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## Legal Control of Consumptive Water Use in Pennsylvania Power Plants

R. Timothy Weston

Joseph R. Gray

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# Legal Control of Consumptive Water Use in Pennsylvania Power Plants

R. Timothy Weston\*  
Joseph R. Gray\*\*

## Table of Contents

I. Introduction .....	354
II. Hydrologic and Technical Aspects: An Overview .....	356
III. Common-Law Approaches to Consumptive Uses .....	363
A. <i>Riparian Rights</i> .....	363
1. <i>Nature and Limit of Riparian Rights</i> .....	364
(a) <i>Uses on riparian lands</i> .....	365
(b) <i>Uses off riparian lands</i> .....	369
(c) <i>Priorities</i> .....	369
2. <i>Power Plants' Riparian Rights</i> .....	371
3. <i>Remedies for Power Plant Diversions</i> .....	372
(a) <i>Equitable remedies</i> .....	372
(b) <i>Legal remedies</i> .....	375
B. <i>Prescriptive Rights</i> .....	376
C. <i>Rights of Public Water Companies Holding State Permits</i> .....	379
1. <i>Acquisition of Rights</i> .....	379
2. <i>Rights of Downstream Water Supply Agency</i> ...	380
3. <i>Taking of Water by Downstream Power Plant</i> ...	382
D. <i>Condemnation by Thermal-Electric Power Plants</i> .....	383
IV. Regulatory Approaches to Consumptive Uses .....	384
A. <i>State Regulatory Programs</i> .....	384
B. <i>Interstate Compact Commission Programs</i> .....	389
C. <i>Federal Controls</i> .....	396
1. <i>Nuclear Regulatory Commission</i> .....	397
(a) <i>Consideration of water use by NRC</i> .....	397
(b) <i>Review of NRC actions</i> .....	403
2. <i>Other Federal Agencies</i> .....	407
V. Conclusion .....	408

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\* B.A. 1969, University of California at Santa Barbara; J.D. *cum laude* 1972, Harvard University. Assistant Attorney General, Pennsylvania Department of Environmental Resources and chief counsel to the Pennsylvania State Water Plan. The opinions expressed in this article are solely those of the authors and do not necessarily represent the opinions or policies of the Commonwealth of Pennsylvania or the Department of Environmental Resources.

\*\* Senior Staff Member, Dickinson Law Review.

## I. Introduction

Amid the resource shortage crises of the past five years, the least mentioned and perhaps most critical is water. The bountiful precipitation in the eastern United States<sup>1</sup> has allowed relatively unrestricted urban, industrial, commercial, agricultural, and recreational development. The apparent availability of abundant water supplies has caused a continuance of a complacent and largely *laissez-faire* approach to water law and management.<sup>2</sup> As with other resources, however, indifferent management of water is coming to an end. New water demands and uses—even in the “wet” East—are approaching or have already exceeded available supplies.<sup>3</sup> The possibilities for shortage have been concealed by a period of relatively high precipitation.<sup>4</sup> Nevertheless, the potential problems to eastern users were underscored recently when a five-year drought brought water supplies in the Delaware basin within days of exhaustion.<sup>5</sup> The need for citizens, administrators, and the legal profession to examine carefully and reform our water management laws and institutions to meet new challenges is patent.

Among the most important new challenges to our water supply are those posed by the developing national energy program. The federal government<sup>6</sup> has committed the country to a program of energy self-sufficiency. On the other hand, the United States Water Resources Council already has concluded that the “availability of adequate supplies of water will be a constraint on reaching energy self-

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1. Most states east of the Mississippi including Pennsylvania receive an annual precipitation in excess of thirty-five inches. U.S. Dep't of Agriculture, Isohyetal Map prepared for Senate Select Comm. on National Water Resources (1959) in 1 WATERS AND WATER RIGHTS 21 (R. Clark ed. 1967) [hereinafter cited as WATERS AND WATER RIGHTS].

2. See generally NATIONAL WATER COMM'N, A SUMMARY DIGEST OF STATE WATER LAWS (1973) [hereinafter cited as STATE WATER LAW DIGEST]; 1 WATERS AND WATER RIGHTS, *supra* note 1, at 65-71.

3. See notes 47-65 and accompanying text *infra*.

4. The last major drought in the northeastern United States occurred from 1962 to 1965. Since 1967 annual precipitation has been near or above average and summer rainfall generally has sustained flows in all major Pennsylvania basins. Interview with O.D. White, Hydrologist-in-Charge, Federal-State River Forecasting Center, Harrisburg, Pa., January 12, 1976.

5. See Hogarty, The Delaware River Drought Emergency, Inter-University Case Program #170 (1970). Simultaneously the Northeast's drought caused small streams in the Susquehanna basin to dry up and severely lowered water quality in others.

6. See Federal Energy Administration Act of 1974, 15 U.S.C.A. §§ 761-86 (Supp. 1976); Energy Supply & Environmental Coordination Act of 1974, *id.* §§ 791-98; Geothermal Energy Research, Development & Demonstration Act of 1974, 30 *id.* §§ 1101-64; Solar Heating & Cooling Demonstration Act of 1974, 42 *id.* §§ 2473, 5501-17; Energy Reorganization Act of 1974, *id.* §§ 5801-91; Federal Nonnuclear Energy Research & Development Act of 1974, *id.* §§ 5901-15; Federal Energy Policy & Conservation Act of 1975, Act of Dec. 22, 1975, Pub. L. No. 94-163, 89 Stat. 871.

sufficiency.”<sup>7</sup> Although on a national scale large amounts of fresh and other water “are available and could be used for meeting energy-related needs . . . , available water supplies are poorly distributed between the several regions of the Nation with wide monthly and seasonal variation.”<sup>8</sup> The north Atlantic and Ohio regions, including portions of the Delaware, Susquehanna, Monongahela, Allegheny, and Ohio watersheds, have been identified as areas of variable water availability and potential shortage for energy purposes.<sup>9</sup> Energy self-sufficiency will require intensive development and management of water resources,<sup>10</sup> a mandate that may exceed the ability of existing state and federal water allocation doctrines, policies, and institutional schemes.<sup>11</sup>

The purpose of this article is to focus on a portion of this problem: the available legal and institutional methods of managing consumptive water uses in thermal-electric generating projects, particularly in the Commonwealth of Pennsylvania. After a brief discussion of physical and technological factors, this article will identify existing common-law, statutory, and administrative means of resolving conflicts between power plant water consumption and other users. The adequacy of remedies available to affected riparian owners, municipalities, and public water supply agencies will be analyzed. Next, the article will focus on the various state, interstate, and federal regulatory programs that address these conflicts. This discussion is intended to guide legal practitioners and administrators through the

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7. U.S. WATER RESOURCES COUNCIL WATER FOR ENERGY SELF-SUFFICIENCY—EXECUTIVE SUMMARY 3 (1974) [hereinafter cited as WRC SELF-SUFFICIENCY REPORT]; see WATER RESOURCES COUNCIL, FEDERAL ENERGY ADMINISTRATION PROJECT INDEPENDENCE BLUEPRINT, FINAL TASK FORCE REPORT, WATER REQUIREMENTS, AVAILABILITIES, CONSTRAINTS AND RECOMMENDED FEDERAL ACTIONS (1974) [hereinafter cited as PROJECT INDEPENDENCE BLUEPRINT]; Kneese & Brown, *Water Demands for Energy Development*, 8 NAT. RES. L. 309 (1975).

8. WRC SELF-SUFFICIENCY REPORT, *supra* note 7, at 3.

9. *Id.* at 4.

10. See note 7 and accompanying text *supra*. Intensive water development and management includes comprehensive water planning, allocating water among priority uses, construction of reservoirs to regulate stream flow, and a program of water conservation.

11. WRC SELF-SUFFICIENCY REPORT, *supra* note 7, at 5. For a discussion of the impact of energy development on the water laws of the western states see Clark, *Ground Water Law: Problem Areas*, 8 NAT. RES. L. 377 (1975); Dewsnup, *Problems Under State Water Laws: Initiation of New Rights*, 8 NAT. RES. L. 347 (1975); Muys, *Legal Problems Involved in Developing Water Supplies for Energy Development*, 8 NAT. RES. L. 335 (1975); Pring & Edelman, *Reclamation Law Constraints on Energy/Industrial Uses of Western Water*, 8 NAT. RES. L. 297 (1975); White, *Problems Under State Water Laws: Changes in Existing Water Rights*, 8 NAT. RES. L. 359 (1975).

maze of issues and institutions involved in the energy-related consumptive water use problem and to stimulate a more constructive approach to these questions.

## II. Hydrologic and Technical Aspects: An Overview

In most eastern river basins water is used repeatedly as it flows to the sea. It is withdrawn and returned through sewage plants and industrial waste discharges and withdrawn again by downstream users. Simultaneously the water is applied to "in-stream" uses, such as commercial navigation, recreation, dilution of pollutants, and maintenance of wildlife and aquatic ecosystems. The Schuylkill River is an example of intensive water use: during the 1965 drought its water was used and reused over seven times before it reached the Delaware at Philadelphia.<sup>12</sup>

Most water uses are relatively nonconsumptive. Ninety percent of municipal and domestic water withdrawals from streams is returned through sewage treatment plants.<sup>13</sup> Of the estimated 4618 million gallons per day (MGD) withdrawn in 1970 for industrial use in Pennsylvania, only 331 MGD or 7.2 percent was consumed.<sup>14</sup> A steady trend toward increased consumptive water use is under way, however, in electricity generation projects.

A thermal power plant uses heat from fossil or nuclear fuel to produce steam, which drives turbines to generate electricity.<sup>15</sup> Current technology allows a relatively low efficiency for thermal power projects. Fossil fuel plants are thirty-three to forty percent efficient

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12. J. McSparren & S. Runkle, *Methods and Criteria for Adequacy of Water Sources*, paper delivered to the American Soc'y of Eng'rs, Nat'l Water Resources Eng'r Meeting, Atlanta, Ga., January 19, 1972.

13. See DELAWARE RIVER BASIN COMM'N, *WATER MANAGEMENT OF THE DELAWARE RIVER BASIN I-59* (1975) [hereinafter cited as DRBC WATER MANAGEMENT]; PA. DEP'T OF ENVIRONMENTAL RESOURCES, OFFICE OF RESOURCES MGMT., *STATE WATER PLAN PLANNING PRINCIPLES 19* (1975) [hereinafter cited as PA. PLANNING PRINCIPLES].

14. Pa. Dep't of Environmental Resources, *Bur. of Resources Programming, Pennsylvania Consolidated Water Use Report—State Totals* (Computer Printout, Oct. 16, 1975) [hereinafter cited as Pa. Water Use].

Agricultural irrigation is considered totally consumptive because all water used is evaporated or enters the ground. PA. PLANNING PRINCIPLES, *supra* note 13, at 19. The Delaware River Basin Commission, however, assumes that forty percent of irrigation water eventually returns to surface streams or percolates to underground aquifers. DRBC WATER MANAGEMENT, *supra* note 13, at I-67. Diversions for irrigation represent a small portion of the total water use in the East—less than one percent of all Pennsylvania water uses in 1970 and only 8.3 percent of all consumptive uses. By 1990 irrigation withdrawals are expected to increase to two percent of the total water used in Pennsylvania. See Pa. Water Use, *supra* note 14. In the Delaware basin irrigation constitutes only two percent of the total use, but in the month of July it can represent almost one-third of the total water consumed. DRBC WATER MANAGEMENT, *supra* note 13, at I-67 to -77.

15. For a general description of thermal power plants that use nuclear fuel to produce heat see M. EL-WAKIL, *NUCLEAR POWER ENGINEERING* 16-19 (1962).

in converting heat from combustion into usable electricity.<sup>16</sup> Over half of the fossil fuel energy is discarded as waste heat. Similarly, nuclear power plants utilizing light water reactors<sup>17</sup> can use only a third of the energy released by the fission process; sixty-seven percent is waste.<sup>18</sup>

The short-term problem<sup>19</sup> is how to discharge excess heat without causing undesirable environmental impact. In fossil fuel plants a portion of the nonproductive heat is discharged directly to the air through the boiler and stack. On the other hand, most waste energy from fossil plants and virtually all nuclear plant waste heat is released through the condenser cooling system.<sup>20</sup> Because water is used for condenser cooling, the question becomes one of dissipating the heat added to the water through another cooling process.<sup>21</sup> The most commonly used cooling methods, either singly or in combination, include the following: (1) once-through systems, in which water is discharged directly to a receiving water body without auxiliary cooling; (2) cooling ponds and canals, in which water is discharged to a holding area to be cooled and subsequently recirculated through the condenser system or discharged to a water body; (3) wet cooling towers, in which water is cooled by evaporation before discharge or recirculation;<sup>22</sup> and (4) dry cooling towers, in which water is cooled by conduction and convection.<sup>23</sup>

Prior to 1970 most fossil and nuclear plants utilized once-through cooling systems, using rivers and oceans to dissipate heat. Increased environmental concern about thermal pollution, however,

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16. KRENKEL, *et al.*, THE WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC POWER GENERATION, National Water Comm'n Rep. No. NWC-CES-72-064, at 21-23 (1972) [hereinafter cited as KRENKEL].

17. Light water reactors use ordinary water to cool the reactor core and transfer heat to the electric turbines. NUCLEAR POWER SYSTEMS 223-24 (MacMillan Co., N.Y., 1964). Most commercial, nuclear-electric facilities use light water reactors.

18. KRENKEL, *supra* note 16, at 21-23.

19. Electricity generation facilities generally have a lead time of ten to fifteen years. Technologies to capture and use waste heat for other beneficial purposes are under study, but are expected to provide "little relief from the waste heat problem over the next 15 years . . ." KRENKEL, *supra* note 16, at 63. See Garton & Christianson, Beneficial Uses of Waste Heat, and Bell, Combination Urban Power Systems Utilizing Waste Heat, in N.Y. Dep't of Environmental Conservation, Proceedings of the Conference on the Beneficial Uses of Thermal Discharges (Sept. 17-18, 1970).

20. KRENKEL, *supra* note 16, at 23.

21. *Id.* at 27.

22. Cooling towers use either natural drafts or mechanical means to circulate air and cool the heated water. Hill, *Thermal Pollution and Its Control*, 2 ENVIR. AFFAIRS 406 (1972).

23. KRENKEL, *supra* note 16, at 27.

resulted in adoption of more rigorous limits on the amount and temperature of heated water that can be discharged to streams and rivers. State<sup>24</sup> and river basin commission<sup>25</sup> agencies have established in-stream water quality criteria necessary for desired uses, including maintenance of aquatic biosystems.<sup>26</sup> Thermal standards expressed in terms of both allowable increases (for example, five degrees) above the stream ambient and maximum tolerable stream temperatures<sup>27</sup> for various rivers or portions thereof are among these criteria. Discharges that will cause these in-stream limits to be exceeded are prohibited.<sup>28</sup> In addition, effluent standards have been adopted that mandate maximum tolerable thermal characteristics of heated discharges.<sup>29</sup>

Similarly, under the Federal Water Pollution Control Act<sup>30</sup> the United States Environmental Protection Agency (EPA) has promulgated new source performance standards<sup>31</sup> and abatement criteria

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24. *E.g.*, 25 PA. CODE §§ 93.1 -6.

25. *E.g.*, DRBC Water Quality Regulations; 18 C.F.R. § 410.1 (1975); DRBC WATER MANAGEMENT, *supra* note 13, at A-13 to -68 (incorporating DRBC Resolutions 67-7 and 74-1 on water quality criteria).

26. 25 PA. CODE § 93.2; DRBC WATER MANAGEMENT, *supra* note 13, at A-11 to -14.

27. 25 PA. CODE § 93.5(c); DRBC WATER MANAGEMENT, *supra* note 13, at A-14 to -65.

28. 25 PA. CODE § 95.1; DRBC WATER MANAGEMENT, *supra* note 13, § 3.10.3. To determine allowable quantities of pollutants in specific discharges, the assimilative capacity of the receiving stream is "allocated" among all dischargers by the regulatory agency.

29. For example, Pennsylvania's industrial waste effluent standards provide as follows:

§ 97.81. Prohibition.

The temperature of the waters of this Commonwealth shall not be increased artificially in amounts which shall be inimical or injurious to the public health or to animal or aquatic life or prevent the use of water for domestic, industrial or recreational purposes, or stimulate the production of aquatic plants or animals to the point where they interfere with these uses.

§ 97.82. Allowable discharges.

(a) The heat content of discharges shall be limited to an amount which could not raise the temperature of the entire stream at the point of discharge 5° F. above ambient temperature or a maximum of 87° F., whichever is less, nor change the temperature by more than 2° F. during any one-hour period, assuming complete mixing but the heat content of discharges may be increased or further limited where local conditions would be benefited thereby.

(b) If downstream circumstances warrant, the specific area in which the temperature may be artificially raised above 87° F. or greater than 5° F. above ambient temperature or by more than 2° F. during any one-hour period shall be prescribed.

\* \* \*

§ 97.85. Trout streams.

There shall be no new discharge to waters providing a suitable environment for trout if as a result the temperature of the receiving stream would be more than 5° above natural temperatures or be increased above 58° F.

25 PA. CODE §§ 97.81-.82, 97.85.

30. 33 U.S.C.A. § 1251 (Supp. 1976).

31. *Id.* § 1316. A "new source" is defined as any building, structure, facility, or installation that may discharge pollutants, the construction of which is commenced after EPA's publication of proposed regulations prescribing the "best available demonstrated control technology" to be used by these sources. *Id.* § 1316(a).

for existing sources.<sup>32</sup> By July 1, 1983, dischargers must apply "best available technology,"<sup>33</sup> which for steam-electric power plants has been determined to include closed cycle,<sup>34</sup> evaporative cooling tower systems that release no heat to streams and rivers.<sup>35</sup> Cooling tower systems also are required for all "new source" power plants constructed after March 4, 1974.<sup>36</sup>

The mandate of both state and federal water pollution control programs has been to eliminate once-through cooling systems in favor of evaporative ("wet") cooling towers and, in limited instances, cooling ponds.<sup>37</sup> These choices have involved considerable water resource compromises. Although once-through methods require large withdrawals and discharge nearly all waste heat to the receiving water body, only minor amounts are consumed. The amount of water available for downstream use is virtually unaffected. Wet cooling towers, on the other hand, require smaller withdrawals and eliminate thermal discharges, but are highly consumptive of water.<sup>38</sup> Dry cooling towers necessitate almost no water withdrawals and are non-

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32. *Id.* § 1311.

33. *Id.* § 1311(b)(2).

34. "Closed-cycle" as used by EPA in this context means that no heated water is discharged to waters of the United States. It does not imply that 100% of the cooling water is recirculated through the power plant, but rather contemplates that substantial quantities will be evaporated. See 39 Fed. Reg. 8294, 8295-96 (1974) (notice of proposed rulemaking); *id.* at 36186, 36193 (explanation of comments on notice of proposed rulemaking).

35. 40 C.F.R. § 423.13(1) (1974). As finally adopted EPA's rules will require installation of best available technology to control thermal discharges from recently constructed power plants by July 1, 1981, unless it is shown that compliance will seriously affect power system reliability in a region. If reliability problems are demonstrated, a scheduled installation of cooling tower systems must be undertaken so that all plants in a region comply on or before July 1, 1983. *Id.* § 423.13(m)-(n). EPA rules, however, do not require control of thermal discharges from "old units"—those plants of greater than 500 megawatts (MW) placed in service before January 1, 1970, or less than 500 MW installed before January 1, 1974. *Id.* §§ 423.20-33. Moreover, the Federal Water Pollution Control Act allows the EPA Administrator to modify the best available technology limitations on thermal discharges for any source if it is demonstrated that these standards are "more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . ." 33 U.S.C.A. § 1326(a) (Supp. 1976).

36. 40 C.F.R. § 423.16(1) (1974); see note 31 *supra*.

37. Existing cooling ponds or those under construction before July 1, 1981, can be used for cooling power plants. 40 C.F.R. § 423.12(a); 39 Fed. Reg. 36186, 36200 (1974). In addition, EPA has the authority to modify the thermal standards contained in its rules if the limitations as applied to a particular source are found "more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . ." 33 U.S.C.A. § 1326(a) (Supp. 1976).

38. KRENKEL, *supra* note 16, at 29.



consumptive, but are seven times more expensive than once-through technology and two to three times as costly as wet cooling tower systems.<sup>39</sup>

The impact on water resources of installing evaporative cooling systems at power plants in eastern watersheds has only recently been perceived as significant. Nevertheless, the consumptive amounts involved are staggering. A 2010 megawatt capacity nuclear plant, for example, will withdraw eighty-six cubic feet per second (CFS) of water (or 55.6 million gallons per day (MGD));<sup>40</sup> consumptive losses due to evaporation will average 34.9 MGD.<sup>41</sup> If EPA's thermal discharge standards<sup>42</sup> are strictly enforced<sup>43</sup> and all existing and new plants install evaporative cooling systems, the nationwide increase of water consumption by the year 2000 may approximate 8.5 billion gallons per day.<sup>44</sup> This prospective growth is said to be "relatively insignificant compared to the total water available in the United States during *average flow conditions*."<sup>45</sup> During ten- or twenty-year drought periods, however, large increases in consumption for power generation will exacerbate "water deficits" in some regions<sup>46</sup> and sufficient water for all users will be unavailable.

The dimensions of the problem can be illustrated by two Pennsylvania watersheds, the Schuylkill and Monongahela River basins. In the Schuylkill River, for example, the seven-day average low flow at Philadelphia during the drought of record did not exceed 194 MGD.<sup>47</sup> Five percent of the time, flow can be expected to fall below 155 MGD.<sup>48</sup> Philadelphia withdraws from the Schuylkill an av-

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39. Using 1969 costs the Federal Power Commission has estimated that contemporary

dry tower designs range from \$18-\$32 per KW [kilowatt] in capital cost (as opposed to \$2-\$5 per KW for once-through systems, \$4-\$9 per KW for cooling ponds, and \$5-\$13 per KW for evaporative cooling towers) and are quite costly to operate and maintain, especially since they reduce the plant's average annual energy output by six to eight percent (and require the construction of an additional 12-16 percent installed capacity).

*Id.* at 58, citing FED. POWER COMM'N, THE 1970 NATIONAL POWER SURVEY, Part I, at I-10-8 (1972).

40. One CFS of water flow is equal to .646 MGD.

41. FED. POWER COMM'N, THE 1970 NATIONAL POWER SURVEY, Part I, at I-10-17 (1972); see DRBC 1975 Master Siting Study, *infra* note 51, at A-61.

42. See notes 30-36 and accompanying text *supra*.

43. This assumes no exemptions or variances are issued by the EPA Administrator pursuant to 33 U.S.C.A. §§ 1311(c), 1326 (Supp. 1976).

44. 39 Fed. Reg. 36186, 36193 (1974).

45. *Id.* (emphasis added).

46. *Id.*

47. This figure represents the observed amount of flow past Fairmont Dam, DRBC WATER MANAGEMENT, *supra* note 13, at I-3, plus reported water withdrawals by the City of Philadelphia at that location. Interview with J. McSparren, Chief, Div. of Comprehensive Resources Programming, Office of Resources Management, Pa. Dep't of Environmental Resources, January 9, 1976.

48. Busch & Shaw, *Pennsylvania Streamflow Characteristics, Low Flow Frequency and Flow Duration*, PA. WATER RESOURCES BULL. NO. 1, at 75 (1966) [hereinafter cited as Busch & Shaw]. See also Office of Engineering & Construction, Pa.

erage of 180 MGD for public water supply purposes<sup>49</sup> and has an adjudicated right to 200 MGD.<sup>50</sup> Philadelphia, however, is not the only water user. Currently the Limerick power plant is under construction along the Schuylkill River in Montgomery County, Pennsylvania. When its two nuclear units are in full operation, Limerick will consume an average of 34.9 MGD.<sup>51</sup> The potential conflicts among power, municipal, industrial, and other uses during drought conditions are obvious. Similarly, in the Monongahela basin power, navigation, and public water needs compete for inadequate supplies. Low flow of the Monongahela above its confluence with the Youghiogheny is only 340 CFS or 220 MGD.<sup>52</sup> Virtually all this flow represents releases from the Army Corps of Engineer's Tygart Reservoir, which is designed to maintain commercial navigation on the river.<sup>53</sup> Interbasin transfers to supply water to metropolitan Pittsburgh remove forty MGD.<sup>54</sup> Under current circumstances low flows—even augmented by Tygart—are inadequate to support both public water supply and navigation demands during a ten-year drought.<sup>55</sup> Consumption by current and proposed power facilities

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Dep't of Environmental Resources, *Long-Duration Low Flow of Pennsylvania Streams*, PA. WATER RESOURCES BULL. NO. 7, at 80 (1972).

49. Public Water Supply Annual Water Use Reports (on file with the Pa. Dep't of Environmental Resources, Division of Dams and Encroachments).

50. In 1932 the Philadelphia Suburban Water Company was enjoined from interfering "by the diversion of water from Perkiomen Creek [a tributary to the Schuylkill], with a flow of the Schuylkill River at Philadelphia of 200,000,000 gallons per day, over and above the requirements of navigation." *Philadelphia v. Philadelphia Suburban Water Co.*, 309 Pa. 130, 151, 163 A. 297, 300 (1932).

51. See Delaware River Basin Electric Utilities Group, Master Siting Study—Major Electric Generating Projects—Delaware River Basin 1975-1989, report to the Delaware River Basin Comm'n, at A-60 to -61 (1975) [hereinafter cited as DRBC 1975 Master Siting Study].

52. Letter from Col. N.G. Delbridge, Pittsburgh Dist., U.S. Army Corps of Engineers, to V.R. Butler, Chief, Div. of Dams & Encroachments, Pa. Dep't of Environmental Resources, Oct. 16, 1973.

53. *Id.*

54. The Western Pennsylvania Water Company withdraws water from the Monongahela at Elrama for service to portions of Pittsburgh and suburban areas in Allegheny and Washington counties. Although the company holds an allocation permit for up to 50 MGD at Elrama, the Elrama works currently has a capacity of only 40 MGD. This water is returned through sewage treatment plants on the lower Monongahela and Ohio Rivers and, therefore, the withdrawal is properly classified as an interbasin transfer that effectively removes 40 MGD from the upper Monongahela watershed. See Pa. Dep't of Environmental Resources, Application for Water Allocation No. 0273601 by Western Pa. Water Co. (August 15, 1973); *id.*, supplements on Aug. 15, 1973 and Sept. 25, 1974; Letter from Col. N.G. Delbridge, Pitts. Dist., Army Corps of Engineers, to V.R. Butler, Chief, Div. of Dams & Encroachments, Pa. Dep't of Environmental Resources, Oct. 16, 1973; Letter from Col. M.R. Janairo, Jr., Pitts. Dist., Army Corps of Engineers, to V.R. Butler, Feb. 27, 1975; Memo from R. Timothy Weston to Walter A. Lyon, Oct. 6, 1975.

55. Authorities cited note 54 *supra*. A ten-year drought is a drought that on

in Pennsylvania and West Virginia can reach 33.9 MGD.<sup>56</sup> Therefore, navigation requirements, consumptive power uses, public water supply transfers, and other losses<sup>57</sup> in the upper Monongahela will exceed available flow during a predictable drought.<sup>58</sup>

Even on the Susquehanna River, the largest United States river flowing to the Atlantic, consumptive water needs for power plants may become significant. By 1989 total power project consumptive uses are projected to approach ten percent of the seven-day minimum flow<sup>59</sup> of the river.<sup>60</sup> Proposals for one or more energy parks<sup>61</sup> in the upper Susquehanna basin could result in even more substantial water demands. A 10,000 megawatt park composed of five fossil fuel and five nuclear plants would evaporate 250-300 CFS,<sup>62</sup>

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the average has a ten percent chance of occurring in any one year. The low flow is often expressed in terms of the lowest consecutive seven-day average flow of such a drought (the seven-day, ten-year low flow), a level that is exceeded approximately ninety percent of the time. When such a drought occurs, critical low flows may last several months, causing depletion of reservoir storage and major shortage for users.

56. Pa. Water Use, *supra* note 14, Watershed 19-B, C, and D printouts. Current power facilities using once-through cooling withdraw in excess of 1434 MGD and consume approximately twelve MGD. Although most of the water diverted by each power plant is returned and reused by lower plants, the 729 MGD withdrawal of the largest plant (Hatfield) exceeds by several times the low flow of the river. Hatfield is planning to install a cooling tower to control thermal discharges. This may improve the temperature in the river at low flow, but also will result in increasing consumptive losses by approximately twenty-three MGD or ten percent of the present low flow.

57. Army Corps of Engineers gauging records indicate that on November 20, 1953, during a drought episode on the Monongahela, a low flow of 269 CFS was recorded at the Charleroi station (sixteen miles above Elrama), even though 340 CFS was being released from the upstream Tygart Dam. The loss of seventy-one CFS (forty-six MGD) is not explained, but substantial infiltration of river waters into active and abandoned coal mines is suspected. Letter from Col. N.G. Delbridge to V.R. Butler, *supra* note 54; Memo from R. Timothy Weston to Walter A. Lyon *supra* note 54, at 2-4.

58. Criteria for judging adequacy of water supplies generally require availability of supplies even under fifty-year drought conditions. PA. PLANNING PRINCIPLES, *supra* note 13, at 49-50. Yet, on the Monongahela River even a ten-year drought, such as occurred in 1953, could create severe conflicts and shortages. See note 57 *supra*.

59. The seven-day minimum flow is the lowest seven-day average flow of record.

60. The seven-day minimum flow of the Susquehanna at Marietta, Pennsylvania is 1720 CFS. Consumptive water use by power projects in 1989 is projected to total 165.4 CFS. Susquehanna River Basin Electric Utilities Group, Master Siting Study Susquehanna River Basin Major Electric Generating Projects 1975-1989, Report to the Susquehanna River Basin Commission, at 20 (1975) [hereinafter cited as SRBC 1975 Master Siting Study]. The Susquehanna River Basin Commission has indicated that a reduction of the minimum flow passing Conowingo Dam (below the Maryland-Pennsylvania border) will not be allowed. The minimum releases from the Raystown Reservoir (now nearing completion) and augmentation from "other existing and proposed reservoirs can be expected to increase the minimum flow (averaged over any seven days) past Conowingo Dam, or alternatively to permit an equal consumptive use while maintaining the current minimum flow averages passing Conowingo Dam." *Id.* at 19.

61. Gilbert Associates, Inc., Report #1853, Energy Park Development Site Identification Study (Nov. 1974).

62. Ferrar, *et al.*, Energy Parks and the Commonwealth of Pennsylvania—Is-

which is equal to nearly one-half of the ten-year low flow of the west branch of the Susquehanna or eighteen percent of the main branch at Sunbury.<sup>63</sup> The necessity and extent of additional reservoir capacity to provide for these consumptive uses is, thus, a vital issue for the entire basin.<sup>64</sup>

A decade ago Senator Frank Moss stated, "For the next generation of Americans, I believe it is not an exaggeration to say that water—its competing uses and the conflicts that arise out of those uses—may be the most critical national problem."<sup>65</sup> In Pennsylvania and its sister states water conflicts among municipal suppliers, industry, agricultural users, and energy development are on the horizon or, in some cases, already at hand. Lawyers and administrators must seek to develop new laws and institutions to resolve these conflicts. As the remaining sections of this article will demonstrate, current legal doctrines, regulations, and administrative arrangements are not capable of managing consumptive water withdrawals by projects and protecting the interests of other water users.

### III. Common-Law Approaches to Consumptive Uses

The problem of consumptive water use was first addressed by the common law. In Pennsylvania the right to take and consume water arises from riparian ownership, prescription, and condemnation.<sup>66</sup>

#### A. Riparian Rights

Most eastern states have adopted the English common-law doctrine of riparian rights as applied to surface waters.<sup>67</sup> The riparian

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sues and Recommendations, Vol. I (prepared for the Governor's Energy Council), at 15-16 (1975) [hereinafter cited as Ferrar].

63. See Busch & Shaw, *supra* note 48, at 142.

64. See Ferrar, *supra* note 62, at 15-16. Note, on January 23, 1976, the Governor's Energy Council suspended indefinitely any further consideration of power parks. See Minutes of the Governor's Energy Council, January 23, 1976.

65. F. MOSS, *THE WATER CRISIS* ix (1967).

66. *Palmer Water Co. v. Lehighon Water Co.*, 280 Pa. 492, 124 A. 747 (1924).

67. *STATE WATER LAW DIGEST*, *supra* note 2, at 3; 1 *WATERS AND WATER RIGHTS*, *supra* note 1, at 61-66. The development of riparian doctrine in Pennsylvania took place, for the most part, during the latter half of the nineteenth century and the early part of the twentieth century. Subsequent to that period, there has been a shift to statutory control of water rights, see notes 192 to 335 and accompanying text *infra*, but most cases delineating riparian rights and duties were decided during the early days of the Industrial Revolution. While the original cases are some-

doctrine governs allocation and use of waters flowing in a natural watercourse.<sup>68</sup> Rights under the doctrine arise from the ownership<sup>69</sup> of real property underlying or bordering streams and rivers.<sup>70</sup> A riparian right, then, is the right to use water flowing in a stream upon riparian land.<sup>71</sup>

1. *Nature and Limit of Riparian Rights.*—The holder of riparian rights has no property interest in the water itself, but only a right to use the water.<sup>72</sup> Furthermore, even this right is not exclusive. All rights to water use by a riparian owner depend upon the equal,

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what dated in their factual settings, often involving gristmill owners and barge-canal proprietors, they are, nevertheless, applicable today and form the basis of current riparian law in Pennsylvania.

68. The terms "natural watercourse" or "stream" refer to water flowing in a definite channel with a bed and banks or sides. 93 C.J.S. *Waters* §§ 3-4, at 596-601 (1956); 39 PA. LAW ENCYC. *Waters* § 1, at 446 (1961); 1 WATERS AND WATER RIGHTS, *supra* note 1, § 52.1(B), at 308-13. The general elements of a watercourse are a channel, consisting of a well-defined bed and banks, a current of water, and a source. A flow and a place of discharge are generally implied. None of these elements or characteristics are considered to be an absolute fixed factor and too much stress should not be placed on any one. 93 C.J.S. *Waters* § 3, at 596 (1956). Water flowing in natural watercourses is, however, distinguished from "diffused surface waters." 1 WATERS AND WATER RIGHTS, *supra*, at 300-303.

A commonly accepted definition of a watercourse is a 'stream of water usually flowing in a definite channel having a bed and sides, or banks, and discharging itself into some other stream or body of water:' 28 Am. & Eng. Ency. of Law (1st ed.), 944. Mere drainage over the surface of land is very different from the flow of a stream or brook across the premises of another. In general the channel and banks formed by the flowing of the water must present to the eye on a casual glance, the unmistakable evidence of the frequent action of running water (Gould on Waters [2d ed.] sec. 264); but the water need not flow continually, and there are many watercourses which are sometimes dry. 'There is, however, a distinction to be taken in law between a regular flowing stream of water, which at certain seasons is dried up, and those occasional bursts of water, which in time of freshet, or melting of ice and snow descend from the fills and inundate the country:' Angell on Water Courses (7th ed.), sec. 4.

Kislinski v. Gilboy, 19 Pa. Super. 453, 454-55 (1902); *accord*, Kunkle v. Ford City Borough, 305 Pa. 416, 158 A. 159 (1931).

69. Ownership of riparian land without actual possession or occupancy is sufficient to give riparian rights, including a right of action against any person transgressing those rights. Hogg v. Connellsville Water Co., 168 Pa. 456, 31 A. 1010 (1895).

70. 1 WATERS AND WATER RIGHTS, *supra* note 2, at 288-89. Riparian rights inhere to all riparian owners, including individuals, Gibbs v. Sweet, 20 Pa. Super. 275 (1902), business corporations, Lord v. Meadville Water Co., 135 Pa. 122, 19 A. 1007 (1890), Finn v. Providence Gas & Water Co., 99 Pa. 631 (1882), municipalities, Appeal of Haupt, 125 Pa. 211, 17 A. 436 (1889), the Commonwealth, Filbert v. Dechert, 22 Pa. Super. 361 (1903), and the federal government. Riparian rights can be exercised by a qualified and authorized agent of a riparian owner, Filbert v. Dechert, 22 Pa. Super. 362 (1903), or by the lessee of riparian lands, Philadelphia & Reading R.R. v. Pottsville Water Co., 182 Pa. 418, 38 A. 404 (1897); Standard Plate Glass Co. v. Butler Water Co., 5 Pa. Super. 563 (1897).

71. Appeal of Heltman, 4 Wall. 35 (Pa. 1882); Garvin v. Miller, 20 Beaver 95 (Pa. C.P. 1958); Hough v. Doylestown Borough, 4 Brewst. 333 (C.P. Bucks 1870).

72. Mayor of City of Philadelphia v. Commissioner of Spring Gardens, 7 Pa. 348 (1847). In property law riparian water rights are classified as usufructuary rights, a type of incorporeal hereditament. 1 WATERS AND WATER RIGHTS, *supra* note 1, § 53.2, at 349-51; Hough v. Doylestown Borough, 4 Brewst. 333 (C.P. Bucks 1870).

correlative rights of other riparians. Riparian proprietors are tenants in common of a shared resource.<sup>73</sup> No right to divert or consume a specific quantity of water exists.

(a) *Uses on riparian lands.*—Under the English version of the doctrine the measure of the right to use water on riparian land was natural flow. A riparian proprietor enjoyed “the usufructuary right to the ordinary flow along or over his land, in its customary channel, undiminished in quantity and unimpaired in quality except as changed by act of God.”<sup>74</sup> With certain exceptions a riparian owner had a right of action against any individual whose unlawful conduct caused a material and perceptible diminution in the flow over the aggrieved riparian’s land.<sup>75</sup> The flow could not be diminished regardless of its effect on the uses of lower riparians. Therefore, consumptive water users, such as industry, agriculture, and power plants, were technically unlawful. Faced with the adverse economic impact of this result at the beginning of the Industrial Revolution, a majority of the American jurisdictions following the riparian doctrine modified the so-called natural flow or English rule.<sup>76</sup> In its place they adopted a reasonable use standard allowing some diminution in flow if other riparian users were not unreasonably harmed.<sup>77</sup>

Pennsylvania developed a hybrid of the natural flow and reasonable use rules. A fusion (or perhaps confusion) of the language

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73. Cf. *Philadelphia & Reading R.R. v. Pottsville Water Co.*, 182 Pa. 418, 38 A. 404 (1897); *Harley v. Meshoppen Water Co.*, 174 Pa. 416, 34 A. 568 (1896); *Irving’s Ex’rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff’d*, 194 Pa. 648, 45 A. 482 (1900); *Lehigh Coal & Nav. Co. v. Scranton Gas & Water Co.*, 6 Pa. Dist. 291 (C.P. Lack. 1896); *Hough v. Doylestown Borough*, 4 Brewst. 333 (C.P. Bucks 1870).

74. 1 WATERS AND WATER RIGHTS, *supra* note 1, § 51.2, at 289; *accord*, *Helms v. Zeitzoff*, 407 Pa. 482, 181 A.2d 277 (1962); *White v. Pennsylvania R.R.*, 354 Pa. 397, 47 A.2d 200 (1946); *Williams v. Fulmer*, 151 Pa. 405, 25 A. 103 (1892); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563, 582-83 (1897); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964); *Rennekamp v. Goldberg*, 54 Montg. 61 (Pa. C.P. 1936).

75. *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Miller v. Miller*, 9 Pa. 74 (1848) (recovery for diminution despite lack of actual damage); *Consolidated Water Supply Co. v. State Hosp. for Criminally Insane*, 66 Pa. Super. 610 (1917); *Craig v. Borough of Shippensburg*, 7 Pa. Super. 526 (1898); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897).

It is no defense that the plaintiff also uses the water in a manner that causes material diminution in the flow to owners below him, *Scranton Gas & Water Co. v. Delaware, L. & W.R.R.*, 240 Pa. 604, 88 A. 24 (1913), or that the plaintiff does not use the water at all, *Hughesville Water Co. v. Person*, 182 Pa. 450, 38 A. 584 (1897); *Miller v. Miller*, *supra*; *Craig v. Borough of Shippensburg*, *supra*.

76. 1 WATERS AND WATER RIGHTS, *supra* note 1, § 51.3, at 291-92; 5 R. POWELL, *LAW OF REAL PROPERTY* § 711 (1949).

77. See note 76 *supra*; *Hanks, The Law of Water in New Jersey*, 22 RUTGERS L. REV. 621, 630-32 (1968).

of the English and American rules is found in many of the later cases.<sup>78</sup> Thus, some analysis of the treatment accorded various water uses in different settings is necessary to identify the current status of consumptive water uses by power plants under Pennsylvania law.

Under both English and American rules a riparian owner's use of water for domestic purposes is paramount.<sup>79</sup> A riparian owner can divert, use, and consume any amount necessary for household<sup>80</sup> and general domestic needs,<sup>81</sup> including drinking, bathing, cooking, laundry,<sup>82</sup> livestock watering,<sup>83</sup> and other uses essential to preservation of life and health.<sup>84</sup> A riparian can divert water for these purposes even though a watercourse's flow is materially diminished or a small stream is entirely consumed.<sup>85</sup> Any diminution in flow and resulting harm to downstream riparians is *damnum absque injuria*.<sup>86</sup>

The English rule and some early Pennsylvania cases suggest that apart from domestic needs no use of water could materially di-

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78. See *Helms v. Zeitzoff*, 407 Pa. 482, 181 A.2d 277 (1962); *White v. Pennsylvania R.R.*, 354 Pa. 397, 47 A.2d 200 (1946); *Williams v. Fulmer*, 151 Pa. 405, 25 A. 103 (1892); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Miller v. Miller*, 9 Pa. 74 (1848); *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964).

79. *Philadelphia v. Philadelphia Suburban Water Co.*, 309 Pa. 130, 163 A. 297 (1932) (diversion for domestic uses superior to public right of navigation); *Palmer Water Co. v. Lehighon Water Co.*, 280 Pa. 492, 124 A. 747 (1924) (domestic uses superior to mechanical and manufacturing uses).

80. A "household" is not limited to a home or family unit. The right to use water for domestic or household purposes is unaffected by the riparian user's living in a house, hospital, tent, or even out in the open on the riparian land. *Filbert v. Dechert*, 22 Pa. Super. 362 (1903).

81. *Palmer Water Co. v. Lehighon Water Co.*, 280 Pa. 492, 124 A. 747 (1924); *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Philadelphia & Reading R.R. v. Pottsville Water Co.*, 182 Pa. 418, 38 A. 404 (1897); *Lord v. Meadville Water Co.*, 135 Pa. 122, 19 A. 1007 (1890); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *City of Philadelphia v. Collins*, 68 Pa. 106 (1871); *Filbert v. Dechert*, 22 Pa. Super. 362 (1903); *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964); *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319 (Pa. C.P. 1885).

82. *Lord v. Meadville Water Co.*, 135 Pa. 122, 19 A. 1007 (1890); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Filbert v. Dechert*, 22 Pa. Super. 362 (1903); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964).

83. *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Lord v. Meadville Water Co.*, 135 Pa. 122, 19 A. 1007 (1890); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319 (Pa. C.P. 1885).

84. *Filbert v. Dechert*, 22 Pa. Super. 362 (1903).

85. *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964) (dictum).

86. *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Filbert v. Dechert*, 22 Pa. Super. 362 (1903); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964).

minish the quantity flowing to lower riparian lands.<sup>87</sup> Nondomestic uses were deemed "extraordinary."<sup>88</sup> The courts gradually recognized, however, that some uses on riparian lands were necessarily consumptive. If stringently enforced, the English rule would completely bar irrigation,<sup>89</sup> for example. Pennsylvania cases subsequently held that riparians could divert water for irrigation. The extent to which this diversion and consumption will be allowed "depends on whether it is reasonable, having due regard to the condition and circumstances of other proprietors on the stream . . . ."<sup>90</sup> Diversion for irrigation is not permissible when it would "destroy or materially diminish or impair the application of water by other proprietors . . . ."<sup>91</sup> In other words, riparian irrigators can materially diminish the *flow* of a watercourse, but they cannot substantially or unreasonably impair the *uses* of lower owners.

Pennsylvania decisions have continued to distinguish a class of "extraordinary" water uses that are not "incident to land for ordinary purposes,"<sup>92</sup> such as manufacturing,<sup>93</sup> milling,<sup>94</sup> diversions by railroads for their engines,<sup>95</sup> diversions to supply municipalities without the use of eminent domain,<sup>96</sup> and diversions for recreational enter-

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87. *Wheatley v. Chrisman*, 24 Pa. 298 (1855) (consumptive use of water for operating lead mine on riparian land unlawful); *Miller v. Miller*, 9 Pa. 74 (1848) (use of water for irrigation of farmland through which watercourse flowed unlawful).

88. The distinction between domestic and extraordinary uses is implicit in the court's statement in *Palmer Water Co. v. Lehigh Water Supply Co.*, 280 Pa. 492, 499, 124 A. 747, 749 (1924), that every riparian owner is entitled to use as much of the stream as is necessary for domestic needs, *but* use for extraordinary purposes must not diminish quantity.

89. Because water applied to irrigation evaporates or enters the groundwater, it is treated for purposes of surface water diversions as 100% consumptive. PA. PLANNING PRINCIPLES, note 14 *supra*, at 19.

90. *Messinger's Appeal*, 109 Pa. 285, 288, 4 A. 162, 162-63 (1885).

91. *Id.*

92. *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1898), *aff'd*, 194 Pa. 648, 45 A. 482 (1899); *Myers & Ervein Co. v. Philadelphia, J. & C. Ry.*, 12 Montg. 46 (Pa. C.P. 1896).

93. *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897) (manufacture of glass).

94. *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132, 133 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900) (party's diversion to furnish power to mill termed an "artificial" use); *Beissell v. Sholl*, 4 Dall. 211 (Pa. 1800) (classification of mill as extraordinary use implicit in court's charge that millowner's water use must not injure other riparians and that diverted water must be returned to stream).

95. *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319 (Pa. C.P. 1885).

96. *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1898), *aff'd*, 194 Pa. 648, 45 A. 482 (1899).



prises.<sup>97</sup> A riparian owner can use only that quantity of water for extraordinary purposes that is reasonable in view of the rights of other riparian owners and that will not materially or perceptibly diminish the watercourse's flow.<sup>98</sup> An extraordinary use is not presumptively unreasonable,<sup>99</sup> however. Its reasonableness "depends upon the circumstances of each case, and is a question for the jury; the character of the stream, the purpose to which water is applied, and the manner of application are important considerations in determining this question."<sup>100</sup> The stream's size and the requirements of lower riparian owners enter the reasonableness equation.<sup>101</sup> On the other hand, the extent of the extraordinary user's business or manufacturing needs is not considered in determining the reasonableness of his use because the necessities of one man's business cannot be the standard for another's rights in something that belongs to both.<sup>102</sup>

Despite the mixed reference by Pennsylvania courts to the requirements of reasonableness and nondiminution in flow, the primary emphasis regarding extraordinary uses appears to be on the quantity taken relative to the size of the watercourse.<sup>103</sup> Often extraordinary uses for manufacturing, milling, or power production will not substantially diminish a watercourse's flow,<sup>104</sup> in which case they are likely to be deemed reasonable.<sup>105</sup>

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97. *Rennekamp v. Goldberg*, 54 Montg. 61 (Pa. C.P. 1936).

98. *Palmer Water Co. v. Lehighon Water Co.*, 280 Pa. 492, 124 A. 747 (1924); *Scranton Gas & Water Co. v. Delaware, L. & W.R.R.*, 240 Pa. 604, 88 A. 24 (1913) (dictum); *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Filbert v. Dechert*, 22 Pa. Super. 362 (1903); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897); *Hollister v. Erie & Wyoming Valley R.R.*, 11 Lack. 247 (Pa. C.P. 1910).

99. *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563, 584 (1897); *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319, 325 (Pa. C.P. 1885) (appropriation and conversion to steam in locomotives is not per se unreasonable, but it can become unreasonable because of the amount taken).

100. This quote, taken from the lower court's charge to the jury, was held to be a correct statement of the elements to be considered in determining reasonableness in *Brown v. Kistler*, 190 Pa. 499, 505, 42 A. 885 (1899).

101. *Brown v. Kistler*, 190 Pa. 499, 42 A. 885 (1899); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886).

102. *Philadelphia & Reading R.R. v. Pottsville Water Co.*, 182 Pa. 418, 38 A. 404 (1897); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Pennsylvania R.R. v. Miller*, 112 Pa. 34, 3 A. 780 (1886); *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319 (Pa. C.P. 1885).

103. "The question is whether his use of the stream is reasonable and appropriate to the size of the stream and the quantity of water usually flowing therein." *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563, 584 (1897).

104. *Palmer Water Co. v. Lehighon Water Supply Co.*, 280 Pa. 492, 124 A. 747 (1924); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Myers & Ervein Co. v. Philadelphia, J. & C. Ry.*, 12 Montg. 46 (Pa. C.P. 1896).

105. There may be exceptions when a use is totally unnecessary. *See, e.g., Hughesville Water Co. v. Person*, 182 Pa. 450, 38 A. 584 (1897) (diversion that gives no benefit to diverting riparian owner will be enjoined); *Filbert v. Dechert*, 22

(b) *Uses off riparian lands.*—While an extraordinary use on the riparian land itself is permissible if it is reasonable and does not materially diminish the flow of the watercourse, a use that diverts water away from the riparian land is totally prohibited irrespective of reasonableness and nondiminution considerations.<sup>106</sup> A railroad company's pumping of water to a reservoir several miles distant for use away from its riparian land<sup>107</sup> or a water company's diversion of water to a distant municipality for consumer use<sup>108</sup> cannot be justified by the diverter's ownership of riparian land and a cause of action for this diversion will accrue to other riparian owners. Rights to use water off riparian lands can be acquired only by municipalities and utilities through eminent domain or prescriptive rights.<sup>109</sup>

(c) *Priorities.*—Priority of use depends upon the relative rights of riparian owners. When all else is equal, priority belongs to the more important use recognized under riparian law. Domestic uses and uses naturally related to riparian land are superior to extraordinary uses carried out on the riparian premises.<sup>110</sup> Extraordinary uses rank above uses that divert water away from the riparian property.<sup>111</sup> If a conflict arises among several extraordinary uses on riparian land, no use priority exists and each riparian owner is required to limit use to an amount that is reasonable relative to the competing uses and that does not materially diminish flow.<sup>112</sup>

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Pa. Super. 362 (1903) (diversion of water to operate a fountain on the grounds of a mental institution not a necessary use).

106. Markleton Hotel Co. v. Connellsville S.L. Ry., 242 Pa. 569, 89 A. 703 (1914); Scranton Gas & Water Co. v. Delaware, L. & W.R.R., 240 Pa. 604, 88 A. 24 (1913); Lord v. Meadville Water Co., 135 Pa. 122, 19 A. 1007 (1890); Consolidated Water Supply Co. v. State Hosp. for Criminally Insane, 66 Pa. Super. 610 (1917); Irving's Ex'rs v. Borough of Media, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900); Standard Plate Glass Co. v. Butler Water Co., 5 Pa. Super. 563 (1897).

107. Scranton Gas & Water Co. v. Delaware L. & W.R.R., 240 Pa. 604, 88 A. 24 (1913).

108. Irving's Ex'rs v. Borough of Media, 10 Pa. Super. 132 (1899), *aff'd*, 193 Pa. 648, 45 A. 482 (1900); Craig v. Borough of Shippensburg, 7 Pa. Super. 526 (1898); Standard Plate Glass Co. v. Butler Water Co., 5 Pa. Super. 563 (1897). *But see* Bland v. Tipton Water Co., 222 Pa. 285, 71 A. 101 (1908) (court refused to enjoin water company with legal right to supply township's inhabitants from supplying water to railroad company that subsequently piped the water to points outside the township).

109. See notes 151-62, 181-91 and accompanying text *infra*.

110. Palmer Water Co. v. Leighton Water Co., 280 Pa. 492, 124 A. 747 (1924) (mechanical and manufacturing uses are secondary to domestic uses).

111. Scranton Gas & Water Co. v. Delaware, L. & W. R.R., 240 Pa. 604, 88 A. 24 (1913).

112. Hughesville Water Co. v. Person, 182 Pa. 450, 38 A. 584 (1897); Pennsylvania R.R. v. Miller, 112 Pa. 34, 3 A. 780 (1886); Hollister v. Erie & Wyoming

Public interest has resulted in exceptions to these priority rules. Thus, it has been held that when a municipality with a duty to supply the domestic necessities of its citizens is faced with a calamity, such as a severe water shortage caused by a long drought, public welfare justifies the municipality's taking water for its citizens' domestic use regardless of the existing rights of riparian owners who may be injured thereby.<sup>113</sup> The municipality will remain liable to any riparian owner whose domestic use has been impaired, but impairment of other uses creates no liability<sup>114</sup> and, in fact, the municipal water supplier can force riparian owners with vested rights in non-domestic uses to forego their diversion temporarily.<sup>115</sup> Nondomestic riparian uses are also subservient to the public right to use navigable waters<sup>116</sup> for navigation.<sup>117</sup> Certain water supply agencies are unrestricted by this right of navigation,<sup>118</sup> but extraordinary riparian wa-

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Valley R.R., 11 Lack. 247 (Pa. C.P. 1910). As noted previously, this limitation upon "extraordinary uses" applies equally to a water company that, solely as a riparian owner, diverts water to a nonriparian municipality without the use of eminent domain. Phillipsburg Water Co. v. Citizens Water Co., 189 Pa. 23, 41 A. 979 (1899); Irving's Ex'rs v. Borough of Media, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900); Standard Plate Glass Co. v. Butler Water Co., 5 Pa. Super. 563 (1897).

113. Philadelphia v. Collins, 68 Pa. 106 (1871) (dictum); North Mt. Water Supply Co. v. Troxell, 14 Luz. 161 (Pa. C.P. 1908), *aff'd*, 223 Pa. 315, 72 A. 621 (1909).

114. Philadelphia v. Collins, 68 Pa. 106 (1871) (dictum on impairment of navigation).

115. North Mt. Water Supply Co. v. Troxell, 14 Luz. 161 (Pa. C.P. 1908), *aff'd*, 223 Pa. 315, 72 A. 621 (1909) (water company supplying municipality entitled to order requiring riparian owner with prescriptive right to dam watercourse to release water).

116. What constitutes a navigable waterway does not depend solely on its size or its actual use for commercial transportation. Pennsylvania Envir. Council, Inc. v. Bartlett, 315 F. Supp. 238 (M.D. Pa. 1970), *aff'd*, 454 F.2d 613 (3d Cir. 1971); Lakeside Park Co. v. Forsmark, 396 Pa. 389, 153 A.2d 486 (1959). Rather, rivers are regarded as navigable in law if, in fact, commerce, trade, and travel can be conducted thereon. United States v. Utah, 283 U.S. 64 (1931); Cleveland & Pitts. R.R. v. Pittsburgh Coal Co., 317 Pa. 395, 176 A. 7 (1935). See generally R.T. Weston, Public Rights in Pennsylvania Waters, State Water Plan Water Laws & Institutional Arrangements Backgd. Rep. No. 1, 2-21 (1975) [hereinafter cited as Weston].

Based on these guidelines the following rivers flowing partially or wholly in Pennsylvania have been declared navigable: Allegheny—United States v. Union Bridge Co., 143 F. 377, *aff'd*, 204 U.S. 364 (1907); Wainwright v. McCullough, 63 Pa. 66 (1869); Delaware—McKeen v. Delaware Diversion Canal Co., 49 Pa. 424 (1865); Lehigh—McKeen, *supra*; Monongahela—Grays Landing Ferry Co. v. Stone, 46 F.2d 394 (3d Cir. 1931); Monongahela Bridge Co. v. Kirk, 46 Pa. 112 (1863); Ohio—Gumbert v. Wood, 146 Pa. 370, 23 A. 404 (1892); Schuylkill—Philadelphia v. Philadelphia Suburban Water Co., 309 Pa. 130, 163 A. 297 (1932); Susquehanna—Post v. Wilkes-Barre Connecting R.R., 286 Pa. 273, 133 A. 377 (1926). Many other streams in Pennsylvania have been declared "public highways" subject to public navigation rights. Weston, *supra*, at 13-18 and Appendix I.

117. Yoffee v. Pennsylvania Power & Light Co., 385 Pa. 520, 534, 123 A.2d 636, 644 (1956); Flanagan v. Philadelphia, 42 Pa. 219 (1862).

118. Philadelphia v. Philadelphia Suburban Water Co., 309 Pa. 130, 163 A. 297 (1932); Philadelphia v. Gilmartin, 71 Pa. 140 (1872); Philadelphia v. Collins, 68 Pa. 106 (1871); Hunt v. Graham, 15 Pa. Super. 42 (1900); Gallagher v. Philadelphia, 4 Pa. Super. 60 (1897).

ter users like manufacturing and power plants cannot impair the navigability of a watercourse.<sup>119</sup> A nondomestic withdrawal and diversion from a navigable river that impairs navigation gives rise to a public nuisance.<sup>120</sup>

2. *Power Plants' Riparian Rights.*—A power plant sited on riparian land owned by an electric utility is a riparian proprietor. Absent special rights gained through specific grant, prescription, or condemnation, when a power plant diverts water from a watercourse for steam condensation and other operating processes, it acts as a mere riparian owner.

Use of water to produce power is generally classified as an extraordinary use.<sup>121</sup> Although most cases dealing with power production by riparian proprietors involves use of water in gravity flow systems to provide mechanical power for enterprises like grain mills,<sup>122</sup> water use by a modern thermal-electric power plant,<sup>123</sup> through analogy to milling and manufacturing on riparian land, would be similarly termed an extraordinary use.<sup>124</sup> Because a power plant's water use is an extraordinary one, its consumption is subject to the same limitations imposed on other extraordinary users.<sup>125</sup> Most important

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119. *Philadelphia v. Philadelphia Suburban Water Co.*, 309 Pa. 130, 163 A. 297 (1932); *Gallagher v. Philadelphia*, 4 Pa. Super. 60 (1897).

120. *Philadelphia v. Gilmartin*, 71 Pa. 140 (1872); *Philadelphia v. Collins*, 68 Pa. 106 (1871); *Gallagher v. Philadelphia*, 4 Pa. Super. 60 (1897).

121. See notes 92-95 and accompanying text *supra*.

122. See note 94 *supra*.

123. In modern thermal-electric power plants, nuclear and fossil-fueled, the primary use of water from an outside watercourse is for condensation. These plants generate electricity by producing steam to turn turbines. The water from which the steam is produced is maintained in, and constantly recycled through, a closed system. When the steam has exhausted through the final turbine stage, it must be condensed and cooled before it can be returned to the steam generators. It is at this condensing-cooling stage that water from outside sources, (e.g., a watercourse flowing through the riparian land on which the plant is situated) must be supplied. Although most of the cooling water is returned to its source, substantial amounts are lost through evaporation and, where cooling towers are used, through "misting." Hill, *Thermal Pollution and Its Control*, 2 ENVIR. AFFAIRS 406 (1972). For a general description of a typical nuclear power plant see M. EL-WAKIL, *NUCLEAR POWER ENGINEERING* 16-19 (1962).

124. *Myers & Ervein Co. v. Philadelphia, J. & C. Ry.*, 12 Montg. 46 (Pa. C.P. 1896) (defendant's diversion of water for steam generation and condensing processes in production of electricity held extraordinary use).

125. See notes 72-120 and accompanying text *supra*. This assumes that the power plant is situated on riparian land and that any diversion of water is for use on that land. If the power plant is situated on nonriparian land, it is not a riparian owner and must justify its diversion on some basis other than riparian ownership. As a practical matter, nuclear power plants must be sited on riparian land or adjacent to some body of water that is constantly replenished. ENERGY POLICY STAFF, OF-

among these is that it lawfully can take only that quantity of water that is reasonable in view of the requirements of other riparian owners and does not materially and perceptibly diminish the watercourse's flow.<sup>126</sup> Although the propriety of a particular extraordinary use might depend on its nature,<sup>127</sup> the usual determinant of reasonableness<sup>128</sup> is the quantity of water diverted and the diversion's effect on the watercourse.<sup>129</sup> A power plant's choosing to supply its water needs by diverting water from a stream instead of other alternatives should have little bearing on the diversion's reasonableness. On the contrary, reasonableness will be determined by considering the stream's size, the amount of diversion, and its effect on other riparians.<sup>130</sup> What the power plant might have done is a moot question.

Power plant use will be subject, however, to superior rights statutorily granted to municipalities and public water supply agencies.<sup>131</sup> It is similarly limited by conflicting uses that have been procured through prescription.<sup>132</sup>

3. *Remedies for Power Plant Diversions.*—If a large nuclear power project so diminished a river's flow that downstream domestic, municipal, and industrial users were injured, what recourse would these riparians have?

(a) *Equitable remedies.*—Injunctions and restraining orders are available to lower riparian owners to terminate unlawful diversions and to prevent proposed withdrawals.<sup>133</sup> When a power plant without any claim of right diverts water for use away from riparian land or when its unlawful conduct creates a public nuisance or clearly

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OFFICE OF SCIENCE & TECHNOLOGY, CONSIDERATIONS AFFECTING STEAM POWER PLANT SITE SELECTION 22 (1968).

126. See notes 98-102 and accompanying text *supra*. See also Myers & Ervein Co. v. Philadelphia, J. & C. Ry., 12 Montg. 46 (Pa. C.P. 1896).

127. See, e.g., Hughesville Water Co. v. Person, 182 Pa. 450, 38 A. 584 (1897) (court indicated that it would enjoin any diversion that gave no benefit to the diverting riparian owner); Filbert v. Dechert, 22 Pa. Super. 362 (1903) (diversion of water to operate a fountain on the grounds of a state insane asylum was not a reasonable or necessary use).

128. See notes 103-05 and accompanying text *supra*.

129. In Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co., 14 Luz. 319 (Pa. C.P. 1885), the court equated unreasonableness with perceptible diminution in a watercourse's flow that injuriously affects a lower riparian's enjoyment. In Hough v. Doylestown Borough, 4 Brewst. 333 (C.P. Bucks 1870), the court stated that the extraordinary purpose for which water is taken is immaterial. The question is whether the water diversion reduces the volume of the stream to the prejudice of lower owners' rights. See notes 103-05 *supra*.

130. Clark v. Pennsylvania R.R., 145 Pa. 438, 22 A. 989 (1891). *But see* RESTATEMENT (SECOND) OF TORTS § 850B (Tent. Draft No. 17, 1971) (practicality of avoiding the harm by adjusting the use, method of use, or quantity of water used by each riparian proprietor is a factor in assessing reasonableness).

131. See notes 163-72 and accompanying text *infra*.

132. See notes 150-62 and accompanying text *infra*.

133. Rider v. York Haven Water & Power Co., 242 Pa. 141, 88 A. 903 (1913); Hughesville Water Co. v. Person, 182 Pa. 450, 38 A. 584 (1897).

injures a lower riparian owner with only small attendant benefit to the utility, the equities strongly favor the plaintiff and the court can grant an injunction without considering available remedies at law.<sup>134</sup> In all water diversion cases an important equitable consideration is that if left unrestrained, a power plant's unlawful diversion can ripen into a prescriptive right. The prescriptive period runs from the commencement of the diversion even though the absence of intervening low flow protects lower riparians from significant injury. If the injunctive remedy is denied, the only means of barring acquisition of prescriptive rights by the power plant would be a multiplicity of lawsuits for nominal damages. To prevent this, an equity court will enjoin wrongful diversions even without proof of injury by the lower riparian owners.<sup>135</sup> A proposed diversion will not be restrained, however, on the speculative apprehension of lower riparian owners that they will be injured.<sup>136</sup> Equitable principles of balancing the equities and laches apply and will result in denial of an injunction if, for example, a lower riparian owner sits on his rights while a utility erects complex and expensive facilities for a diversion and use of water that may result in legal injury to the plaintiff.<sup>137</sup>

A power plant's performance of an essential public service<sup>138</sup> can make an injunction difficult to obtain for riparian owners legally

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134. See *Markleton Hotel Co. v. Connellsville S.L. Ry.*, 242 Pa. 569, 89 A. 703 (1914); *Borough of Tyrone v. Stevens*, 178 Pa. 543, 36 A. 166 (1897); *Beech v. Kuder*, 15 Pa. Super. 89 (1900).

135. *Griffiths v. Monongahela R.R.*, 232 Pa. 639, 81 A. 713 (1911).

136. *Hey v. Springfield Water Co.*, 207 Pa. 38, 56 A. 265 (1903); *Harley v. Meshoppen Water Co.*, 174 Pa. 416, 34 A. 568 (1896).

137. *Appeal of Pennsylvania R.R.*, 125 Pa. 189, 17 A. 478 (1889); *Powers v. Bald Eagle Boom Co.*, 125 Pa. 175, 17 A. 254 (1889); *Heilman v. Union Canal Co.*, 37 Pa. 100, 104 (1860); *Lukens v. Alan Wood Iron & Steel Co.*, 19 Montg. 78 (Pa. C.P. 1903). Note, however, that an equity action is not barred by laches when the reason for the delay was the plaintiff's difficulty, despite diligent efforts, in ascertaining the identity of the party who caused the diversion. *Symons v. Golubic*, 58 Pa. D. & C.2d 76 (C.P. Mercer 1968).

138. There are no appellate cases that deal with the diversion and consumptive use of water, based on riparian rights alone, by a power plant for the purpose of producing electric power, but such use is analogous to diversions by railroad or water supply companies taking water without the aid of eminent domain powers or special statutory grants. In each case the taker is a public utility company performing a public service for profit, the use is classified as extraordinary, and the taker is constrained by the reasonable use and material diminution concepts. Since in these situations both railroad and water supply companies have been held liable to lower riparian owners when the use materially diminished watercourse flow, caused actual damages, or interfered with lower riparian uses, *see, e.g.*, *Rider v. York Haven Water & Power Co.*, 242 Pa. 141, 88 A. 903 (1913); *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891), similar results can be expected for corresponding effects caused by power plants generating electricity.

injured by the plant's diversion. In *Dimmock v. City of New London*<sup>139</sup> a municipality had constructed a dam and diverted one-half of a river's water to supply its inhabitants during an extended drought. When the shortage ended, the city maintained its diversion, removed restrictions on water use by its inhabitants, approved sixty new residential users, and agreed to supply daily a substantial quantity of water to a nuclear power plant. Since the city used its riparian rights rather than eminent domain to obtain the additional flow during the drought and thereafter,<sup>140</sup> a group of lower riparians sought to enjoin the continuation of its increased diversion. The Connecticut Supreme Court held that because defendant's diversion was for a beneficial public use, it would not be enjoined even though the emergency had long since passed. The injured riparian owners, unable to prove substantial injuries from the city's actions, were awarded only nominal damages.

The usefulness of power plants in combating the ongoing energy shortage may induce courts to take a *Dimmock* approach in dealing with unlawful diversions by power plants when mere riparian owners seek to enjoin their consumptive use. Nevertheless, *Dimmock* took an artificially restricted view of the equitable remedies available to lower riparians and courts. Shutting down a power plant if its diversion unlawfully injures other riparians is not the only alternative. The offending utility could construct new water facilities or participate in financing projects to develop water in the basin. Additionally, installation of backup reservoir capacity or adoption of a schedule of diversions may remove a utility's need to divert stream waters during low flow conditions when interference with other riparians is most likely to occur. Similarly, the utility could arrange to provide alternative water supplies from other streams or ground sources to affected lower riparians. These alternatives, of course, can be very expensive. If a utility does not voluntarily adopt one of these approaches, it is uncertain whether it can be forced to do so as a condition of continued operations.<sup>141</sup> Although regulatory agencies in some instances have imposed such conditions,<sup>142</sup> the

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139. 157 Conn. 9, 245 A.2d 569 (1968).

140. Connecticut riparian law, for the most part, is identical to that of Pennsylvania. A riparian owner is entitled to the natural flow of a watercourse, undiminished in quantity and unimpaired in quality, and can recover actual or at least nominal damages for any wrongful diversion or unreasonable use. *Id.*

141. It is not entirely clear that a power plant's diversion of water to a reservoir on nonriparian land for use in low flow periods based on its riparian rights alone is lawful. While ultimately the water will be pumped back and used at the power plant *on riparian land*, there is initially a diversion away from the riparian land. A question, which apparently has not yet been addressed by the courts, is whether the diversion is unlawful under the riparian doctrine's proscription of diversions for "use" on nonriparian land. See notes 103-05 and accompanying text *supra*.

142. See notes 250-59 and accompanying text *infra*.

courts have not. Judicial reluctance notwithstanding, as important water uses come into conflict and demands for municipal, industrial, irrigation, and power uses exceed available supply, more creative use of equitable remedies will become imperative.

(b) *Legal remedies.*—When a power plant unlawfully diverts or consumes water, lower riparian owners are entitled to recover any actual and special damages sustained.<sup>143</sup> The measure of damages depends on whether the power plant interferes with an existing or a prospective riparian right and whether the interference is temporary or permanent.

If an unlawful diversion deprives lower riparian owners of existing water uses and forces them to acquire water from other sources to continue their activities, the measure of damages is the expense of replacing the water lost.<sup>144</sup> Alternatively, if the plant's consumption amounts to a permanent, material diminution in the volume of the watercourse, lower riparian owners can recover the depreciation in value of their property—the difference between the land's value before and after the unlawful diversion.<sup>145</sup> A continuous, unlawful diversion deemed temporary in nature will be considered a continuing trespass giving rise to successive causes of action.<sup>146</sup> To assure that the injured party recovers the full extent of his damages, suit must be timely commenced.<sup>147</sup>

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143. See *Craig v. Borough of Shippensburg*, 7 Pa. Super. 526 (1898); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897).

144. *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 143 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900) (mill owner entitled to amount expended to replace quantity of flow diverted by defendant); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897) (glass manufacturer who used large amounts of water in its process permitted to recover expense of resupply made necessary by defendant's diversion).

145. *Wagner v. Purity Water Co.*, 241 Pa. 328, 88 A. 484 (1913); *Williams v. Fulmer*, 151 Pa. 405, 25 A. 103 (1892); *Diehm v. Borough of New Holland*, 126 Pa. Super. 315, 191 A. 393 (1937).

146. *Wagner v. Purity Water Co.*, 241 Pa. 328, 88 A. 484 (1913); *Lentz v. Carnegie Bros. & Co., Ltd.*, 145 Pa. 612, 23 A. 219 (1892); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897).

147. A riparian owner who has been legally injured by unlawful diversions may unwittingly limit the damages recoverable by his failure to bring suit promptly. This is best illustrated by *Lentz v. Carnegie Bros. & Co.*, 145 Pa. 612, 23 A. 219 (1892). In that case a riparian owner sued for damages to his farmland caused by defendant's damming of a watercourse. Since defendant had conducted its activities for nearly seventeen years, it contended that the statute of limitations precluded plaintiff's suit. Although the court rejected this contention, it held that the Act of March 27, 1713, 1 SM. L. 76, § 1 (compiled at PA. STAT. ANN. tit. 12, § 31 (1953)) imposed a six-year statute of limitations on this action in trespass. Because a continuing trespass was involved, plaintiff could recover for the damage done to his lands in the six years



A cause of action exists even when a power plant's diversion neither causes actual damage nor deprives the lower riparians of specific uses. While no actual damage has been inflicted, lower owners are entitled to nominal damages<sup>148</sup> because the diverting party has committed a legal wrong that can ripen into a prescriptive right if damages are not allowed.<sup>149</sup>

### B. Prescriptive Rights

The second method of obtaining water rights under the common law is by prescription. In general, the right to use a quantity of water in any watercourse other than a navigable stream<sup>150</sup> can be acquired by an open, notorious, and continuous use in a manner ad-

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before suit. *Accord*, *Kraft v. Hanover & McSherrystown Water Co.*, 242 Pa. 114, 88 A. 909 (1913); *Roeder v. Schuylkill Haven Gas & Water Co.*, 15 Sch. 325 (Pa. C.P. 1919). But since defendant had operated in the same manner for nearly seventeen years, the condition of plaintiff's land was the same at the time of suit as it had been six years earlier and as a result he recovered nothing. While plaintiff was able to prevent defendant from obtaining a prescriptive right, his delay in bringing suit prevented the recovery of any actual or consequential damages caused by defendant's clearly unlawful act.

A similar result can accrue in inverse condemnation cases. Under PA. STAT. ANN. tit. 26, § 1-524 (Supp. 1975), any private party whose property has been injured but not condemned by a party that has the powers of eminent domain can file a petition for appointment of viewers to assess damages within six years of the date of the injury. A failure to file within six years results in a loss of the right to be compensated for the injury. The applicability of this statute of limitations to power plants depends upon whether the plant possesses power to condemn water. See notes 181-91 and accompanying text *infra*.

148. *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891); *Miller v. Miller*, 9 Pa. 74 (1848).

149. *Clark v. Pennsylvania R.R.*, 145 Pa. 438, 22 A. 989 (1891). An important point regarding riparian rights should be noted. The lower riparian has the power to protect both existing and future (inchoate) rights. Interference with water uses may not be readily apparent, as when a power plant commences its diversion in times of relatively high flow. The prospective interference is, nevertheless, cognizable. It is hydrologically predictable. The loss is subject to evaluation, either in terms of the cost of acquiring alternative water supplies or the diminution of the value of impacted riparian land. Even when a power plant's diversion permanently interferes only with inchoate prospective uses, the market value of the riparian land will reflect the preclusion of those future uses. A key problem arises in this regard; there is no evidence that the market value of land directly reflects the loss or gain of water rights, especially interference with prospective uses. Many factors, such as urban land needs, inflation, transportation availability, and taxes affect land values, and the positive stimulus of some of these factors may mask the negative impact of water use interferences. The market may not reflect the value of prospective water uses precluded by a power plant's diversion until those future uses become more predictable current needs, that is, until those who need the water are willing to bid for it. Failure to perceive future scarcity and potentials for water conflict has resulted in little development of a water rights market, making evaluation of damages from loss of water highly speculative and probably economically inaccurate.

150. A right to a use that interferes with navigation in a navigable watercourse cannot be acquired by prescription, *Bird v. Smith*, 8 Watts 434 (Pa. 1839), because property held for a public purpose cannot be acquired by adverse possession. See *A.D. Graham & Co. v. Pennsylvania Tpke. Comm'n*, 347 Pa. 622, 33 A.2d 22 (1943); *Lacy v. Montgomery*, 181 Pa. Super. 640, 124 A.2d 492 (1956).

verse to the rights of others<sup>151</sup> for a period of twenty-one years.<sup>152</sup> Under certain circumstances similar rights can be obtained by public service entities possessing eminent domain powers unless inverse condemnation actions are commenced within six years of a taking.<sup>153</sup>

Prescriptive rights differ markedly from riparian rights in that they are absolute and exclusive and not constrained by considerations of reasonableness or requirements of use on riparian land. Thus, a person who diverts water to nonriparian land or who in the process of extraordinary riparian manufacturing enterprise substantially diminishes a stream's flow can acquire a prescriptive right by open, notorious, and continuous use of the water in a manner inconsistent with the legal rights of upstream and downstream riparians.

A party can acquire through prescription absolute ownership of all the water of a watercourse.<sup>154</sup> The prescriptive right is limited,

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151. *Loughran v. Matylewicz*, 367 Pa. 593, 81 A.2d 879 (1951); *Horn v. Miller*, 142 Pa. 557, 21 A. 994 (1891). To support a defensive claim of prescriptive rights, the acts that are the basis of the claim must be injurious to the plaintiff and give to him or those under whom he claims a right of action. *Hughesville Water Co. v. Person*, 182 Pa. 450, 454, 38 A. 584, 585 (1897). Under Pennsylvania law, however, a lower riparian gains a right of action for at least nominal damages when a defendant engaged in an extraordinary use materially diminishes the stream flow or diverts water to nonriparian land, even if the plaintiff is making no use of the water that could be injured. *See Clark v. Pennsylvania R.R.*, 145 Pa. 438, 450, 22 A. 989, 990 (1891). "Any trespass or nuisance which infringes upon the rights of the plaintiff, or which would abridge his present or *potential use* of his property, will justify an action, *although it causes no present actual damage . . .*" *Id.* (emphasis added). Still, to gain a prescriptive right the "aggrieved" riparian owner must have notice of the adverse use. The statute runs from the time when the owner is or with proper attention to his own property should be warned of the adverse claim. *Hughesville Water Co. v. Person*, *supra* at 454, 38 A. at 585. In *Hughesville* defendants operated factories along a stream and for over twenty-one years had made open, continuous, nightly diversions. The court held that since plaintiffs, lower riparian owners, made no use of the water during the nighttime, defendants' nightly diversions were not reasonably discoverable by plaintiffs and, therefore, no prescriptive right could be gained through this continuous use.

152. PA. STAT. ANN. tit. 12, § 72 (1953); *see Shaffer v. Baylor's Lake Ass'n*, 392 Pa. 493, 141 A.2d 583 (1958); *Palmer Water Co. v. Lehighon Water Co.*, 280 Pa. 492, 124 A. 747 (1924); *McGeorge v. Hoffman*, 133 Pa. 381, 19 A. 413 (1890); *Appeal of Messinger*, 109 Pa. 285, 4 A. 162 (1885); *Gehman v. Endman*, 105 Pa. 371 (1884); *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 646, 45 A. 482 (1900); *Lancaster Milling Co. v. Media Heights Golf Club*, 59 Lanc. 159 (Pa. C.P. 1964). The period begins to run at the instant an unlawful diversion occurs. *Appeal of Messinger*, 109 Pa. 285, 4 A. 162 (1885).

153. PA. STAT. ANN. tit. 26, § 1-524 (Supp. 1975); *O'Keefe v. Altoona City Auth.*, 9 Pa. Commonwealth Ct. 397, 304 A.2d 916 (1973). Early eminent domain codes contained no statute of limitations on inverse condemnation actions and consequently public entities could acquire no prescriptive rights. *See Brankin v. Philadelphia, N. & N.Y.R.R.*, 286 Pa. 331, 133 A. 563 (1926).

154. *Consolidated Water Supply Co. v. State Hosp. for Criminal Insane*, 66 Pa. Super. 610 (1917).

however, to the amount of water taken continuously during the entire statutory period.<sup>155</sup> For example, in *Lancaster Milling Co. v. Media Heights Golf Club*<sup>156</sup> the court held that the proprietor of a golf course, who for over twenty-one years had used water from a stream to irrigate greens, could not exercise a prescriptive right to divert additional quantities to irrigate fairways. The prescriptive right also might be restricted to the particular use engaged in during the twenty-one-year period, at least when a party seeks to engage in a use radically different from the one through which it gained a prescriptive right. However, no definitive holdings address this point.<sup>157</sup>

Once obtained, a prescriptive right can be asserted against a power plant's consumptive, interfering use. Because prescriptive rights are absolute, as contrasted with the impermanent and correlative nature of riparian rights, they can be asserted with more assurance that an effective remedy will be granted to the injured party. Thus, a mill owner or manufacturer with a prescriptive right to a daily quantity of water can restrain an upstream power plant operating as a mere riparian owner from interference with his prescriptive use.<sup>158</sup> In turn, a power plant acting as a mere riparian owner cannot enjoin an upstream owner whose impoundment or diversion of water under a prescriptive right interferes with the power plant's use.<sup>159</sup>

Prescriptive rights to the use of water, therefore, hold a stronger position against a power plant's consumptive use than riparian rights. A power plant, like any other water user, however, can gain a prescriptive right by uninterrupted use for twenty-one years.<sup>160</sup> Moreover, prescriptive rights gained by older power plants apply to new plants built on the same site as long as increased quantities of water are not taken.<sup>161</sup> Prescriptive rights held by power

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155. *Scranton Gas & Water Co. v. Delaware, L. & W.R.R.*, 240 Pa. 604, 88 A. 24 (1913); *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900).

156. 59 *Lanc.* 159 (Pa. C.P. 1964).

157. In *Scranton Gas & Water Co. v. Delaware, L. & W.R.R.*, 240 Pa. 604, 88 A. 24 (1913), the court ruled that the railroad company's prescriptive right to divert a large quantity of water for use on riparian land could not be construed as a prescriptive right to divert water to a reservoir on distant, nonriparian land. While the case can be read as a prohibition against application of water to a use different from that for which a prescriptive right exists, the railroad's attempt to divert larger quantities to the reservoir than it previously had used on riparian land under its prescriptive right casts some doubt on this interpretation.

158. *Cf. Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900).

159. *Cf. Appeal of Messinger*, 109 Pa. 285, 4 A. 162 (1885) (defendant's damming of stream under prescriptive right not enjoined by downstream mill owner).

160. Provided, of course, that the plant does not possess eminent domain powers over water rights. See note 153 and accompanying text *supra*; notes 181-91 and accompanying text *infra*.

161. In *Lukens v. Alan Wood Iron & Steel Co.*, 19 *Montg.* 78 (Pa. C.P. 1903), defendant had diverted a quantity of water for over thirty years to run its grist mill.

plants give them a virtually unassailable right to the consumptive use of water.<sup>162</sup>

### C. Rights of Public Water Companies Holding State Permits

1. *Acquisition of Rights.*—The acquisition of water and water rights for public supply generally is governed by statute in Pennsylvania. Enabling acts permit cities and boroughs to acquire the water of springs, creeks, streams, and rivers to supply their citizens and confer the power of eminent domain for that purpose.<sup>163</sup> Municipal acquisitions are restricted in that they cannot deprive riparian and spring owners of water for domestic, dairy, stock watering, and farming uses.<sup>164</sup> All acquisitions of water and water rights by public water supply agencies, a term that encompasses all corporations vested with power to supply water to the public<sup>165</sup> including private, municipal, and quasi-municipal corporations, districts, and authorities, currently are governed by the Pennsylvania Water Rights Act,<sup>166</sup> at least with respect to water rights acquired after the Act's effective date.<sup>167</sup>

Under the Water Rights Act no public water supply agency can acquire water rights, including the right to increased quantities, by purchase, gift, lease, prescription, or condemnation without first pro-

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During six months of the year the diversion used nearly the entire stream flow and in months of greater flow it took a substantial portion. When defendant subsequently built a steel mill on riparian land and diverted the same quantity to a reservoir for use in steel processing and steam production, a lower riparian mill owner sought an injunction. The court refused to enjoin diversion for the new use, however, because no greater quantity was taken than during the prior thirty-year period. The court also alluded to defendant's expenditure of large sums of money in erecting the steel plant and the inequity of allowing plaintiff to restrain the new use and diversion.

162. *Id.*

163. PA. STAT. ANN. tit. 53, § 2905 (1974); *id.* § 38505 (1957).

164. PA. STAT. ANN. tit. 53, § 2905 (1974); *id.* § 38505 (1957).

165. PA. STAT. ANN. tit. 32, § 631(b) (1967).

166. *Id.* §§ 631-41. Originally the Act of April 29, 1874, P.L. 73, No. 32 (compiled at PA. STAT. ANN. tit. 15, § 3241 (1967)), gave public water supply agencies incorporated in the Commonwealth eminent domain power to appropriate all water required for their present and future needs in supplying the public. This act was subsequently repealed by the Act of July 20, 1968, P.L. 459, No. 216 (compiled at PA. STAT. ANN. tit. 15, § 2204(c)(2) (Supp. 1975)), insofar as it was inconsistent with PA. STAT. ANN. tit. 15, § 1322 (Supp. 1975). The latter statute provides that a public utility corporation with the principal purpose of supplying water to the public shall have the power of eminent domain to condemn water, provided that such corporation procures a water supply permit required by the Water Rights Act, *id.* tit. 32, §§ 631-41 (1967). Therefore, all public water supply corporations must obtain a water supply permit before exercising the power of eminent domain and, once this permit is obtained, must exercise that power within the limits of the permit.

167. Act of June 24, 1939, P.L. 842, No. 365, § 5 (compiled at PA. STAT. ANN. tit. 32, § 635 (1967)).

curing a water supply permit.<sup>168</sup> In reviewing permit applications the Department of Environmental Resources (DER)<sup>169</sup> must ascertain whether a proposed water use will conflict with the rights of any other public water supply agency and must determine (1) that the proposed diversion is reasonably necessary for current and future needs and (2) that the taking of this water will not interfere with navigation, jeopardize public safety, or cause substantial injury to the Commonwealth.<sup>170</sup> Once a public water supply agency receives a permit, it has the power to condemn all necessary water rights by eminent domain.<sup>171</sup> A right to a hearing is provided to anyone who may be directly or adversely affected by any DER action under the Act.<sup>172</sup>

2. *Rights of Downstream Water Supply Agency.*—The rights of a downstream water supply agency whose supply is affected by an upstream power plant depend upon the manner in which the agency acquired its water rights. The mere incorporation of a water company and conferral of eminent domain powers does not give the corporation the right to appropriate and divert water without condemnation; it has only the rights of a riparian owner.<sup>173</sup> It can seek to

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168. PA. STAT. ANN. tit. 32, §§ 635-36 (1967).

169. In accordance with § 1908-A of the Administrative Code, the Department of Environmental Resources assumed the powers and duties formerly vested in the Water Supply Commission and Water and Power Resources Board with respect to the condemnation or appropriation of waters, applications for new or additional sources of water supply, and construction of water works. *Id.* tit. 71, §§ 510-8(1) (d)-(f) (Supp. 1975).

170. *Id.* tit. 32, § 637 (1967); see *Borough of Collegeville v. Philadelphia Suburban Water Co.*, 377 Pa. 636, 105 A.2d 722 (1954), *construing* PA. STAT. ANN. tit. 32, §§ 636-37 (1967).

171. PA. STAT. ANN. tit. 32, § 639 (1967). Prior to the passage of the Water Rights Act, acquisition of water and water rights by water supply agencies was governed by *id.* §§ 621-25 and the public utility supplements to the Corporation Act of 1874, *id.* tit. 15, §§ 3241-56.

172. PA. STAT. ANN. tit. 32, § 640 (1967); *id.* tit. 71, § 510-21 (Supp. 1975) (hearing powers conferred on Environmental Hearing Board).

173. *Phillipsburg Water Co. v. Citizens Water Co.*, 189 Pa. 23, 41 A. 979 (1899); *Lord v. Meadville Water Co.*, 135 Pa. 122, 19 A. 1007 (1890); *Appeal of Haupt*, 125 Pa. 211, 17 A. 436 (1889). Thus, if a water supply agency diverts water away from its riparian land to the community it serves, it has acted illegally as a riparian owner and is liable to other riparian owners injured thereby. *Lord v. Meadville Water Co.*, *supra*; *Irving's Ex'rs v. Borough of Media*, 10 Pa. Super. 132 (1899), *aff'd*, 194 Pa. 648, 45 A. 482 (1900); *Craig v. Borough of Shippensburg*, 7 Pa. Super. 526 (1898); *Standard Plate Glass Co. v. Butler Water Co.*, 5 Pa. Super. 563 (1897). A municipality that diverts water for supply purposes under statutes permitting it to do so is required to compensate riparian owners for the rights of which they have been deprived. *Appeal of Haupt*, 125 Pa. 211, 17 A. 436 (1889); *Craig v. Borough of Shippensburg*, 7 Pa. Super. 526 (1898). But when a public calamity, such as a long drought, requires the taking, the courts will bow to the public interest and permit a public water supply company to use the waters of a watercourse on an emergency basis despite injury to riparian owners and even though the water company never acquired such rights through condemnation, prescription, or grant. *North Mt. Water Supply Co. v. Troxell*, 14 Luz. 161 (Pa. C.P. 1908), *aff'd*, 232 Pa. 315, 72 A. 621 (1909).

restrain power plant diversions that unreasonably affect its supply or materially diminish watercourse flow within the limits of riparian doctrine, but it has no absolute right to a specific quantity or supply of water. On the other hand, when a public water supply agency acts pursuant to its power of eminent domain and in accordance with governing statutes,<sup>174</sup> its powers are broad.<sup>175</sup> The statutory power to appropriate water imposes a duty on a water company to supply the maximum demands of its subscribers under all conditions including drought and minimum flow periods.<sup>176</sup> Consequently, public water supply agencies and the courts can be expected to protect public supplies and sources jealously from threatening consumptive uses by others.

The question of what action can be taken to protect previously acquired public water supplies endangered by an electric power plant's consumptive use has not been addressed by Pennsylvania courts. The situation is analogous, however, to one in which a manufacturer, railroad company, or some other commercial enterprise owning riparian land attempts to divert and consume water in a manner that interferes with public water supply. The courts' willingness to vindicate the rights of downstream public water supply agencies threatened by consumptive diversions of upstream extraordinary uses is illustrated by *Appeal of Haupt*.<sup>177</sup> A private water company had contracted to supply water to private users and proceeded to install pipes and pumping apparatus. A downstream public water

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174. See notes 163-72 *supra*.

175. In *Reeves v. Philadelphia Suburban Water Co.*, 287 Pa. 376, 135 A. 362 (1926), the supreme court stated,

The supply of pure water to the public in territory thickly populated is today a most difficult problem and its difficulties are bound to multiply as time goes on and population increases. Whatever may have been this court's position . . . in previous decades, when its great importance may not have been fully realized, the tendency, as our decisions in the evolution will show, has been to broaden the view and to construe liberally grants of power to water companies, furnishing, as they do, the most essential of all public services to mankind, vital to life itself.

*Id.* at 382, 135 A. at 364. In this same vein, public water supply agencies generally are given power to condemn all water they reasonably deem necessary for their present and future needs. *Philadelphia v. Philadelphia Suburban Water Co.*, 309 Pa. 130, 163 A. 297 (1932); *Palmer Water Co. v. Lehighon Water Supply Co.*, 280 Pa. 492, 124 A. 747 (1924); *Boalsburg Water Co. v. State College Water Co.*, 240 Pa. 198, 87 A. 609 (1913). A water supply agency can appropriate an entire stream if necessary, *Palmer Water Co. v. Lehighon Water Supply Co.*, *supra*, and can store, carry away, and sell water in accordance with the needs of its subscribers, *Reeves v. Philadelphia Suburban Water Co.*, *supra*.

176. *Palmer Water Co. v. Lehighon Water Supply Co.*, 280 Pa. 492, 124 A. 747 (1924).

177. 125 Pa. 211, 17 A. 436 (1889).

agency established to supply a municipality previously had acquired through condemnation the right to as much water as necessary for that purpose. The public agency sued the private company to enjoin completion of the diversion works, alleging that the diversion would interfere with plaintiff's water supply, particularly in times of low flow. The court granted the injunction, ruling that public water supply was given a special status by the legislature, was of greater relative importance than commercial uses, and must be protected when the public supplier acquired its rights pursuant to statute and not as a mere riparian owner. Under this reasoning injunctions have been granted to restrain similar diversions by railroad companies to supply their engines.<sup>178</sup> Uses by electric utilities that interfere with public water supplies will be similarly restrained.

3. *Taking of Water by Downstream Power Plant.*—When an electric power plant is located downstream from a public water supply agency, a question whether the plant is entitled to an adequate supply for its needs arises. In general, an extraordinary user cannot force a public water supply agency to release water for the lower owner's use. In *Palmer Water Co. v. Lehighton Water Supply Co.*<sup>179</sup> a private water firm was incorporated for the sole purpose of supplying water to a zinc manufacturer. The zinc concern later installed new processes and its requirements increased. Its private supplier was unable to meet the new demand from available flow and, in turn, brought an equity action against a nearby public water utility to force release of a constant amount of water from its upstream reservoirs. Defendant water utility, which served municipal consumers, had acquired through eminent domain the right to divert a substantial portion of the watershed's available flow. The court held that the private water firm was not entitled to an injunction, emphasizing that a public water utility has an important obligation and that the use of water for manufacturing and mechanical purposes is always secondary to the public's domestic and health needs.

While a power plant downstream from a public water utility can divert water for its extraordinary use, it must do so within the confines of riparian law if it takes as a mere riparian owner. Since diversion by a water supply agency may reduce significantly the quantity reaching the power plant, the plant might be further limited in the amount it can divert because any substantial diversion by the plant will more easily cause a material diminution in the flow of the already partially depleted watercourse. Moreover, the flow reaching the power plant is subject to further diminution since an up-

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178. *Wilkes-Barre Water Co. v. Lehigh Coal & Nav. Co.*, 14 Luz. 319 (Pa. C.P. 1885).

179. 280 Pa. 492, 124 A. 747 (1924).

stream public water supply agency can condemn additional quantities of water as its needs require.<sup>180</sup>

#### D. Condemnation by Thermal-Electric Power Plants

Several legislative enactments purport to confer power on utilities to appropriate water for electricity production by means other than hydroelectric generation.<sup>181</sup> Under close analysis, however, this authorization is completely ineffective. Section 322(A) of the Pennsylvania Business Corporation Law provides that any public utility corporation shall have the right to take and condemn "property" for "[t]he production, generation, manufacture, transmission, storage, distribution or furnishing of . . . electricity . . . to or for the public."<sup>182</sup> On the other hand, subsection (F) of the same section<sup>183</sup> states that the powers granted by the statute are not to be construed to permit a public utility to condemn waters or water rights without first having obtained a limited power permit<sup>184</sup> authorizing the acquisition. The statute that purportedly enables electric utilities to appropriate water for thermal-electric power generation is the Limited Power Act.<sup>185</sup> Any public service company holding a limited power permit granted on behalf of a power project<sup>186</sup> for use

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180. For example, in *Philadelphia & Reading R.R. v. Pottsville Water Co.*, 182 Pa. 418, 38 A. 404 (1897), the court refused to restrain the condemnation of water by a public water supply agency and held that the downstream railroad that sought the injunction had no right of action against the public water company and that its water rights were subject to appropriation for public water supply.

181. These statutes concentrate on the use of water for thermal-electric power generation by nuclear or fossil-fueled plants as opposed to hydroelectric power generation. *E.g.*, PA. STAT. ANN. tit. 15, § 1322(A)(3) (Supp. 1975).

182. *Id.* Although the statute refers to the power to condemn "property," as opposed to a specific power to condemn water and water rights, the language implies that water is included in the term "property" and that "property" is used merely as a general term to describe land, water, water rights, easements, rights-of-way and the myriad of other "property," the acquisition of which would be appropriate for public utility purposes. The conclusion that water and water rights are included is supported by subsection (F) of the statute, which specifically refers to water, water rights, and condemnation powers and limits the exercise of those powers. *Id.* § 1322(F).

183. PA. STAT. ANN. tit. 15, § 1322(F) (Supp. 1975).

184. Limited power permits are granted pursuant to *id.* tit. 32, §§ 591-600, 621-25 (1967). For a discussion of limited power permits in the context of overall state regulation of water resources, *see* notes 192-212 and accompanying text *infra*.

185. PA. STAT. ANN. tit. 32, §§ 591-600 (1967).

186. A power project is defined as a complete unit of improvement or development for the procuring and/or supplying of light, heat, or power by electricity and includes the various structures, facilities, appurtenances, transmission systems, and the like that are necessary and appropriate in the construction, maintenance, and operation of the unit. *Id.* § 621.



in public service has the right to appropriate and condemn waters<sup>187</sup> and other property and rights if DER<sup>188</sup> finds the region's and the Commonwealth's interests served by the project's operation.

These two statutes notwithstanding, the requirement of first obtaining a limited power permit renders the statutory grants of eminent domain powers nugatory. An anomaly in the Limited Power Act allows permits only for nonnavigable streams,<sup>189</sup> which are with few exceptions insufficient to support a major electric generating facility. For practical purposes, therefore, electric utilities are precluded from acquiring eminent domain powers to condemn water necessary for generating electricity by thermal-electric means under either section 322 of the Business Corporation Law or the Limited Power Act. Moreover, no statute enables the Pennsylvania Public Utility Commission to confer water acquisition powers on utilities for use in operation of thermal-electric plants. The Public Utility Code prohibits a utility's use of eminent domain until it obtains a certificate of public convenience from the Commission.<sup>190</sup> The power of eminent domain over water, however, is conferred through other statutes, all of which refer to the Limited Power Act.<sup>191</sup>

Thus, no means currently exist by which a thermal-electric generating facility can acquire the power to condemn water from navigable rivers for use in normal operating processes. Absent that power utilities must satisfy their needs by purchase or by taking as a riparian owner.

#### IV. Regulatory Approaches to Consumptive Uses

During the past fifty years a network of state, regional, and federal regulatory programs have gained primacy over common-law mechanisms in governing the water field. The ability of these programs to deal effectively and comprehensively with the challenge of power plant water use must be examined carefully. Whether these regulatory laws can avoid potential water conflicts and expeditiously resolve those that do arise is of paramount concern.

##### A. State Regulatory Programs

In 1971 the Pennsylvania Department of Environmental Resources assumed the powers formerly vested in the Water Supply

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187. *Id.* § 623.

188. By reason of section 1908-A of the Administrative Code, DER assumed these powers and duties that were formerly vested in the Water Supply Commission and the Water and Power Resources Board. *Id.* tit. 71, § 510-8 (Supp. 1975).

189. See notes 198-212 and accompanying text *infra* for a detailed discussion of the problems of the Limited Power and Water Supply Act and reasons for its ineffectiveness.

190. PA. STAT. ANN. tit. 66, § 1124 (Supp. 1975). This requirement does not apply to electric cooperatives. *Id.* tit. 15, § 12432 (1967).

191. *Westside Elec. St. Ry. v. Public Serv. Comm'n*, 91 Pa. Super. 162 (1927).

Commission and the Water and Power Resources Board to regulate construction of dams and other water obstructions, condemnation and appropriation of waters, and applications for new or additional supplies of water and water power.<sup>192</sup> Through this transfer DER administers the 1913 Water Obstructions Act,<sup>193</sup> the 1923 Limited Power Act,<sup>194</sup> and the 1939 Water Rights Act.<sup>195</sup>

Under the Limited Power Act any person who uses a dam or changes the course, current, or cross section of any stream or body of water for the "development of water power" or for "the main purpose of storing, cooling, diverting, [or] using . . . water for steam raising or steam condensation . . . in the generation of electric energy for use in public service" must obtain a limited power permit.<sup>196</sup> This includes both hydroelectric and thermal-electric plants.

By its terms the Limited Power Act is the exclusive method of obtaining state permits for power projects. Except as provided in the fourth paragraph of section 2, the Act supersedes the Water Obstructions Act<sup>197</sup> with respect to changes in streams and diversions of water for power purposes. The peculiar construction of section 2,<sup>198</sup> however, creates an anomaly in its application to thermal-electric plants. That section distinguishes between changes in streams to develop power<sup>199</sup> within the jurisdiction of the United States and those that are not within the jurisdiction of the United States. A power dam or a stream change to develop power is deemed to be within the first category under the following circumstances: (1) the stream change or dam is constructed in or upon navigable waters of the United States; or (2) the Federal Power Commission (FPC) finds that interstate or foreign commerce would be affected by a dam or stream change.<sup>200</sup> DER is empowered to issue permits for power

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192. PA. STAT. ANN. tit. 71, § 510-8 (Supp. 1975).

193. *Id.* tit. 32, §§ 681-91 (1967).

194. *Id.* §§ 591-600.

195. *Id.* §§ 631-41.

196. *Id.* §§ 592, 594.

197. *Id.* §§ 681-91.

198. *Id.* § 592.

199. This term includes both hydroelectric dams and thermal-electric diversions. *Id.* tit. 32, § 591 (1967) (definitions).

200. *Id.* tit. 32, § 592 (1967). The term "navigable waters of the United States" is a term of judicial art developed in a series of cases defining the extent of the federal government's power to regulate navigation and commerce. One of the earliest and most generally accepted legal definitions of navigable waters of the United States was contained in *The Daniel Ball*, 77 U.S. (10 Wall.) 557, 563 (1871) (emphasis added):

Those rivers must be regarded as public navigable rivers in law which are

plant water use for up to fifty years subject to conditions that the Department deems

necessary to protect the present and future interests of the Commonwealth and its people in the construction, maintenance, and operation of the project, and in the water and power resources to be utilized thereby, and suitable to secure to the permittee a reasonable opportunity for a fair return on the actual investment prudently made in the project.<sup>201</sup>

Unfortunately, the 1923 Limited Power Act created a statutory *non sequitur* as applied to power projects *within* the jurisdiction of the United States. The Act attempted to tie the Commonwealth's issuance of a permit to receipt of a FPC license authorizing the proposed water diversion.<sup>202</sup> The difficulty is that the FPC has no jurisdiction to regulate diversion and consumptive water use for thermal-electric power generation. The United States Supreme Court recently affirmed<sup>203</sup> the Commission's long-standing position<sup>204</sup> that its jurisdiction under the Federal Power Act<sup>205</sup> is limited to hydroelectric and not thermal-electric power production. The incongruity<sup>206</sup> between the Pennsylvania Limited Power Act and the Federal Power Act imposed impossible conditions upon projects to supply

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navigable in fact. And they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. And they constitute navigable waters of the United States within the meaning of the acts of Congress, in contradistinction from the navigable waters of the States, when they form in their ordinary condition by themselves, or by uniting with other waters, a continued highway over which commerce is or may be carried on with other States or foreign countries in the customary modes in which such commerce is conducted by water.

See *United States v. Oregon*, 295 U.S. 1, 15 (1935); *United States v. Utah*, 283 U.S. 64, 76 (1931); *United States v. Holt State Bank*, 270 U.S. 49, 56 (1926); *Brewer-Elliott Oil & Gas Co. v. United States*, 260 U.S. 77, 86 (1922); *United States v. Rio Grande Dam & Irrigation Co.*, 174 U.S. 690, 698 (1899).

The federal courts have embellished and expanded the basic test over the past century. To date the most fully developed and expansive statement of the federal test of navigability is contained in *United States v. Appalachian Elec. Power Co.*, 311 U.S. 377 (1940). As explained by the Supreme Court, the test does not depend on the ability of a river in its natural (unimproved) condition to support commercial navigation. If a river can be made navigable by "reasonable improvements," it is deemed a part of the navigable waters of the United States. For a fuller discussion of these definitions see Guinn, *An Analysis of Navigable Waters of the United States*, 18 BAYLOR L. REV. 559 (1966); Leighty, *The Source and Scope of Public and Private Rights in Navigable Waters*, 5 LAND & WATER L. REV. 391 (1970); Weston, *supra* note 116.

201. PA. STAT. ANN. tit. 32, § 592 (¶ 5) (1967).

202. *Id.* § 592 (¶ 3).

203. *Chemehuevi Tribe of Indians v. FPC*, 420 U.S. 395 (1975). For a more detailed discussion of this case and the issue of FPC jurisdiction, see notes 339-42 *infra*.

204. "[T]he Commission is limited to the consideration of projects designed to produce *water power*." FPC ANN. REP. 51-52 (1921) (emphasis added).

205. 16 U.S.C. § 797(e) (1970).

206. Letter from Robert E. Woodside, Attorney General of Pennsylvania, to S.S. Lewis, Secretary of Forests and Waters, March 26, 1953 [hereinafter cited as Woodside Letter].

water for steam (thermal-electric) power on streams "within the jurisdiction of the United States."<sup>207</sup> Because the Federal Power Act does not require and the FPC does not issue permits for thermal-electric plants, the requirement that a limited power permit for a steam power project within the jurisdiction of the United States shall become "null and void" unless the permittee obtains a federal permit within one year<sup>208</sup> created an anomaly in the law.<sup>209</sup>

To eliminate this ambiguity the general assembly amended section 2 of the Limited Power Act in 1953 to add the following paragraph:

The provisions of this act relating to dams or changes in streams to supply water for steam power within the jurisdiction of the United States shall be suspended and postponed until the Federal Power Commission shall require licenses for such dams or changes in streams; and during the period in which the provisions of this act shall be so suspended and postponed, any such dams or changes in streams shall continue to be subject to existing laws relating to water obstructions.<sup>210</sup>

The "existing laws relating to water obstructions" consist primarily of the Water Obstructions Act.<sup>211</sup> Thus, to the extent a thermal-electric project involves a diversion from navigable waters of the United States, it is subject to the regulatory provisions of the Water Obstructions Act and not those of the Limited Power Act.<sup>212</sup>

The 1913 Water Obstructions Act<sup>213</sup> empowers DER to regulate the construction of dams and other water obstructions, together with activities that "in any manner . . . change or diminish the course, current or cross section of any stream."<sup>214</sup> A thermal-elec-

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207. Since the FPC lacks regulatory authority over thermal-electric power projects and, thus, will not engage in findings that these projects affect interstate or foreign commerce, for the purposes of § 2 of the Limited Power Act we need only be concerned with thermal-electric projects that involve the diversion and use of navigable waters of the United States. . See PA. STAT. ANN. tit. 32, § 592 (¶1) (1967).

208. *Id.* § 592 (¶ 3).

209. DER General Counsel's Opinion, "Control Over Consumptive Uses of Water in Power Projects," memo from R.T. Weston to W.E. Gilbertson at 2-8 (May 7, 1974).

210. PA. STAT. ANN. tit. 32, § 592 (¶ 4) (1967).

211. *Id.* §§ 681-91.

212. It was the consistent administrative practice of the Water and Power Resources Board after the effective date of the Limited Power Act to issue permits for dams to supply water for steam power under the Water Obstructions Act. Thus, the 1953 amendment to § 2 of the Limited Power Act affirmed and statutorily authorized prior administrative practice with respect to steam power projects. See Woodside Letter, *supra* note 206, at 1.

213. PA. STAT. ANN. tit. 32, §§ 681-91 (1967).

214. *Id.* § 682.

tric project can come under the permit provisions of the Act in two ways. First, it will usually involve "construction of a dam or other water obstruction" in or along a stream at the point of diversion. Second, diversion of large quantities of water for steam generation and cooling purposes will substantially "change or diminish" the current and cross section of the stream or body of water involved.<sup>215</sup>

Although DER and its predecessor, the Water and Power Resources Board, have issued many permits for thermal-electric diversions under the Water Obstructions Act, no regulations specifically addressing the consumptive water use issue have been promulgated.<sup>216</sup> For a number of years, however, the agency applied a "guideline"<sup>217</sup> in evaluating permit applications for dams and diversions. The guideline required the minimum release of .15 cubic feet per second for every square mile of drainage area above the diversion.<sup>218</sup> In 1974 a task force for the State Water Plan prepared more sophisticated criteria to guide planning and regulation of low flows and to protect water quality and stream regimes.<sup>219</sup> The criteria have not been adopted in regulatory form, but are used in assessment of future water availability and new permit requests.<sup>220</sup>

Persons aggrieved by permit decisions of DER, including affected riparian owners,<sup>221</sup> can appeal to the Environmental Hearing

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215. The significance of the change upon the current and cross section of streams caused by consumptive water use in thermal-electric projects was emphasized by the court in *Chemehuevi Tribe of Indians v. FPC*, 489 F.2d 1207 (D.C. Cir. 1973). The United States Court of Appeals for the District of Columbia Circuit specifically noted that cooling water requirements of thermal-electric plants are projected to increase from 120 billion gallons per day in 1971 (equivalent to ten percent of the average daily runoff of the United States) to 600 billion gallons per day in the year 2000 or fifty percent of the average daily runoff. However, only a fraction of this amount will be consumed by evaporation in the cooling process.

The Water Obstructions Act does not apply to "tidal waters of the Delaware River and of its navigable tributaries." PA. STAT. ANN. tit. 32, § 682 (1967). Since the Delaware River and its navigable tributaries are clearly navigable waters of the United States, *Rundle v. Delaware & Raritan Canal Co.*, 55 U.S. (14 How.) 80 (1852); *Black v. American Int'l Corp.*, 264 Pa. 260, 107 A. 737 (1919), thermal-electric projects diverting and utilizing these waters are not covered by § 2 of the Limited Power Act, PA. STAT. ANN. tit. 32, § 592 (1967). Nor would this diversion for thermal-electric plants be covered by the Water Obstructions Act. Thus, DER has no authority to regulate the diversion of water from tidal portions of the Delaware River or of its navigable tributaries for use in fossil-fueled or nuclear-fired power plants.

216. The regulations governing Water Obstructions Act matters are contained in 25 PA. CODE §§ 105.1-158.

217. For an explanation of the legal distinction between regulations and guidelines see *Commonwealth v. Harmar Coal Co.*, 452 Pa. 77, 97, 306 A.2d 308, 319 (1973); *Swartley v. County of Bucks, Dep't of Health, Pa. Env. Hearing Bd., Dkt. No. 73-262-B* (July 24, 1974).

218. For example, if a dam drained a watershed of 200 square miles, the minimum low flow release would be 30 cubic feet per second.

219. PA. PLANNING PRINCIPLES, *supra* note 13, at 50-52.

220. The issue of whether low flow criteria should be incorporated in regulations and the potential impact of alternative criteria are currently under study as part of the Pennsylvania State Water Plan's water law analysis effort.

221. See *Community College v. Fox*, 20 Pa. Commonwealth Ct. 335, 345, 342

Board<sup>222</sup> and commonwealth court<sup>223</sup> in accordance with the Administrative Agency Law.<sup>224</sup> Hearing board adjudications follow a full administrative hearing of record and a decision by independent board members based on evidence produced.<sup>225</sup> Appeals from these adjudications are limited in scope and must allege constitutional or statutory violations, arbitrary, capricious, and unreasonable action, failure to support determinations by substantial evidence, or manifest abuse of discretion.<sup>226</sup>

The best protection for water users who may be affected by proposed power plant diversions is early and active intervention in administrative processes. Long before DER issues or denies a permit, notice of application is published in the *Pennsylvania Bulletin*. Concerned party input to the framing of permit review and the development of appropriate terms and conditions often can avoid protracted litigation in which the burden is on the challenging party. If, however, aggrieved persons do not intervene or bring an appeal within thirty days after notice of permit issuance, all rights to challenge the permit will be cut off.<sup>227</sup>

### B. Interstate Compact Commission Programs

Pennsylvania is signatory to two river basin compacts<sup>228</sup> that established a comprehensive planning and regulatory regime for water resources. These compacts, approved by Congress<sup>229</sup> and the member states,<sup>230</sup> created the Delaware River Basin Commission

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A.2d 468, 475 (1975) (citizens owning riparian land downstream of proposed sewer interception have standing to challenge grant of Clean Streams Law permit).

222. PA. STAT. ANN. tit. 71, § 510-21 (Supp. 1975).

223. *Id.* tit. 17, §§ 211.14, 211.403.

224. *Id.* tit. 71, §§ 1710.1-51 (1962).

225. *See* Warren Sand & Gravel Co. v. Commonwealth, 20 Pa. Commonwealth Ct. 186, 341 A.2d 556 (1975).

226. PA. STAT. ANN. tit. 71, § 1710.44 (1962); *Belin v. DER*, 5 Pa. Commonwealth Ct. 677, 291 A.2d 553 (1972); *A.P. Weaver & Sons v. Sanitary Water Bd.*, 3 Pa. Commonwealth Ct. 499, 284 A.2d 515 (1971).

227. 25 PA. CODE § 21.21(a) (reported in 4 Pa. Bull. 2281 (1974)); *Borough of Grove City v. Commonwealth*, Pa. Env. Hearing Bd., Dkt. No. 74-267-C (April 10, 1975); *see* *De Francis v. Commonwealth*, Unemploy. Comp. Bd. of Review, 17 Pa. Commonwealth Ct. 514, 333 A.2d 202 (1975).

228. Delaware River Basin Compact, PA. STAT. ANN. tit. 32, § 815.101 (1967) [hereinafter cited as DRBC Compact]; Susquehanna River Basin Compact, *Id.* §§ 820.1-8 (Supp. 1975) [hereinafter cited as SRBC Compact].

229. DRBC Compact was approved by Act of Sept. 27, 1961, Pub. L. No. 87-328, 75 Stat. 688; SRBC Compact by Act of Dec. 24, 1970, Pub. L. No. 91-575, 84 Stat. 1509.

230. The legislation ratifying the DRBC Compact includes DEL. CODE ANN. tit. 7, §§ 6501-11 (1975); N.J. STAT. ANN. §§ 32:11D-1 to -110 (1963); N.Y. ENVIRON-

(DRBC) and the Susquehanna River Basin Commission (SRBC) as separate regulatory entities,<sup>231</sup> providing for a "joint exercise" of the sovereign rights of the signatory parties "in the common interests of the people of the region."<sup>232</sup> Both DRBC and SRBC are directed to prepare and adopt comprehensive plans "for the immediate and long range development and uses of water resources" in their basins.<sup>233</sup> The commissions are empowered to allocate water among their signatory states,<sup>234</sup> but the allocation does not constitute a prior appropriation of waters nor does it confer any superiority of right to use the waters.<sup>235</sup>

The compacts confer two powers on the commissions in regulating surface water withdrawals and uses: to review and approve certain projects and to regulate withdrawals within certain protected areas and under emergency conditions. Projects that have a "substantial effect" on basic water resources must be reviewed and approved by DRBC and SRBC.<sup>236</sup> Projects can be approved by DRBC only if it finds that the proposal as submitted or modified will not "substantially impair or conflict with the comprehensive plan."<sup>237</sup> SRBC approval requires a determination that a proposal "is not detrimental to the proper conservation, development, management, or control of the water basin" and is consistent with the comprehensive plan.<sup>238</sup> Both commissions are empowered to adopt regulations governing submission, review, and consideration of project proposals.<sup>239</sup>

DRBC and SRBC have implemented the project review provisions with administrative regulations. Along the Delaware signifi-

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MENTAL CONSERVATION LAW §§ 21-0701 to 0723 (McKinney 1973); PA. STAT. ANN. tit. 32, § 815.101 (1967). Legislation ratifying the SRBC Compact includes MD. NAT. RES. CODE ANN. § 8-301 (1974); N.Y. ENVIRONMENTAL CONSERVATION LAW §§ 21-1301 to -1321 (McKinney 1973); PA. STAT. ANN. tit. 32, §§ 820.1-8 (Supp. 1975).

231. DRBC Compact § 2.1; SRBC Compact § 2.1.

232. DRBC Compact § 1.3(b); SRBC Compact § 1.3(2).

233. DRBC Compact § 3.2; SRBC Compact § 3.3.

234. DRBC Compact § 3.3 (such allocations to be "in accordance with the doctrine of equitable apportionment"); SRBC Compact § 3.8.

235. DRBC Compact § 3.3(b); SRBC Compact § 3.8(c). This language is meant to limit the effectiveness of any commission allocations to the duration of the compact. While the compact is in effect, SRBC or DRBC allocation confers on the party a right to use the water so provided. This right is not permanent, however. Unlike a right of prior appropriation or an apportionment by the United States Supreme Court, it may terminate at the expiration of the basin compact.

236. DRBC Compact § 3.8; SRBC Compact § 3.10. The SRBC Compact requires approval for any project (i) on or crossing the boundary of member states; (ii) involving diversion of water; (iii) having a significant effect on water resources in another state; or (iv) that has been included in the comprehensive plan or would significantly affect the plan. *Id.*

237. DRBC Compact § 3.8.

238. SRBC Compact § 3.10(4).

239. DRBC Compact § 3.8; SRBC Compact § 3.10(5).

cant projects are defined to include surface water diversions in excess of a daily average gross withdrawal of 100,000 gallons in any calendar month.<sup>240</sup> DRBC requires review applications for electricity generation projects with a design capacity of 100,000 kilowatts (KW) or more<sup>241</sup> to be accompanied by an environmental impact statement<sup>242</sup> prepared pursuant to the National Environmental Policy Act.<sup>243</sup> In addition, each power plant application must contain a "master siting study" and "site selection analysis for the project."<sup>244</sup> A master siting study describes in general terms all existing power projects and all projects planned or proposed for the ensuing fifteen-year period, together with the impact of each project upon the water and related land resources of the basin.<sup>245</sup> The site selection analysis must demonstrate the "relationship of the proposed project, and its specific location, to the master siting study."<sup>246</sup>

SRBC rules provide similar project review requirements for activities that have the potential to alter the physical, biological, chemical, or hydrologic characteristics of interstate waters.<sup>247</sup> Projects that require commitment of water for longer than ten years must be approved by the Commission, although withdrawals of less than one MGD that in conjunction with other diversions do not exceed twenty-five percent of the seven-day, twenty-year low flow are exempted.<sup>248</sup> Virtually all power plant proposals must gain commission approval. SRBC does not mandate that a master siting study accompany each application. Instead, the Commission has required the several power utilities active in the basin to prepare and submit at least annually a joint master study covering the following fifteen-year period.<sup>249</sup> The contents of the annual study are almost identical to DRBC specifications.

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240. 18 C.F.R. §§ 401.32, 401.35-2 (1975).

241. *Id.* § 401.35-2.

242. *Id.* §§ 401.37(a), 401.51-67.

243. 42 U.S.C.A. §§ 4321-47 (1973).

244. 18 C.F.R. § 401.37(a) (1975).

245. *Id.* § 401.37(b): The study must include, with as much detail as is available, a description of the five-mile reach of any stream within which each proposed project is or will be located, the concept, capacity and fuel source of each project, the quantity and method of heat and moisture dissipation, the water resource requirements and water-related ecological effects of each proposed project in the study.

246. *Id.* § 401.37(c).

247. *Id.* § 803.3(a)(4).

248. *Id.* § 803.3(a)(5).

249. SRBC Resolution 73-15 (Sept. 12, 1973).



Both DRBC and SRBC rules provide for review and comment on project applications by concerned agencies of the signatory states as well as commission staff review.<sup>250</sup> In the past several years both commissions have adopted principles to guide approval of proposed electric power project water uses. The Susquehanna body has incorporated a policy into its comprehensive plan requiring "compensation . . . for consumptive uses during periods of low flow."<sup>251</sup> Precise criteria defining the "trigger" low flow are now under study. Both the mean annual and ten-year low flows are being considered.<sup>252</sup> Whichever trigger is selected, the policy will require either termination of consumptive water uses in power projects during low flows, construction of backup storage facilities, or purchase of adequate flow releases from federal, state, or SRBC reservoirs to offset fully any consumptive withdrawals.<sup>253</sup>

Although not yet incorporated in regulatory form, the same policy has been followed by the Delaware Commission in reviewing several power project applications. Most notable is the recent DRBC docket decision on Philadelphia Electric Company's Limerick Nuclear Generating Station.<sup>254</sup> After extended hearings by both the Delaware Commission and the Nuclear Regulatory Commission,<sup>255</sup> DRBC set minimum flow criteria for the Schuylkill and Delaware Rivers and Perkiomen Creek and limited withdrawals from these sources by Philadelphia Electric to periods when designated minimum flows are exceeded.<sup>256</sup> DRBC imposed a "river follower" op-

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250. 18 C.F.R. §§ 401.37-39, 803.5, 803.25 (1975).

251. SRBC, COMPREHENSIVE PLAN FOR MANAGEMENT AND DEVELOPMENT OF THE WATER RESOURCES OF THE SUSQUEHANNA RIVER BASIN 55 (1973) [hereinafter cited as SRBC COMPREHENSIVE PLAN].

252. Conversation between R.T. Weston and P. Carlucci, Esq., Assistant to the Executive Director of SRBC, December 9, 1975. The *SRBC Comprehensive Plan* additionally establishes minimum low flows for the Susquehanna entering Chesapeake Bay. The twenty-year low flow to the Chesapeake cannot be reduced in the months of August, September, and October. "The flows of 3,500 cfs, 3,050 cfs and 2,820 cfs into Conowingo Reservoir during August, September and October respectively are selected as surrogates for low flow into the Bay at the mouth of the Susquehanna River during those months." SRBC COMPREHENSIVE PLAN, *supra* note 252, at 55.

253. Under the Susquehanna Compact the Commission can construct water supply projects or buy storage capacity in federal, state, or private reservoirs and contract with entities desiring to purchase a portion of the developed water. SRBC Compact §§ 3.9, 4.1-.5. Similar powers are conferred on the Delaware River Basin Commission. DRBC Compact §§ 3.7, 4.1-.5; *see* DRBC Resolution 71-4, in DRBC WATER MANAGEMENT, *supra* note 13, at A-6 to -9.

254. DRBC Dkt. No. D-69-210 CP (Final) (Nov. 5, 1975). For further background regarding this project *see* notes 47-51 and accompanying text *supra*; notes 307-22 and accompanying text *infra*.

255. *See* notes 307-22 and accompanying text *infra*.

256. Withdrawals for consumptive uses are allowed from the Schuylkill River, which adjoins the Limerick Plant, when upstream flows exceed 530 CFS (342 MGD) with one reactor unit in operation, or 560 CFS (362 MGD) with two units in operation. This "trigger" criteria is substantially in excess of both the seven-day, ten-year and seven-day, two-year low flows. Diversions from Perkiomen Creek, which involve an interbasin transfer to the Schuylkill, would be prohibited when flows

erational scheme upon the Limerick plant: whenever the identified flow constraints prevent plant operation at full load, Philadelphia Electric can "operate the plant only at such percentages of full load as the available water supply allows, as determined by the [Delaware River Basin] Commission from time to time."<sup>257</sup> In addition, DRBC imposed a special condition upon approval of the Limerick plant:

Prior to January 1, 1977, the Commission will, in its sole discretion, determine the adequacy of the then existing storage facilities on the Delaware River or its tributaries together with additional storage to be built to supply all needs (including the applicant's) for water supply from that source by the year 1981. If the Commission then determines that the storage will not be adequate for all projected needs of the Basin, the applicant will build or cause to be built, at its own expense, at a location approved by the Commission, for service in 1981, a reservoir of sufficient storage capacity to assure the water supply needed for consumptive use by the Limerick plant, during periods when such use would reduce the flow in the Delaware River at the Trenton gauge below 3,000 cfs. Storage and release of water in such facility will be under the Commission's regulation, at the expense of the applicant.<sup>258</sup>

Thus, DRBC has reserved an option to require the power company to build backup storage if other reservoirs in the basin are determined inadequate to meet all present and projected water needs.<sup>259</sup>

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dropped below 180 CFS (116 MGD) with one unit operating or 210 CFS (136 MGD) with two units operating. The goal for the Perkiomen is maintenance of a long-term median flow of 150 CFS at Graterford gauge. Delaware River waters can be transferred to the Perkiomen only when flows measured at Trenton exceed 3,000 CFS, a level set to prevent saline intrusion in the lower Delaware and to protect Philadelphia's water supply. DRBC Dkt. No. D-69-210 CP (Preliminary Decision, March 29, 1973), at 5-6.

257. DRBC Dkt. No. D-69-210 CP (Final) (Nov. 5, 1975), at 15.

258. *Id.*

259. This reservation was stimulated by the uncertain status of several proposed Delaware basin reservoir projects, including the controversial Tocks Island Dam. Following DRBC rejection of the Tocks project on July 31, 1975, the Commission undertook a broad reexamination of the basic water supply elements of its Comprehensive Plan, including base flow criteria, drought frequency planning assumptions, and priorities accorded competing uses. *Id.* at 13. Until the results of these studies are received, the Commission elected to impose a river follower regime on the Limerick plant's water use. Opponents of the Limerick project challenged the validity of the river follower scheme in a parallel appeal of the Nuclear Regulatory Commission's grant of a construction license for Limerick. The Environmental Coalition on Nuclear Power argued that the most viable option (and probable outcome) would involve construction of a backup reservoir by Philadelphia Electric and that the power plant should not be approved prior to preparation of an environmental impact statement showing that this reservoir was environmentally possible. The Third Circuit rejected this challenge in a memorandum opinion issued one week after the final DRBC docket decision. *Environmental Coalition on Nuclear Power v. NRC*, No. 75-1421 (3d Cir., Nov. 12, 1975).

In addition to project review authority, both DRBC and SRBC are empowered to “regulate and control withdrawals and diversions from surface waters” within designated protected areas or under emergency conditions.<sup>260</sup> After public hearings the commissions can declare as “protected areas” portions of the basins in which demands “have developed or threaten to develop to such a degree as to create a water shortage or to impair or conflict with the requirements or effectuation of the comprehensive plan.”<sup>261</sup> In any designated protected area water withdrawals for domestic, municipal, agricultural, or industrial uses in excess of quantities set forth in commission rules are prohibited unless the withdrawals are made pursuant to a commission permit or a state permit issued prior to the effective date of the basin compact.<sup>262</sup>

In the event of drought or other conditions that may cause immediate water shortage, DRBC and SRBC can declare a water supply emergency in all or part of their basins.<sup>263</sup> Under the DRBC compact, for the duration of an emergency no person can divert or withdraw water without a special permit from the Commission.<sup>264</sup> The SRBC emergency powers do not provide specifically for a special permit system, but allow that Commission to “direct increases or decreases in any allocations, diversions, or releases previously granted or required, for a limited time to meet the emergency condition.”<sup>265</sup> The standards for issuing a permit or modifying an allocation, diversion, or release are identical in both compacts. The commissions are directed

to avoid such depletion of the natural stream flows and ground waters in the protected area or in an emergency area as will adversely affect the comprehensive plan or the just and equitable interests and rights of other lawful users of the same source, giving due regard to the need to balance and reconcile alternative and conflicting uses in the event of an actual or threatened shortage of water of the quality required.<sup>266</sup>

Both the protected area and emergency powers overlay state common and statutory law relating to water use. Indeed, whenever the commissions find it necessary or desirable to exercise these powers, state-issued permits for water diversion or withdrawal can be superseded “to the extent of any conflict with the control and regulation” exercised by DRBC or SRBC.<sup>267</sup>

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260. DRBC Compact §§ 10.1-8; SRBC Compact §§ 11.1-8.

261. DRBC Compact § 10.2; SRBC Compact § 11.2.

262. DRBC Compact § 10.3; SRBC Compact § 11.3.

263. DRBC Compact § 10.4; SRBC Compact § 11.4.

264. DRBC Compact § 10.4.

265. SRBC Compact § 11.4(a).

266. DRBC Compact § 10.5; SRBC Compact § 11.5.

267. DRBC Compact § 10.8; SRBC Compact § 11.8.

To date, neither body has invoked its permit authority pursuant to the protected area provisions. In the 1960's, however, the Delaware Commission confronted severe drought conditions and was forced to implement an emergency diversion control program.<sup>268</sup> The Commission authorized most withdrawals and diversions to continue without special permit,<sup>269</sup> but imposed an emergency limit on New York City's use<sup>270</sup> and a regime to control releases from some major reservoirs.<sup>271</sup> The emergency was terminated in March 1967.<sup>272</sup>

The project review provisions give the basin commissions control over new power plants that contemplate significant consumptive water uses. Emergency and protected area powers, which cover both new and existing uses, allow direct intervention in water management during low flow periods when conflicts are most likely to arise. The commission process also provides concerned water users who may be adversely affected by power project water consumption with a forum for raising and resolving conflicting water needs. DRBC<sup>273</sup> and SRBC<sup>274</sup> rules provide for public hearings on certain project applications. DRBC regulations authorize a full adjudicatory hearing procedure whenever "substantial opposition" is filed to a project.<sup>275</sup> This hearing is limited, however, to issues raised in written objections, which must specify the grounds for opposition.<sup>276</sup> SRBC rules allow the Commission in its discretion to hold either a formal adjudicatory hearing or a less formal, "legislative-style"

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268. DRBC Emergency Resolution No. 1, Res. 65-13 (July 7, 1965).

269. DRBC Conservation Order No. 1, Res. 65-15 (July 7, 1965).

270. DRBC Emergency Resolution No. 2, Res. 65-14 (July 7, 1965); DRBC Resolution 65-16 (July 28, 1965); DRBC Resolution 65-17 (August 6, 1965); DRBC Emergency Resolution No. 5, Res. 65-19 (August 18, 1965); DRBC Emergency Resolution No. 6, Res. 65-25 (October 7, 1965); DRBC Emergency Resolution No. 7, Res. 65-26 (Nov. 24, 1965); DRBC Emergency Resolution No. 8, Res. 65-28 (Dec. 29, 1965); DRBC Emergency Resolution No. 9, Res. 66-4 (March 23, 1966); DRBC Emergency Resolution No. 19, Res. 66-8 (May 25, 1966); DRBC Emergency Resolution No. 11, Res. 66-12 (Aug. 24, 1966); DRBC Emergency Resolution No. 12, Res. 66-17 (Nov. 28, 1966).

271. DRBC Conservation Order No. 1, Res. 65-15 (July 7, 1965); DRBC Conservation Order No. 2, Res. 65-18 (August 6, 1965).

272. DRBC Emergency Resolution No. 13, Res. 67-3 (March 2, 1967). For a detailed analysis of the background and resolution of the Delaware Basin drought see R. Hogarty, *The Delaware River Drought Emergency*, Inter-University Case Program #107 (1970).

273. 18 C.F.R. §§ 401.81-.87 (1975).

274. *Id.* §§ 803.40-.51.

275. *Id.* § 401.42; see *In re Philadelphia Electric Co., Limerick Nuclear Generating Station*, DRBC Dkt. No. D-69-210 CP (Final) (Nov. 5, 1975).

276. 18 C.F.R. § 401.43 (1975).

public hearing when evaluating major projects.<sup>277</sup> Hearings of both commissions provide for administrative decision-making based on the compiled record. Decisions by either commission in executing project review, protected area, or emergency powers are subject to "judicial review in any court of competent jurisdiction."<sup>278</sup> The federal statutes ratifying the compacts confer original jurisdiction over all appeals of commission actions upon the United States district courts.<sup>279</sup>

Although the compact commissions can provide an expert forum for avoiding or resolving water use conflicts, their effectiveness in managing power plant consumptive water withdrawals has not been demonstrated. Only two basins are covered; the critical Monongahela-Allegheny-Ohio watershed, Potomac basin, and Lake Erie areas are not subject to equivalent regulatory structures. Moreover, the adequacy of current "comprehensive plans" in identifying minimum flow standards and assuring adequate water for all users has been seriously questioned.<sup>280</sup> In the absence of definitive standards and criteria, ad hoc determination of these complex water resource issues in the context of each power plant application is unlikely to provide viable, long-term solutions.

### C. Federal Controls

In addition to regulatory controls imposed on consumptive water uses by state and river basin agencies, federal regulations and regulatory agencies become concerned when water is to be diverted and consumed for certain purposes. Since this article's emphasis has been on consumptive uses related to thermal-electric power generation, the structure and policies of the Nuclear Regulatory Commission (NRC) and other federal agencies principally involved in regulation of electric power generation and energy development will be examined in an attempt to outline available redress for those who have been or may be injured by consumptive uses.

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277. *Id.* §§ 803.42, 803.45.

278. DRBC Compact §§ 3.8, 10.6; SRBC Compact §§ 3.10(6), 11.6 (must be brought within ninety days). Special provisions in both compacts allow signatory states to invoke the original jurisdiction of the United States Supreme Court to review particular commission determinations. DRBC Compact § 3.3(c) (approval of out-of-basin diversions or compensating releases); SRBC Compact § 3.10(7) (approval of project reducing flow below proper minimum).

279. Act of Sept. 27, 1961, Pub. L. No. 87-328, 75 Stat. 688 (reservations to DRBC Compact); Act of Dec. 24, 1970, Pub. L. No. 91-575, 84 Stat. 1509 (reservations to SRBC Compact).

280. Although the challenge in *Environmental Coalition on Nuclear Power v. NRC*, No. 75-1421 (3d Cir., Nov. 12, 1975), was unsuccessful, the need for restudying current comprehensive plans was underscored in DRBC's final Limerick decision. Dkt. No. D-69-210CP (Final) (Nov. 5, 1975), at 13.

1. *Nuclear Regulatory Commission.*—Prior to 1975 exclusive and primary responsibility for licensing and regulating construction and operation of commercial, nuclear-fueled electric generating facilities in the United States was vested in the Atomic Energy Commission (AEC).<sup>281</sup> Although the AEC was abolished in 1975,<sup>282</sup> its regulatory functions, powers, duties, and rules were transferred intact to the NRC.<sup>283</sup> With respect to regulation of commercial nuclear power, therefore, the only visible change has been in the agency name. AEC policies and regulations, as well as judicial interpretations thereof, are applicable in discussing NRC control of this field.

Under the Atomic Energy Act of 1954<sup>284</sup> the NRC administrative process regulates commercial nuclear power plants in two stages—issuance of construction permits and operating licenses. Before an electric utility can begin construction of a generating facility, it must apply for and receive a construction permit.<sup>285</sup> Intensive NRC involvement begins upon receipt of the construction permit application and continues at various levels for the entire useful life of the nuclear facility.

(a) *Consideration of water use by NRC.*—Prior to 1971 the AEC contended that under the Atomic Energy Act it was only authorized to consider the radiological effects of the proposed facility in deciding whether a construction permit or an operating license should be granted. The Commission refused to consider potential environmental effects. *New Hampshire v. AEC*<sup>286</sup> upheld this position against the State of New Hampshire's attempt to force consideration of potential thermal pollution in the agency's review of a construction permit application.

The AEC allegedly modified its stance when the National Environmental Policy Act (NEPA)<sup>287</sup> became law in 1970. This

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281. 42 U.S.C. §§ 2201-10 (1970).

282. Act of Oct. 11, 1974, Pub. L. No. 93-438, tit. I, § 104, 88 Stat. 1237 (effective Jan. 19, 1975 by Exec. Order No. 11,834, 40 Fed. Reg. 2971 (1975)).

283. 42 U.S.C.A. §§ 5841(f), 5871(b) (Supp. 1975).

284. 42 U.S.C. §§ 2011-96 (1970).

285. *Id.* § 2131.

286. 406 F.2d 170 (1st Cir.), *cert. denied*, 395 U.S. 962 (1969).

287. 42 U.S.C. §§ 4331-35 (1970). This article does not seek to provide an in-depth exposition of the provisions, requirements, and policy of NEPA. Briefly, the Act requires that all federal agencies consider the potential environmental effects of agency actions and decisions and that environmental considerations be given weight equal to other factors that influence an agency decision. NEPA explicitly requires that federal agencies examine the environmental effects and consequences of their actions and the like effects of viable alternatives and balance the environmental costs

change supposedly was reflected in updated regulations<sup>288</sup> designed to bring the AEC into compliance with NEPA. As the landmark case of *Calvert Cliffs' Coordinating Committee, Inc. v. AEC*<sup>289</sup> demonstrated, however, the new regulations failed dismally in accomplishing their objective. The court of appeals noted that NEPA has two facets—the substantive policy set out in section 101<sup>290</sup> and the procedural mandates of section 102.<sup>291</sup> The substantive aspect, whereby NEPA directs that to the fullest extent possible federal agencies are to give appropriate consideration to environmental impact, is flexible and allows a limited exercise of discretion by an agency.<sup>292</sup> In contrast, the procedural requirements of section 102 are not discretionary and must be strictly adhered to at every significant, nonduplicative decision-making stage of a project unless compliance clearly would conflict with the agency's statutory authority.<sup>293</sup> These requirements include preparation of environmental impact statements identifying environmental problems and project alternatives, balancing environmental, technical, and economic effects of the agency decision, and considering alternatives that would affect the balance. The overall goal is selecting the optimum course and mitigating environmental harm.

After the *Calvert Cliffs* decision the AEC again amended its regulations to bring them into compliance with NEPA. The new regulations mandate that an impact statement must be prepared, circulated, and reviewed prior to the issuance of a construction permit

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and benefits of the federal action. The vehicle through which the environmental effects are identified, analyzed, and evaluated and in which alternatives are raised and the cost-benefit analysis performed is the environmental impact statement prepared by the agency primarily responsible for the federal action to be taken. See generally F. ANDERSON, *NEPA IN THE COURTS* (1973).

288. 10 C.F.R. § 50, App. D. (1971). These revised regulations clearly evidenced the Commission's reluctance to depart from its pre-NEPA position that it need give little consideration to environmental factors. For example, the agency regulations provided that (1) the AEC's NEPA-impact statement need not be independently considered or factored into the decision-making process at the construction permit or operating license application hearings unless environmental issues were affirmatively raised by outside parties or AEC staff; (2) the agency hearing board was prohibited from conducting an independent evaluation and balancing of environmental factors if other agencies agreed that their own environmental standards would be satisfied under the proposed action; (3) nonradiological issues were not to be raised in any AEC hearing for which notice had been published in the *Federal Register* prior to March 4, 1971; and (4) a review of environmental factors was not to be conducted, at least prior to the time of final licensing hearings, for facilities already under construction on the effective date of NEPA.

289. 449 F.2d 1109 (D.C. Cir. 1971). For a detailed analysis of the *Calvert Cliffs* case and its implications with respect to AEC administrative procedures and policies see Comment, *Calvert Cliffs' Coordinating Committee v. AEC; The AEC Learns the True Meaning of the National Environmental Policy Act of 1969*, 3 ENVIR. L. 316 (1973).

290. 42 U.S.C. § 4331 (1970).

291. *Id.* § 4332.

292. 449 F.2d at 1114-15.

293. *Id.*

for a nuclear power reactor<sup>294</sup> and also before the issuance of a full power or design capacity license to operate a power reactor.<sup>295</sup> In addition, impact statements must be prepared for any other action that the Commission determines will have a significant effect on the quality of the human environment.<sup>296</sup>

The revised NRC regulations do not, and possibly could not, list all the environmental considerations that must be addressed in an appropriate impact statement. Nevertheless, little doubt exists that the importance of water supply—both to the neighboring public and the facility itself—requires careful consideration of power plant consumptive water use in the agency's permit and licensing process.<sup>297</sup>

The Limerick nuclear generating facility provided NRC with an opportunity to explore the water supply impact of its licensing decisions. In reviewing issuance of construction permits the Commission recognized at the outset that it had a duty to analyze water avail-

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294. 10 C.F.R. § 51.5(a)(1) (1975).

295. *Id.* § 51.5(a)(2).

296. *Id.* § 51.5(a)(10). Note that in *Scientists' Institute for Public Information, Inc. v. AEC*, 481 F.2d 1079 (D.C. Cir. 1973), it was held that an impact statement is required under NEPA not only when the Commission proposes to build a facility itself, but also whenever it makes a decision that permits action by other parties that will affect the quality of the human environment. Under its regulations the Commission, in accordance with Council on Environmental Quality guidelines, can require an impact statement before the issuance of an amended construction permit, a full power or design capacity license, or a license to operate at less than full or design capacity. 10 C.F.R. § 51.5(b)(2)-(3) (1975); see *Izaak Walton League of America v. Schlesinger*, 337 F. Supp. 287 (D.D.C. 1971) (application for fifty percent operating license that involves discharge of heated water that will endanger fish and violate state thermal standards constitutes an act significantly affecting human environment and requires environmental impact statement). Additional regulations require submission of an environmental report by the applicant for a permit or license, 10 C.F.R. §§ 51.20-21 (1975), list the required contents of the impact statements, *id.* § 51.23, and provide for the circulation and review of draft statements and the preparation of final statements, *id.* §§ 51.24, 51.26. Finally, provision is made for public hearings and review of all impact statements required by the Commission. *Id.* § 51.52.

297. See *Environmental Defense Fund, Inc. v. Corps of Engineers*, 324 F. Supp. 878 (D.D.C. 1971) (water supply impact of Cross-Florida Barge Canal). See also *Hanley v. Mitchell*, 460 F.2d 640 (2d Cir.), *cert. denied*, 409 U.S. 990 (1972) (NEPA requires consideration of any and every effect that a particular project might have on the quality of the human environment).

The availability of cooling water is one of the most important factors in choosing the site for a nuclear power plant. Energy Policy Staff, Office of Science and Technology, *Considerations Affecting Steam Power Plant Site Selection* 22 (1968); Baram, *The Legal and Regulatory Framework for Thermal Discharge from Nuclear Power Plants*, 3 ENVIR. AFFAIRS 505 (1973); Bronstein, *The AEC Decision-Making Process and the Environment: A Case Study of the Calvert Cliffs Nuclear Power Plant*, 1 ECOL. L.Q. 689 (1971).



ability and the impact of alternative methods for providing cooling water as part of a "good faith effort . . . to describe the reasonably foreseeable impact of a proposed action."<sup>298</sup> Although final decision-making authority over the water question rested with DRBC,<sup>299</sup> the NRC considered alternative water arrangements including the proposed Tocks Island Dam,<sup>300</sup> the "river follower" system,<sup>301</sup> and a supplemental reservoir.

One procedural weakness that can prevent consumptive use problems from receiving the weight they deserve or the comprehensive approach they need is that NRC review of construction permit applications—the first point at which an environmental statement is prepared<sup>302</sup>—comes late in a long process of planning and designing a nuclear facility. By that time a utility proposing to build a nuclear plant will have expended considerable time, effort, manpower, and funds in facility design, site selection and acquisition, and preliminary site preparation.<sup>303</sup> Moreover, long-lead-time plant components, such as reactor vessels and steam turbines, will have been ordered from and at least partially fabricated by manufacturers. As a consequence several courts have recognized that because prior expenditures of funds and irretrievable commitments of resources must be considered by the agency as elements in the NEPA cost-benefit analysis, each additional increment of money invested in a project tilts the balance away from environmental concerns.<sup>304</sup> Although an agency's decision on the stage of a project at which a NEPA statement must be prepared is subject to judicial scrutiny,<sup>305</sup> the NRC's requirement of a critical impact statement only at the construction permit stage remains effectively unchallenged.<sup>306</sup> By that time suf-

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298. *In re Philadelphia Electric Co. (Limerick Generating Station)*, Atomic Safety & Licensing Appeal Bd., Dkt. Nos. 50-352, 50-353, ALAB-262 (March 19, 1975), at 41, *aff'd*, *Environmental Coalition of Nuclear Power v. NRC*, No. 75-1421 (3d Cir., Nov. 12, 1975).

299. *Id.* at 42-43; see notes 228-80 and accompanying text *supra*.

300. At the time of NRC's decision in March 1975, the Tocks Island project proposed by the Corps of Engineers was still in official favor. Although Tocks was not rejected by DRBC until July, the NRC decision foresaw the possibility and recognized the need to assess alternative water supply approaches.

301. See notes 254-59 *supra*.

302. 10 C.F.R. § 50.15(a)(1) (1975).

303. See, e.g., Bronstein, *The AEC Decision-Making Process and the Environment: A Case Study of the Calvert Cliffs Nuclear Power Plant*, 1 *ECOL. L.Q.* 689 (1971). Bronstein estimated that site acquisition costs for the Calvert Cliffs station were \$1.6 million as compared to an overall construction and plant cost of \$347 million.

304. *Coalition for Safe Nuclear Power v. AEC*, 463 F.2d 954 (D.C. Cir. 1972); *Morningside-Lenox Park Ass'n v. Volpe*, 334 F. Supp. 132 (N.D. Ga. 1971). See also *Environmental Defense Fund, Inc. v. Corps of Engineers*, 470 F.2d 289 (8th Cir. 1972) (court ruled that in view of the fact that more than \$10 million had been expended, the project should be approved despite the existence of environmental problems).

305. *Scientists Institute for Public Information, Inc. v. AEC*, 481 F.2d 1079 (D.C. Cir. 1973); F. ANDERSON, *NEPA IN THE COURTS* 179-86 (1973).

306. In *Gage v. AEC*, 479 F.2d 1214 (D.C. Cir. 1973), petitioners challenged

ficient resources may have been expended to limit or prejudice the environmental review process.

Perhaps the most serious problem is NRC's lack of authority or expertise to act as a comprehensive water planning agency. The Commission can review water uses in power plants only through individual impact statement analyses. It is unable to coordinate power plant water withdrawals with other water management decisions and must rely upon state and basin water agencies to the extent they exist and are effective.

The shortcomings of NRC's planning and review of nuclear facilities, at least in the water use field, are exemplified by the Limerick case.<sup>307</sup> The Commission found that the river follower mode of operation would allow economically viable operation of the Limerick facility,<sup>308</sup> although note was made that construction of a supplemental reservoir might improve the plant's benefit/cost ratio.<sup>309</sup> While recognizing the strong possibility that a supplemental reservoir would be required by DRBC if the Tocks Island Dam is not built, NRC gave the reservoir alternative only a "generic" evaluation. No specific reservoir sites were approved.<sup>310</sup> The Commission merely attempted to identify and appraise the range of "environmental costs which would likely be incurred no matter which of the numerous

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AEC regulations requiring an impact statement only at the construction permit stage on the ground that the regulations did not go far enough to implement NEPA. The petitioners contended that the AEC should prohibit site acquisition until after an impact statement has been prepared. The court dismissed the action on the grounds that the petitioners had waived their right to complain by failing to participate in the rulemaking proceeding at which the challenged regulations were formulated and noted that, in any event, the petitioners could ask for new rulemaking in this regard under 10 C.F.R. §§ 2.802-803 (1975). Although the court declined to rule on the merits of the petitioners' complaint, it did express the view that the AEC had no power to interfere with the free alienation of property by prohibiting a utility from acquiring a desired site because of problems identified in the impact statement. While such an observation may indeed be true, it overlooks the fact that a requirement of an impact statement before the acquisition of land for a nuclear power plant site would not be a prohibition against a utility's purchase of land, but merely a restriction on the use of that land for a nuclear-electric generating facility. The AEC in its regulatory capacity had always exercised such power in granting or denying construction permits and operating licenses.

307. See notes 298-301 and accompanying text *supra*.

308. *In re Philadelphia Electric Co. (Limerick Generating Station)*, Atomic Safety & Licensing Appeal Bd., Dkt. Nos. 50-352, 50-353, ALAB-262 (March 19, 1975), at 42-43, 79-92.

309. *Id.* at 83-84, 91.

310. A previous study by the Delaware River Basin Commission initially had explored the possibility of using a supplemental reservoir for the Limerick plant. A number of reservoir sites were discussed by state and commission staff, but detailed site evaluations were not conducted. *Id.* at 10, 20-22.

potential sites . . . might eventually be selected by DRBC as the most appropriate locale for a supplemental reservoir.”<sup>311</sup> Ultimately NRC determined that “[c]onstruction of the Limerick facility should not be now authorized on the basis of an overall cost/benefit balance which presupposed employment of either the Tocks Island or the supplemental reservoir alternative.”<sup>312</sup> This balance could not be struck until further decisions are made and information collected. Since the river follower scheme appeared viable, the Commission found “no reason to withhold approval of construction simply because of the contingency that one of the two other alternatives might later be adopted.”<sup>313</sup>

Although NRC’s issuance of construction permits for Limerick ultimately was upheld by the court,<sup>314</sup> substantial questions are raised by both the NRC and DRBC position of interim approval based on the river follower scheme. The river follower provisions of the permit theoretically would require Limerick to shut down when flows in the three source streams fall below designated levels. Other water users apparently would be protected during the most critical drought periods. According to the DRBC analysis the first of Limerick’s two units will constitute 10.6 percent of Philadelphia Electric’s 1981 generating capacity and two percent of the capacity for the Pennsylvania-New Jersey-Maryland (PJM) Interconnection power pool.<sup>315</sup> By 1984 the PJM pool is projected to have a reserve capacity of 23.9 percent.<sup>316</sup> DRBC concluded that even if all five generating stations under the river follower regime<sup>317</sup> were shut down simultaneously, sufficient generating capacity including interconnections and reserves would still exist to meet loads.<sup>318</sup> This assumes, however, that virtually all of the other PJM plants would be operational when operations at the five river follower stations are curtailed during low flow. The scheme appears to leave little room for emergency conditions and normal maintenance shutdowns in other parts of the PJM system.<sup>319</sup> Miscalculated adoption of the river follower scheme for a number of plants may leave the basin commission and public with an unenviable choice in a future

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311. *Id.* at 73-74.

312. *Id.* at 79.

313. *Id.*

314. *Environmental Coalition on Nuclear Power v. NRC*, No. 75-1421 (3d Cir., Nov. 12, 1975).

315. *In re Philadelphia Electric Co., Limerick Nuclear Generating Station*, DRBC Dkt. No. D-69-210 CP (Final) (Nov. 5, 1975), at 11.

316. *Id.* at 12.

317. These include Limerick, Summit, Hope Creek, Gilbert, and Martins Creek. For a description of these plants see DRBC 1975 Master Siting Study, *supra* note 51.

318. DRBC Dkt. No. D-69-210 CP (Final), at 11.

319. DRBC did not mention this potential problem in its docket decision and the authors are not qualified to assess its seriousness.

drought: to suffer shortages of electricity, to face even more critical water scarcity, or to allow discharge of untreated thermal wastes.

Limerick highlights an even more serious need to consider power plant siting and water use in the context of overall basin water resources management. An effective use of a basin's resources demands that water use and supplementary storage as needed by all generating stations be coordinated and planned with reference to a master siting study.<sup>320</sup> In the Delaware basin, for example, eight generating stations are involved in the water supply area. Five stations using 86 CFS (including Limerick) are or may be subject to river follower low flow constraints. Three of these five stations, using 70.7 CFS, are owned by the same three companies that own other stations (Salem, Eddystone, and Edge Moor) not previously made subject to river follower regimes.<sup>321</sup> If these companies are able to build water supply facilities to meet the requirements of the docket decision for one project, they could satisfy similar requirements for all their projects easily and economically at the same time. For example, Philadelphia Electric Company, in building a facility to meet Limerick's needs, could readily construct a slightly larger facility to provide both for Limerick's requirements of 54.3 CFS and for the Eddystone station's requirements of 3.9 CFS.<sup>322</sup>

The case-by-case review of power projects currently conducted by NRC and DRBC cannot be expected to protect adequately the interests of other users and the public over a long period. Only preparation of a basin-wide plan for assessing water availability, siting power plants, and establishing detailed criteria for power project water withdrawals will provide the information required for rational approval of new generating projects the NRC, state agencies, and basin commissions.<sup>323</sup> The foundation of a total water management program is necessary before a multitude of new power uses are initiated and limited resources are committed.

(b) *Review of NRC actions.*—Riparian owners, municipalities, public water agencies, and other users that could be injured by a power plant's withdrawals can intervene in NRC proceedings. If they properly participate in and exhaust available administrative proceed-

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320. See DRBC Dkt. No. D-60-210 CP (Final), at 11; notes 244-49 and accompanying text *supra*.

321. DRBC Dkt. No. D-60-210 CP (Final), at 11.

322. *Id.* at 13.

323. DRBC is reassessing its comprehensive plan in light of changed conditions and pressing water needs. *Id.*

ings,<sup>324</sup> the interveners can seek judicial reversal<sup>325</sup> of the final NRC decision on various grounds, including (1) failure of the agency to balance properly the benefits of power production against the cost

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324. AEC (NRC) regulations provide that no permit, license, or order for which an environmental impact statement is required shall be issued until ninety days after a draft impact statement (or thirty days after a final impact statement) has been circulated for comment to the Council on Environmental Quality and made available to the public. 10 C.F.R. § 51.51 (1975). A public hearing on the impact statement is required. *Id.* § 51.52. The hearing officer must determine if NEPA requirements have been met and is authorized to consider independently the cost-benefit analysis and recommend agency action based on the impact statement. All interested persons can participate in the hearing and offer evidence regarding the impact assessment and any aspect of the proposed NRC action. In addition, any person whose interests may be affected can petition for leave to intervene as a party in NRC license proceedings. *Id.* § 2.714. As a general rule, any person with more than a passing interest will be permitted to intervene. See Comment, *The Proper Role of the Public in Power Plant Licensing Decisions*, 15 *ATOMIC ENERGY L.J.* 34 (1973). Intervenor is designated as full parties to the proceeding. 10 C.F.R. § 2.714(g) (1975). Persons not designated as parties nevertheless may be permitted to make a limited appearance with respect to certain issues at the discretion of the presiding officer. *Id.* § 2.715. Denials of a request for a hearing or a petition to intervene are appealable to the Atomic Safety and Licensing Appeal Board. *Id.* § 2.714(a). Of course, the right to intervene can be waived inadvertently by a lack of timely petition to intervene. *Easton Util. Comm'n v. AEC*, 424 F.2d 847 (D.C. Cir. 1970).

When a person has a right to intervene but fails to do so (*Gage v. AEC*, 497 F.2d 1214 (D.C. Cir. 1973)) or when he has not requested a full agency review or exhausted available remedies within the agency (*Coalition for Safe Nuclear Power v. AEC*, 463 F.2d 954 (D.C. Cir. 1972)), the courts may refrain from judicial review of agency action. Thus, it behooves an interested or potentially aggrieved party to petition for intervenor status early, to participate in all agency proceedings, and to exhaust the available agency remedies to preserve the right to seek judicial review of the agency's final action.

325. Section 10 of the Administrative Procedure Act provides persons aggrieved by an agency action the right to seek judicial review in federal court. 5 U.S.C. § 702 (1970). This includes the power to seek judicial review of an agency's failure to fulfill the mandates of NEPA in conducting or approving an action that may significantly affect the environment. *Silva v. Lynn*, 482 F.2d 1282 (1st Cir. 1973); *Cape Henry Bird Club v. Laird*, 359 F. Supp. 404 (W.D. Va.), *aff'd*, 484 F.2d 453 (4th Cir. 1973); *Harrisburg Coalition Against Ruining the Envir. v. Volpe*, 330 F. Supp. 918 (M.D. Pa. 1971). Standing to seek review requires that the party suffer injury in fact and that the injury be within the zone of interests protected by the statute claimed to have been violated. *Barlow v. Collins*, 397 U.S. 159 (1970); *Association of Data Processing Serv. Org., Inc. v. Camp*, 397 U.S. 150 (1970). The injury alleged, whether to economic, conservational, recreational, or aesthetic interests, must be "individualized," that is, it must be to the specific party seeking judicial review. *Sierra Club v. Morton*, 405 U.S. 727 (1972). In this regard, it has been held that allegations that a particular project would adversely affect a party's hunting and fishing pursuits on a river, interfere with land uses of a riparian owner, or destroy the water supply of complaining consumers are all sufficient to give standing. *Environmental Defense Fund, Inc. v. TVA*, 468 F.2d 1164 (6th Cir. 1972); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 348 F. Supp. 916 (N.D. Miss. 1972); *Natural Resources Defense Council, Inc. v. Grant*, 341 F. Supp. 356 (E.D.N.C. 1972); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 325 F. Supp. 728 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 324 F. Supp. 878 (D.D.C. 1971). *Calvert Cliffs' Coordinating Comm. v. AEC*, 449 F.2d 1109 (D.C. Cir. 1971), clearly established that the environmental aspects of a nuclear power plant are within the zone of interest of NEPA and that NEPA makes NRC decisions affecting the environment judicially reviewable. Consequently, there is little doubt that parties whose water rights would be adversely affected by a nuclear power plant's consumptive use would have standing to challenge the NRC's grant of a construction permit or an operating license.

of impaired water supplies, (2) failure to consider alternative plant siting or design, and (3) failure to consider water management alternatives that would increase available water and reduce adverse water resource impact. NEPA, however, grants at best only limited substantive rights to those challenging agency actions. An aggrieved party cannot use NEPA to recover damages,<sup>326</sup> but is confined to preventing agency action based on failure to comply with the statute's procedural mandates in preparing a thorough impact assessment.<sup>327</sup> Only a few cases have suggested an enforceable, affirmative duty on the agencies to mitigate adverse environmental impacts incurred as part of an activity governed by NEPA.<sup>328</sup>

The scope of review in NEPA cases has largely followed traditionally narrow administrative appeal tests. The party challenging an agency's NEPA decision must prove by a preponderance of the evidence<sup>329</sup> that the agency failed to engage in "a full, good faith

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326. *Pye v. Georgia Dep't of Transp.*, 513 F.2d 290, 7 E.R.C. 2006 (5th Cir. 1975); *Morris v. TVA*, 345 F. Supp. 321, 324 (N.D. Ala. 1972); *Virginians for Dulles v. Volpe*, 344 F. Supp. 573, 578 (E.D. Va. 1972).

327. *See Bradford Tp. v. Illinois State Toll Highway Auth.*, 463 F.2d 537 (7th Cir.), *cert. denied*, 409 U.S. 1047 (1972); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 325 F. Supp. 728 (E.D. Ark. 1971), *aff'd*, 470 F.2d 289 (8th Cir. 1972); *Pizitz v. Volpe*, 4 E.R.C. 1195 (M.D. Ala.), *aff'd*, 467 F.2d 208 (5th Cir. 1972); *Virginians for Dulles v. Volpe*, 344 F. Supp. 573 (E.D. Va. 1972).

328. *In Sierra Club v. Froehlke*, 359 F. Supp. 1289 (S.D. Tex. 1972), *reviewed on other grounds sub nom. Sierra Club v. Callaway*, 499 F.2d 982 (5th Cir. 1974), the district judge concluded,

NEPA states indirectly, but affirmatively, that under some circumstances federal agencies must mitigate some and possibly all of the environmental impacts arising from a proposed project. This requirement is embodied primarily within Section 101, 42 U.S.C.A. § 4331, with important implementing assistance from Section 102, 42 U.S.C.A. § 4332. . . . The courts should not impose unreasonable extremes of compliance or interject themselves into the area of discretion as to what action should be taken; . . . but they should not hesitate to require further agency consideration when a project appears to call for mitigation and yet none was considered or only a half-hearted effort was made.

*Id.* at 1339-40; *see Akers v. Resor*, 339 F. Supp. 1375 (W.D. Tenn.), *aff'd*, 4 E.R.C. 1966 (W.D. Tenn. 1972) (mitigation plan for stream channelization project found insufficient under NEPA); *cf. Maryland-Nat'l Capital Park & Planning Comm'n v. United States Postal Service*, 487 F.2d 1029, 1042 (D.C. Cir. 1973) (dictum) (when no environmental impact statement has been filed for an agency action, court can condition its decision not to issue an injunction on agency agreement to modify design to eliminate environmental harm). In a pending Pennsylvania case, "mitigation damages" have been requested to compensate the environment for losses created by the routing of the I-95 highway through Tinicum Marsh. These "damages" could be awarded in the form of equitable relief requiring the Federal Highway Administration to purchase other areas of marsh land and dedicate them to wildlife preservation. *Stewart v. Resor*, Civil Action No. 70-551 (E.D. Pa., filed Feb. 17, 1970).

329. *Sierra Club v. Callaway*, 499 F.2d 982, 992 (5th Cir. 1974); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 492 F.2d 1123, 1130-31 (5th Cir. 1974).

consideration and balancing of environmental factors”<sup>330</sup> before reaching its decision or that “the actual balance of costs and benefits that was struck was arbitrary or clearly gave insufficient weight to environmental factors.”<sup>331</sup> The fundamental inquiries are whether the agency acted within the scope of its authority, whether its decision was arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law, and whether all procedural mandates were followed.<sup>332</sup> The court must determine that the agency considered all relevant elements<sup>333</sup> and took a “hard look” at the environmental impact of and alternatives to a proposed action.<sup>334</sup> It is unclear whether NEPA mandates selection of the least adverse alternative to a project<sup>335</sup> or imposition of the least adverse set of conditions upon its approval. Nor is it settled that NEPA requires agencies and their licensees to take affirmative steps to ameliorate avoidable environmental harm.

While a few decisions indicate a judicial willingness to engage in a broader review of agency NEPA decisions,<sup>336</sup> the Supreme Court’s pronouncement in *Citizens to Preserve Overton Park v. Volpe*<sup>337</sup> remains the guiding formula. Although the court’s “inquiry into the facts is to be searching and careful, the ultimate stand-

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330. *Environmental Defense Fund, Inc. v. Corps of Engineers*, 470 F.2d 289, 300 (8th Cir. 1972); *Calvert Cliffs’ Coordinating Comm. v. AEC*, 449 F.2d 1109 (D.C. Cir. 1971).

331. *Calvert Cliffs’ Coordinating Comm. v. AEC*, 449 F.2d 1109, 1115 (D.C. Cir. 1971); *accord*, *Environmental Defense Fund, Inc. v. Corps of Engineers*, 470 F.2d 289, 300 (8th Cir. 1972).

332. *Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 416 (1971); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 470 F.2d 289, 300 (8th Cir. 1972).

333. Cases cited note 332 *supra*; L. JAFFE, *JUDICIAL CONTROL OF ADMINISTRATIVE ACTION* 182 (1965).

334. *Scientists’ Inst. for Pub. Inform., Inc. v. AEC*, 481 F.2d 1079 (D.C. Cir. 1973); *Environmental Defense Fund, Inc. v. Corps of Engineers*, 470 F.2d 289 (8th Cir. 1972); *Natural Resources Defense Council, Inc. v. Morton*, 458 F.2d 827 (D.C. Cir. 1972); *Environmental Defense Fund, Inc. v. TVA*, 468 F.2d 1164 (6th Cir. 1972). Although the alternatives that must be considered should be those that are reasonably available, they are not limited solely to actions that the agency has the power to adopt. An agency is not relieved of the duty to consider alternatives merely because they would require legislative action or cooperation of another agency or would be administratively difficult. *Environmental Defense Fund, Inc. v. Froehlike*, 473 F.2d 346 (8th Cir. 1972); *Natural Resources Defense Council, Inc. v. Morton*, *supra*. *But see National Helium Corp. v. Morton*, 486 F.2d 995, 1004 (10th Cir.), *rev’g* 361 F. Supp. 78 (D. Kan. 1973) (overturning order requiring consideration of a broad range of executive and legislative actions as alternatives to cancellation of helium procurement contracts). One alternative an agency must consider is taking no action at all. NRC regulations specifying the contents of impact statements require consideration of the “no action” alternative. 10 C.F.R. § 11.55(c)(5) (1975).

335. See Note, *The Least Adverse Alternative Approach to Substantive Review Under NEPA*, 88 HARV. L. REV. 735 (1975).

336. See, e.g., *National Helium Corp. v. Morton*, 486 F.2d 995 (10th Cir. 1973); *Silva v. Lynn*, 482 F.2d 1282 (1st Cir. 1973); *Conservation Council v. Froehlike*, 473 F.2d 664 (4th Cir. 1973); *Conservation Society v. Secretary of Transp.*, 362 F. Supp. 627 (D. Vt. 1973).

337. 401 U.S. 402 (1971).

ard of review is a narrow one. The court is not empowered to substitute its judgment for that of the agency."<sup>338</sup>

2. *Other Federal Agencies.*—No federal agencies other than the NRC have direct control over the siting, licensing, or water diversions of thermal-electric plants in Pennsylvania. The United States Supreme Court recently confirmed that the Federal Power Commission has no authority to regulate thermal-electric facilities.<sup>339</sup> Reversing a lower court ruling that FPC had at least limited power to control power plant use of "surplus water" from federally owned dams,<sup>340</sup> the Court held that jurisdiction under the Federal Power Act<sup>341</sup> was confined to hydroelectric projects.<sup>342</sup>

The Federal Nonnuclear Energy Research and Development Act of 1974<sup>343</sup> directly addresses the problem of water uses in energy projects. The Energy Research and Development Administration (ERDA) is empowered, as part of its research, development, and demonstration projects, to request the interagency Water Resources Council<sup>344</sup> to assess water resource requirements and water availability for energy technologies that are the subject of federal research and development efforts.<sup>345</sup> A Water Resources Council evaluation of the environmental, social, and economic impacts of proposed water uses is required prior to ERDA approval of federal assistance for demonstration projects and commercial applications of

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338. *Id.* at 416, *quoted in* Environmental Defense Fund, Inc. v. Corps. of Engineers, 470 F.2d 289, 300 (8th Cir. 1972).

339. Chemehuevi Tribe of Indians v. FPC, 420 U.S. 395 (1975).

340. Chemehuevi Tribe of Indians v. FPC, 489 F.2d 1207, 1240 (D.C. Cir. 1973). The circuit court opinion had argued that 16 U.S.C. § 797(e) (1970) gave the FPC licensing jurisdiction over

nonfederal construction and operation of water power projects on navigable waters, public lands, or reservations, and for the licensing of the nonfederal use either of water impounded by a government dam in excess of the amount needed to accomplish the purpose of the dam or of actual hydroelectricity generated by a Government dam and not required for governmental purposes.

The Supreme Court, however, found that the "surplus water" clause only applied to surplus water used in hydroelectric power projects. 420 U.S. at 416-22.

341. 16 U.S.C. §§ 791a-823 (1970). The Federal Power Act was enacted originally as the Federal Water Power Act, Act of June 10, 1920, ch. 285, § 320, 41 Stat. 1077, and was amended to its present form by the Act of Aug. 26, 1935, ch. 687, tit. II, § 212, 49 Stat. 847.

342. Included here are both traditional power dams and pumped-storage projects that utilize the mechanical potential of water to drive turbine generators. FPC v. Union Elec. Co., 381 U.S. 90, 98-99 (1965); Scenic Hudson Preserv. Conf. v. FPC, 354 F.2d 608 (2d Cir. 1965), *petitions denied*, 453 F.2d 463 (2d Cir. 1971).

343. 42 U.S.C.A. §§ 5901-15 (Supp. 1976).

344. See notes 347-49 *infra*.

345. 42 U.S.C.A. § 5912(a) (Supp. 1976).



energy technologies covered under the Act.<sup>346</sup> ERDA, however, is not a regulatory agency. Its authority is limited to research and development of energy technologies. Only the water uses of research and development projects are subject to the assessment provisions of the Nonnuclear Energy Research and Development Act. Therefore, it is unlikely that ERDA will have any significant effect upon consumptive water uses in conventional thermal-electric power facilities.

The Federal Water Resources Council, formed by the Water Resources Planning Act,<sup>347</sup> similarly is restricted to an advisory role. The Council's duties to review river basin commission plans and maintain a continuing study of the adequacy of water supplies for each region's requirements,<sup>348</sup> together with its special studies of energy-related water problems,<sup>349</sup> may form an important basis for future water decisions. The Council, however, has no direct control over water uses.

## V. Conclusion

The need to dispose of waste heat from power facilities and the consumptive water losses inherent in current thermal waste control technology clearly pose a major challenge to our water resource laws and institutions, a challenge that to some extent has been recognized, but not yet effectively addressed.

State law on the subject in Pennsylvania and many other eastern states is antiquated and confusing. The riparian doctrine leaves neither electric utilities nor other users with secure water rights in the event of shortage. The protracted litigation necessary to enforce riparian rights often will render "justice" long after the drought has ended—a prospect all water users should view with dismay. Past legislative efforts have been sporadic, ill-drafted, and poorly monitored. Anomalies in the Limited Power Act<sup>350</sup> allow the Commonwealth to oversee consumptive power withdrawals from relatively minor, nonnavigable streams, while canceling jurisdiction over large takings from Pennsylvania's great navigable rivers. Although the Commonwealth may continue to attempt regulation of power plant water uses under its 1913 Water Obstruction Act,<sup>351</sup> that statutory structure is an incomplete and ineffective foundation for water management planning and for resolving water use conflicts.

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346. *Id.* § 5912(b)-(c).

347. *Id.* § 1962 (1974).

348. *Id.* § 1962a-1.

349. *See* PROJECT INDEPENDENCE BLUEPRINT, *supra* note 7.

350. *See* notes 198-212 and accompanying text *supra*.

351. *See* notes 213-27 and accompanying text *supra*.

Federal law is no more coordinated or comprehensive. Water issues can be explored in late stages of nuclear plant licensing or during development of new energy technologies, but most fossil-fueled generating facilities are left unaddressed.

The only holistic approaches to the power water use problem are being developed by the interstate river basin commissions. Both the Delaware and Susquehanna commissions are trying to tie power plant water use to comprehensive, basin-wide plans for all water needs as well as to a more rational electric facility siting process. Yet, much remains to be done to develop these plans into meaningful documents and to adopt effective criteria for approving and controlling water diversions. Moreover, the Delaware and Susquehanna compacts cover only a part of Pennsylvania's land area. The heavily urbanized and industrialized Allegheny-Monongahela-Ohio basin is subject only to the advisory planning efforts of the Ohio River Basin Commission; no basin authority exists to set water use priorities and regulate diversions accordingly.

Ultimately the solution to the consumptive water loss issue must come from a different direction. The inescapable problem is not balancing thermal pollution versus power plant water consumption, but the need to stem our profligate waste of energy. If we continue to capture no more than one-third of the thermal energy available from fuels burned in electric facilities, we will increasingly waste both energy and water resources. The possibility of using "waste" heat in industries and intensive agriculture around power plants may now be technologically impractical. In the future it will be imperative. For the interim we must be prepared to use our laws and institutions to conserve and protect our water resources while stimulating the development of a more energy-efficient and self-sufficient nation.