear, however, and it is undoubtedly true that private ownership and control of non-consumptive water rights is highly concentrated in Chile. In response, the current Minister of Public Works has proposed several legislative and constitutional changes that would increase public restrictions on private property rights.[213]

In addition, the level of conflict over water among powerful economic actors is high. A leading Chilean business magazine recently published a cover story titled, "The Water Is Boiling," which described the variety of intensifying water conflicts in different regions of the country from north to south.[214] Interviews with corporate executives and the head of the DGA agreed that growing numbers of high-stakes conflicts were ending up in court and many were leading to expensive and ad hoc financial settlements.[215]

Finally, and most relevant to my argument in this article, ENDESA has taken legal action to try to convince the courts that electricity law is superior to water law in managing river basins. The specific issues are technical and apply to particular local disputes with irrigators and, so far, there has not been a definitive resolution. But the steam is building up.[216]

5. Climate Change

In Chile, as in so many countries, issues of climate change have gone from obscure scientific debates to headline news over the past few years. In early 2007, the National Environment Commission released a study concluding that global warming would cause higher temperatures in Chile and, therefore, less snowfall and more rain and flooding. The

---

Chilean Town Withers in Free-Market for Water, N.Y. TIMES, Mar. 14, 2009, at 8 (quoting and partially misquoting Carl Bauer).

213. Claudia Urquieta Chavarría, *MOP se la Juega por Abrir Debate Político*, EL MOSTRADOR, Jan. 7, 2009; *El Agua como Derecho Constitucional*, EL MOSTRADOR, Sept. 21, 2009.

214. Roberto Sapag, *Hierve el Agua*, CAPITAL N. 255, June 26–July 9, 2009, at 40-48, *available at* http://www.capital.cl/reportajes-y-entrevistas/hierve-el-agua-2.html.

215. *Id.*

216. *SNA se Enfrenta a Endesa en Demanda por Control de Embalses*, EL DIARIO FINANCIERO, Apr. 25, 2008, *available at* http://www.chilepotenciaalimentaria.cl/content/view/173358/SNA-se-enfrenta-a-Endesa-en-demanda-por-control-de-embalses.html; Claudia Urquieta Chavarría, *La Última Jugada de Endesa para Concentrar sin Contrapesos Derechos de Agua*, EL MOSTRADOR, May 12, 2008, *available at* http://www.ecosistemas.cl/1776/fo-article-82026.pdf.

impact was predicted to be severe for agriculture and for hydropower.[217] At the same time, the Fourth Report of the Intergovernmental Panel on Climate Change indicated that precipitation in central and south-central Chile was likely to drop by 15 to 20 percent over the next 75 years.[218] One of the implications was that hydropower in Patagonia might become especially attractive in that context.[219] Most recently, in November 2009, a United Nations study of the economics of climate change in Chile concluded that decreasing precipitation would cause hydropower generation to decline 10 to 20 percent over the next century, at an estimated cost of US$100 million per year. Chile's Minister of Environment said that the study would form the basis of the country's position in the international climate meetings in Copenhagen in December 2009.[220]

VI. SUMMARY AND CONCLUSIONS

In this article I have argued that hydropower is a nexus between water and energy—both a use of water and a source of electrical power—and, therefore, we need to look at hydropower regulation along two different axes—from the different perspectives of the water sector and the electricity sector. The structure of the article reflects this two-part analysis. I discussed hydropower regulation, first, in the context of other water uses and water rights at the scale of river basins and, second, in the context of the national electricity sector and the crucial relationship with thermal power generation. In each sector, I also focused on the institutional law and economics of property rights and markets—the rules of the game.

This two-part analysis of hydropower seems to be a simple idea in theory, almost self-evident, but it has rarely been applied in practice in Chile or elsewhere. My approach here can apply to all countries with mixed hydro-thermal power systems, despite different frameworks of water and electricity laws. In the current context of global and regional

---

217. DEPARTAMENTO DE GEOFÍSICA, UNIVERSIDAD DE CHILE, COMISIÓN NACIONAL DEL MEDIO AMBIENTE CONAMA: ESTUDIO DE LA VARIABILIDAD CLIMÁTICA EN CHILE PARA EL SIGLO XXI, (Dec. 2006), *available at* http://www.conama.cl/portal/1301/articles-39442_pdf_Estudio_texto.pdf.

218. *See generally* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT, *available at* http://www.ipcc.ch/.

219. Gustavo Orellana Venegas, *Cambio Climático Llevará al País a Modificar Fuentes de Energía*, EL MERCURIO, Feb. 6, 2007, *available at* http://diario.elmercurio.cl/detalle/index.asp?id={8ee7f0cb-a23f-4e82-8519-c7721e1ca746}.

220. Cristina Espinoza, *100 Millones de Dólares Perderá Sector Hidroeléctrico por Cambio Climático*, LA NACIÓN, Nov. 21, 2009, *available at* http://www.lanacion.cl/100-millones-de-dolares-perdera-sector-hidroelectrico-por-cambio-climatico/noticias/2009-11-20/205450.html.

climate change, changes in the dual roles of hydropower are both complex and critically important. Chile is internationally significant because it combines strong, pro-market laws in both water and electricity sectors. How are rivers governed for multiple uses when both sectors are so market-oriented? How is the power grid governed when water and environmental trade-offs are so diverse and interconnected?

The point of the Chilean water sector analysis is that hydropower enjoys a privileged position in a weakly regulated water rights system. Both the 1981 Water Code and its minor reform in 2005 have favored hydropower development, and government agencies have acted accordingly. The situation has been complicated because the Water Code has also favored other economic uses of water and, until 2005, it also encouraged unproductive speculation in water rights. Nevertheless, hydropower has been treated as "first among equals." The Chilean Supreme Court favored hydropower water rights over consumptive water uses in its 1993, landmark *Pangue* decision, which is still the law of the land despite its poor reasoning. The short-term benefits for hydropower interests are obvious. The long-term costs for multipurpose water management are unknown. For water uses other than hydropower, river basin governance and integrated water management remain weak in Chile. Two of Chile's most important rivers for hydropower, the Maule and Laja, are unusual because their uppermost reservoirs are still governed by legal agreements dating from the 1940s and 1950s. Even so, the government has favored hydropower over irrigation in managing those reservoirs during recent droughts.[221]

Chilean water law does not address electricity issues, except implicitly in defining non-consumptive water rights to promote hydropower development. Likewise, Chilean electricity law does not address water issues, except for "water as fuel"—that is, falling water as an input for generating electrical power. For that purpose, electricity regulations are spelled out in detail and control how dams store and release water. There is little reference to water law, although there are a few older examples of dual-purpose dams that operate to supply irrigation water rights as well as hydropower.

In the Chilean electricity sector, the primary issue is that hydropower is the key to national power generation, and dams with reservoir storage are especially strategic to this generation. This strategy dates back to the 1940s, when the government created ENDESA to carry out a national electricity plan of which hydropower was the backbone. Since privatization, the dynamic relationships and sometimes conflicting interests between hydropower and thermal power have been at the heart of

221. *See supra* Part III.

the sector's political economy. The tension between hydropower and thermal power, when owned by competing companies, explains many of the last decade's conflicts within the Chilean electricity sector.

Chilean electricity law has granted de facto property rights to water to the owners of hydropower dams. These are not the water rights defined by the Water Code—which dam-owners have as well—but these de facto rights are the rules that effectively govern how rivers are controlled, determining for what purposes the rivers are used and for whose benefit. The CDEC's mandatory orders to operate dams and reservoirs are the clearest example. Another way to put this argument is that electricity law trumps water law when hydropower is present. I do not mean to say that the two laws are in conflict, but rather that the water law is secondary and facilitates the dominance of electricity regulations. The best example of this is the basic principle that water is free, a principle that is rarely questioned in Chile and certainly not in the electricity sector. As a result, wealth has been transferred from farmers, fishermen, environmentalists, and other water users to the owners of hydropower.

This leads to an unexpected conclusion: Chilean rivers that have hydropower dams are in fact more regulated than they seem. This is the explanation for the Maule basin puzzle that I described in Part I; that is, why the electricity companies were not concerned about the Water Code's ineffective river management. I did not understand this explanation in my previous work.[222] Because Chile's regulatory framework for electricity is more centralized than the laissez-faire Water Code, the governance of river systems with hydropower is not as weak as it appears from the perspective of water rights.

This conclusion is especially significant for dams with storage capacity. Building a reservoir effectively brings a river under the jurisdiction of electricity law.[223] For purposes other than hydropower, however, water regulation is weak whether the issues concern other water uses, integrated water management, or ecosystem support. This is bad news for water sustainability and governance.[224]

These lessons matter for future hydropower development in Chile, and not only in Patagonia. From the standpoint of environmental advocates, arguments about hydropower dams should be framed at least partly in terms of electricity regulation. Arguments that are limited to

---

222. *See supra* note 26 and accompanying text. R

223. I owe this insight to David Tecklin.

224. For a more upbeat assessment written by the former head of the DGA, see generally Humberto Peña et al, *Water and sustainable development: Lessons from Chile*, GLOBAL WATER PARTNERSHIP POLICY BRIEF (2004), *available at* http://www.gwpforum.org/gwp/library/Policybrief2Chile.pdf; *see also* Peña, *Taking It One Step at a Time*, *supra* note 75. R

environmental law or water law will miss the driving forces behind hydropower development and operation. This means that environmental advocates need to understand the technicalities and trade-offs that are fundamental to mixed hydro-thermal power systems, such as the security and efficiency of different sources of electricity generation. Environmental advocates should also analyze the basic political economy of the electricity sector, the distribution of costs, benefits, and risks among different actors—including how price signals and incentives both reflect and reinforce that distribution. A deeper understanding of these factors would help to design political strategies and build innovative political alliances.

The environmental campaign against dams in Chilean Patagonia has some important similarities with the early stages of the environmental movement in the United States. The political conflicts over proposed dams at Echo Park and the Grand Canyon, which were to be built by the U.S. Bureau of Reclamation in the 1950s and 1960s, involved fundamental questions about the balance between economic growth and environmental preservation.[225] In Chile, an equivalent conflict was the campaign in the 1990s against ENDESA's Pangue and Ralco dams on the upper Bío Bío River.[226] That campaign failed to block the dams but it began to turn the terms of national debate away from the automatic approval of new dam projects. The current debate about Patagonia has built on that earlier change. The Chilean and U.S. historical contexts have important differences, too, of course; the influence of international factors is much greater in Chile, as is the social and political pressure for more economic growth.

For Chilean policymakers, in both public and private sectors, the current hydropower boom is a critical challenge and opportunity. The existing legal framework has let many of hydropower's externalities go uncompensated, both the impacts on other water uses and the environmental costs. Chile needs to strengthen capacity for integrated water management and water governance before the next generation of hydropower development fixes water allocations in concrete. Energy policymakers, in particular, need to more carefully consider the long-term impacts of Chile's hydropower boom on water governance and on ecosystem goods and services. In a world of changing climates, there are new uncertainties in water supplies and untold levels of complexity in the interactions between water and energy systems. The different roles of

225. *See generally* JOHN MCPHEE, ENCOUNTERS WITH THE ARCHDRUID (1971); MARC REISNER, CADILLAC DESERT: THE AMERICAN WEST AND ITS DISAPPEARING WATER 284–85 (1986).

226. *See* BAUER, AGAINST THE CURRENT, *supra* note 24. R

hydropower in water and energy are changing, just as the physical conditions of water systems are becoming more variable and unknown. New or modified infrastructure is probably needed but this is not a good time to build first and ask questions later.

The Chilean government's lack of regulatory power in the energy sector places major constraints on its national energy strategy. Government agencies such as the National Energy Commission and Ministry of Economy have authority to enforce existing regulations but not to change legislation that imposes strong limits on administrative discretion. Because of these limits and the dominant role of private companies, government agencies have little capacity to require alternatives or to change price signals affecting energy conservation, efficiency, and nonconventional or renewable sources of energy. This is a problem because hydropower and thermal power must be regulated together or any increased costs for hydropower will simply lead to greater carbon emissions. Unfortunately, to some extent, this is already happening in Chile.[227]

In the international policy arena, people look to Chile for advanced examples of markets in water and for pioneering—if dated—examples of markets in electricity. However, no one looks to Chile for examples of governance or sustainability. Chile has been essentially absent from the last two decades of international debate about river science and policy, particularly in the areas of environmental flows and ecosystem goods and services.[228] This is unfortunate because much of that debate has been about market incentives,[229] yet, the Chilean experience has offered little because of its narrow economic emphasis.[230] Today, the leading edge of international water policy is focused on trying to achieve a more balanced approach and, as water problems have become more politically and socially difficult, the central concern is governance: the institutions and processes for resolving conflicts.

The changing dual roles of hydropower are a global theme, framed by climate change and the water-energy nexus. Many countries lack the interdisciplinary analysis of hydropower governance as a problem that brings together water, energy, and environmental systems. We need more studies of the relationships between hydropower and thermal power, between hydropower and other renewable energy sources, and

---

227. *See supra* note 208 and accompanying text. R

228. *See generally* POSTEL & RICHTER, RIVERS FOR LIFE, *supra* note 11. R

229. *See, e.g.*, Aylward, *Freshwater Ecosystem Services*, *supra* note 15; Dustin Garrick et al., *Water Markets and Freshwater Ecosystem Services: Policy Reform and Implementation in the Columbia and Murray-Darling Basins*, 69 ECOLOGICAL ECON. 366 (2009). R

230. BAUER, SIREN SONG, *supra* note 23, at 89–90. R

between large-scale and small-scale hydropower. There are water and energy trade-offs and interactions that we are just beginning to sort out. Sorting them out in terms of institutional change, the evolution of property rights, and governance are among the looming challenges of sustainability. In this sense, climate change represents a new set of driving forces for an old historical problem.[231]

Finally, let us return to the issue of water and electricity as different commodities. In her study of the privatization and regulation of the water industry in the United Kingdom, the geographer, Karen Bakker, has argued that water is an "uncooperative commodity" because its unusual physical characteristics prevent its full conversion into an economic good that can be sold for a price in a market exchange—despite strong political support for neoliberal policies.[232] I have made a similar argument; although the Water Code has more fully commodified water rights in Chile than the United Kingdom, nevertheless the physical characteristics of water have imposed limitations in practice.[233]

If we apply this framework to Chilean hydropower, however, we find a different story on the electricity side of the nexus. Chile has gone further in all three areas of electricity policy than in the case of water; not only in privatization and commercialization, but also in commodification. Electricity is apparently a more cooperative commodity than water, since electricity's physical characteristics are more readily manipulated by humans and their technology. In short, water and electricity are physically stuck together in hydropower but they have been commodified to different degrees. This distinction should also apply to other countries besides Chile, since it reflects the physical nature of the two resources rather than different legal approaches.

Thus, I conclude by reaffirming core principles of institutional law and economics and political economy: rules come before markets. Law and politics determine economic value as much as markets do, because law and politics establish the rules of the game that include how property rights are defined, what costs and benefits are recognized, to whom they are allocated, how conflicts are resolved, and who gains and who loses.[234] In the Chilean example, the electricity sector's de facto property rights to water, together with the courts' preference for hydropower

---

231. *See generally* Kathleen Miller et al., *Global Change in Microcosm: The Case of U.S. Water Institutions*, 29 POL'Y SCI. 271(1996).

232. *See* Bakker, *Neoliberalizing Nature?*, *supra* note 32, at 543–46; BAKKER, AN UNCOOPERATIVE COMMODITY, *supra* note 32, at 18–42. R R

233. *See generally* BAUER, AGAINST THE CURRENT, *supra* note 24; Bauer, *Slippery Property Rights*, *supra* note 24. R R

234. *See* BAUER, SIREN SONG, *supra* note 23 and accompanying citations; Bauer, *The Experience of Chilean Water Markets*, *supra* note 67. R

water rights, have strongly affected the price of electricity and the distribution of its costs and benefits. These legal rules and political decisions have effectively subsidized hydropower generation, despite the frequent claim in Chile that hydropower's dominance reflects neutral market forces.[235] Many values and interests are at stake here, in Chile and other countries, and how to combine markets and regulation for both water and energy will continue to be arenas of political and economic struggle.

235. Prieto, El Modelo Chileno, *supra* note 30; Prieto & Bauer, Hydroelectric Power, *supra* note 30. R R