Antitrust laws, 29. See also Justice Department, U.S.; Monopolies, natural; Regulation application of, 15–16 and deregulation legislation, 197–198 under deregulation scenarios, 98, 101, 103, 196–197 and joint ventures, 171, 226n2 and nuclear power plants, 17 and power pooling, 76 problems with, 244–245n27 and wholesale power market, 23, 101 Atomic Energy Act, 1970 amendments to, 15	of ownership, 180, 242 patterns, 182, 184, 185, 188, 189 regional, 182, 185, 188 simulation summary of, 186–187 and cooperation tensions, 147, 193–195, 197, 198, 244n24 under scenario 2, 99, 167–168 under scenario 3, 103, 171–173 and demand, 185, 243n11 under deregulation, 94, 188, 190, 212, 213 and economic efficiency, 22, 23 and economics of scale, 190–191 entry level, 154–156, 180, 226n7
Averch, Harvey, 86	evaluations of, 181–182, 198
riveren, marvey, oo	at generation level, 179-193
Bonneville Power Authority, 145 Bulk power. See Wholesale power	and market equilibria simulations, 182–190
Capacity, 38. See also Demand absolute growth of, 47 changes in, 85 and emergencies, 39 forecasting of, 40–41, 60, 142 planning expansion of, 9–10, 40, 142–143 of pools, 68–69 of prototype utility, 95–96 and rate structure, 89 and regulatory incentives, 86 shortage of, 6 and size, 47, 53 and technological change, 49, 50, 51 Central Electricity Generating Board	measurement of, 181 Herfindahl index, 184–185, 186–187 output index (QI), 184, 185, 186–187, 188, 189, 243n8 and merger proposals, 219 and public power, 106, 188, 190, 202 simulation, 182–190 and size of market area, 243n12 at transmission level and access to facilities, 195 and capacity constraints, 183, 185, 190, 200 types of, 20 at wholesale power level, 22–23, 147, 200–201, 213 Contractual relationships
Central Electricity Generating Board (CEGB), 60, 145, 146 Christensen, Laurits R., 54, 55, 56, 57,	Contractual relationships and competitive bidding, 192–193 under deregulation, 214, 235–236n10
182 Clayton Act, 98 Competition. See also Monopolies, natural and concentration	scenario 1, 148, 149 scenario 2, 117, 148, 149, 150, 158–160 scenario 3, 117, 148, 149, 150, 158–160, 163, 172

Contractual relationships (continued)	rates based on, 157–158
scenario 4, 117–118, 129–152,	and technological change, 86–88
158–160, 163, 176	Demsetz, Harold, 31, 97
of distribution companies, 125	Deregulation
	<u> </u>
and generating companies, 141-142	conditions for success of, 212–213
and power pools, 116, 117, 138–146,	impacts, 212
148–151, 152	on competition, 94, 188, 190, 212, 213
and economic efficiency, 113-114	on contractual relationships, 214,
and incentive mechanisms, 138, 160,	235-236n10
217, 247n1	on economic efficiency, 137–138, 213,
and investments, 120–124, 126–127,	221
130–138	on market structure, 177–178, 191,
opportunistic behavior in, 110-111	213–214
and contractual incompleteness, 112	on publicly-owned utilities (POUs),
by distribution companies, 125, 194	203
effects of. 134	on wholesale power, 213
and financing generation capacity,	and investment decisions, 126-127
130–134	market structure under, 177-178,
	213–214
by generating systems, 132, 148	
and transaction-specific characteristics,	need for, 185, 188
123, 124, 126, 136	phases in, 99, 101–102, 153, 201, 203,
by transmission-pooling entities, 132,	206–209
133, 134, 141, 144, 172, 174, 195	power pooling under, 114-115,
of power pools	146-148, 244n24
and distribution systems, 116, 117,	pressures for, 4–8
138-146, 148-151, 152	and regulation, 195-196, 212-213
and generating systems, 116, 117,	Deregulation scenarios
146–148	alternative 1, 97–98
versus regulation, 168	entry under, 98, 155
and risk sharing, 135-137, 149, 177,	market structure under, 97–98, 149,
238n8	176
and shared savings, 118, 119, 137,	power pooling under, 98, 149
238n9	regulation under, 97, 154, 155
short-term, 151-152	alternative 2
and transaction costs, 109-113, 196	entry under, 99
and transaction-specific investments,	market structure under, 99, 149, 157,
111-112	167, 176
and transition issues, 201, 202, 245n4	power pooling under, 99–100, 117,
types of, 27–28, 115–119	149, 167–168, 176, 200–201
for wholesale power, 129–152, 158–160,	regulation under, 98–99, 100, 167–168
163	alternative 3
Coordination. See Power pools	entry under, 101
Corio, Marie R., 84	market structure under, 100-101,
Costs. See Economic efficiency; Rates	102-103, 149, 157, 168-169, 172
Cowing, Thomas G., 49, 54	power pooling under, 101, 103, 117,
	149, 151, 169, 170–172, 173
Cross-subsidization, 158, 162, 164, 165	
D 1 00 Co1 Co	regulation under, 101, 102, 103, 164,
Demand, 38. See also Capacity	169, 170
consolidation of, 64	alternative 4
and cross-subsidization. 162. 164	entry under, 190–193
diversity and transmission capacity, 64	market structure under, 104-105, 149,
elasticity, 82, 156, 183, 185, 243n11	157, 173, 174–175
and emergencies, 39-40	power pooling under, 104-105,
fluctuations in, 37–40, 47, 64	117–118, 151, 173–174
	regulation under, 105, 164, 174, 175
forecasting, 40–41, 60, 142	
growth, 86–87, 122, 237n16	and antitrust laws, 98, 101, 103,
and multiproduct production 4/1	140-147

competition under, 140-141	and fuel adjustment clauses, 84-85, 138
contractual relationships under,	gains in
117–118, 129–152, 158–160, 163,	under scenario 2, 167, 176
175, 176	under scenario 3, 176
and coordination requirements, 114–115	under scenario 4, 175, 177
differences among, 148–151	at generation level, 82-83, 84, 85
and distribution systems, 100–103	incentives for, 136-137, 139, 217,
economic efficiency of, 204 evaluating, 93-95, 105, 153-154,	246n1
166–167, 176–178, 198	and marginal cost calculations, 36-37
evaluation summary of, 176-178	measurement of, 9–10
and generation systems, 122–123	and natural monopolies. 29-30
and prototype utility, 95–98, 100,	from power pooling, 83–84, 143, 144,
102–103, 105, 118–119, 236n11	194–195
rates under, 156-157, 166, 177	under scenario 2, 167–168
and regulatory change, 96, 97, 98-99,	under scenario 3, 170–172, 173
101, 104	under scenario 4, 173–174, 175–176
similarities among, 148	at production level, 79–80, 82–88,
transmission facility access under, 195	166–176
wholesale prices under, 201–202	as public policy, 8–9
wholesale transactions under, 235n5	and public power, 106–107, 190
Distribution systems. See also Capacity;	and rate structure, 80–82, 88–90, 155,
Generating systems; Power pools;	157–158, 161–163, 165–166
Transmission systems	structural requirements for, 113-114
contractual relationships of, 125	and technological change, 86
with generating companies, 141–142	and transmission capacity, 85
with power pools, 116, 117, 138–146,	and wholesale power sources, 22
148–151, 152	Economies of scale, 76–77
under deregulation, 100–103	and competition, 190–191
economic characteristics of, 124–125	and coordination, 64, 65–77
and economies of scale, 59–60	at distribution level, 59–60
as natural monopolies, 59, 60, 61 opportunistic behavior of, 125, 194	demand density, 59
opportunistic behavior of, 125, 174	and integration benefits, 60
Economic efficiency, 7	and economic efficiency, 190–191
and competition, 22, 23	at the firm level, 54–58
and competitive entry under scenario 1,	at generation level, 48-49, 85-86 and labor costs, 51
155	and plant size, 50, 51, 58
of contracts under deregulation,	
137–138	and technological change, 49, 50, 51–52, 58
and contractual relationships, 110-111	unit level, 52–54, 58, 121
and coordination, 114-115, 194	of nuclear power plants, 53–54
under scenario 2, 167–168	from power pooling, 42, 66–77
under scenario 3, 170–172	and size. 57–58
under scenario 4, 175–176	from structural integration, 60
and cost minimization	at system level, 56
under scenario 2, 168	and technological differences, 229n14
under scenario 3, 169, 170	at transmission level, 58, 64, 65, 66
under scenario 4, 174	Economy interchanges, 64, 151–152
under deregulation, 137–138, 204, 213, 221	definition of, 37
	potential for, 83
scenario 1, 155	power pool agreements on, 75
scenario 2, 161–163, 167–168 scenario 3, 157–158, 168–173	Electric Power Research Institute (EPRI),
scenario 4, 157–158, 165–173	87
and economies of scale, 190–191	Energy Department, U.S., 11, 16, 52, 66,
evaluating deregulation scenarios for,	69
153–154, 166–167, 168, 173,	Energy interchange. See Economy
176–178, 198, 204	interchanges

Externality problems, 41-42, 63, 177-178 and peak loads, 70 and power pools, 75, 146-148 Federal Energy Regulatory Commission production efficiencies of, 79-80, 82-88, (FERC), 14, 15, 22. See also 166-176 Regulation scale trends of, 49, 50, 51-54 and antitrust laws, 15 size distribution of, 12, 13, 57, 223n3 and competitive disputes, 244n24 and sources of power, 239 and deregulation, 98, 159, 199, 209 and spinning reserves, 39-40 scenario 2, 99, 100, 157, 199, 200, 201, structure under deregulation, 122-123 and transmission system interrelationscenario 3, 101, 103, 169, 171 ships, 63-65 scenario 4, 149, 164 types of, 45-47 and marginal cost pricing for wholesale Golub, Bennett W., 182, 205 rates, 88, 166-167 Gordon, Robert J., 51, 52 and power pooling, 15, 16, 113, 118 Greene, William H., 54, 55, 56, 57, 182 and proposed reform, 216-218, 219, 220-221 Herfindahl index (HI), 184, 185, 186-187 and prototype utility, 96 Hobbs, Benjamin F., 181, 182 and Public Utilities Regulatory Policy Huettner, David A., 54, 55 Act (PURPA), 235n5 Hyman, Leonard S., 205 and purchased power costs, 161 and sales by investor-owned utilities Integration. See Structure (IOUs), 14, 66, 84, 113 Investments and state regulation, 207, 217-218, and capacity needs, 40-41 241-242n24 and contractual relationships, 126-127 and unit sales contracts, 131, 150 coordination of, 146 and yardstick competition guidelines, 22 decisions under deregulation, 126-127 Federal Power Act of 1935, 14, 200, 203 economic efficiency of, 80 Federal Power Commission, 144 in generating capacity, 63, 120-124, 130-138, 223-224n12, 237n14 Florida brokerage, 67, 71, 83, 127, 132, under deregulation scenario 4, 175 Florida Coordinating Group (FCG), 67, planning for, 142-143 69 impact of, on economy, 3-4 longevity, 224n20 Generating systems. See also Capacity; and public enterprises as capital source, Distribution systems; Power pools; Reliability; Transmission systems; rate of return on, 5, 6, 13, 161, 219 Wholesale power and regulatory constraints, 167 characteristics of, 41, 42 and regulatory process, 144 and competition, 179–193 transaction-specific, 111-112, 123, and concentration of ownership, 135-136 180-181 in transmission capacity, 4, 65, 120, and construction, 191-192 124–126, 174 and contractual relationships, 124 Investor-owned utilities (IOUs), 11–16, with distribution companies, 141-142 25–26, 113 with power pools, 116, 117, 146-148 characteristics of, 11, 12, 13 and demand fluctuation, 47 energy accounts of, 14 and economies of scale, 48-58, 64-65, and generation cost, 45 85-86, 121 regulation of, 13 and economy interchanges, 37, 75 size distribution of, 57 fuel efficiency of, 45, 46, 47 structure of, 25-26, 113 and industrial cogeneration, 16 investment in, 63, 120-124, 130-138, Johnson, Leland L., 86 142-143, 175, 223-224n12, 237n14 Joskow, Paul L., 53 and maintenance scheduling, 57, 65, 73, Justice Department, U.S., antitrust activities of, 15, 23 opportunistic behavior by, 132, 148 under deregulation scenario 2, 200, 201

and mergers, 15, 184, 204, 219 reforms proposed, 218-219 and nuclear power, 17 regional variation in, 19 and power pooling bottlenecks, 99 and size, 28-29, 83 and wheeling, 101 and system-wide economies, 65 transition issues in, 204-208 Komanoff, Charles, 53 and vertical integration, 25-26, 30 Miller, John T., 101 Landon, John H., 54, 55 Monopolies, natural, 26. See also Anti-Load. See Demand trust laws Los Angeles Department of Water and alternatives to, 31–32 Power (LADWP), 17 and competitive entry, 226n7 distribution systems as, 59, 60, 61 Maintenance and economies of scale, 29, 30 decline in, 84 and multiproduct firms, 30, 34 scheduling, 57, 65, 75, 147-148 and public policy, 30-31 Marginal costs, 36-37, 89, 90 regulation of, 30-32 and average costs, 164, 165 and single-product firms, 29-30, 33-34 calculation of, 36-37, 227n2 transmission-coordination systems as, and concentration patterns, 185 65, 125, 126 definition of, 223n8 and utility structure, 32-34 and demand, 232n1 and long-term contracts, 160 Natural Gas Policy Act of 1978, 203 and policy reforms, 216-217 Natural monopolies. See Monopolies, and rates, 80-81, 88-90, 165-166 natural increases in, 234n36 New England Power Pool (NEPOOL), for public power, 202 67, 69, 76, 143 structure of, 81-82, 161, 162 New York Power Pool (NYPP), 67 Market relationships, 27–28 Nuclear power Market structure. See also Distribution and antitrust laws, 17 systems; Generation systems; Monopdecline of, 223-224n12 olies, natural; Transmission systems economic viability of, 53 under deregulation, 122-123, 177-178, and economies of scale, 53-54 191, 213–214 Nuclear Regulatory Commission (NRC), scenario 1, 97-99, 149 15, 17 scenario 2, 99, 149, 157, 167, 176 scenario 3, 100-101, 102-103, 149, Old Dominion Cooperative, 119 157, 168–169, 172 Opportunistic behavior. See Contractual scenario 4, 104-105, 149, 157, 173, relationships 174-175 Output index (QI), 184, 185, 186–187, and economic efficiency requirements, 188, 189, 243n8 113-114 and externality problems, 41-42, 63, Pennsylvania-New Jersey-Maryland Pool 177-178 (PJM), 68-69 firms versus markets, 26-29 Perl, Lewis J., 51, 53, 54 horizontal integration, 25-26, 188 Posner, Richard A., 97 and integration by contract, 140, 141, Power Authority of the State of New 150, 172, 236n2 York (PASNY), 17 and integration economies, 55-56, 60 Power pools and interutility coordination, 66-77 and antitrust laws, 76 of investor-owned utilities (IOUs), approaches to, 72-74 11-16, 25-26, 113 and central dispatch defined, 230n28 and joint ventures, 28 and competition tensions, 3, 99, 103, and multiproduct nature, 34, 40-41 147, 167–168, 171–173, 193–195, and natural monopoly issue, 32-33 197, 198, 244n24 ownership patterns, 12 and contracts and power pooling, 71 of publicly-owned utilities (POUs), with distribution systems, 116, 117, 16–20, 113, 204–205 138-146, 148-151, 152

Power pools (continued)	pressures for, 174-175
with generating systems, 116, 117,	and rate structures, 165-166
146–148	reforms proposed, 219-220
coordination by, 147-148, 149, 151,	subsidy to, 17, 18, 106–107, 225n15
152, 239n20	and wholesale markets, 202-203
and costs, 69, 71, 82-83	Public Utilities Holding Company Act of
under deregulation, 114-115, 146-148,	1935, 15, 205, 219
244n24	
scenario 1, 98, 149	QI (output index), 184, 185, 186–187,
scenario 2, 99-100, 117, 149, 167-168,	188, 189, 243n8
176, 200–201	
scenario 3, 101, 103, 117, 149, 151,	Rates
169, 170–172, 173	capital cost component of, 158-159,
scenario 4, 104-105, 117-118, 151,	239n1
173-174	and cross-subsidization, 158, 162, 164,
difficulties with, 57, 76, 83-84	165
and economies of scale, 42, 66-77	under deregulation, 156-157, 166, 177
and economy interchanges, 37, 75	scenario 1, 154–156, 176
effect of regulation on, 83-84, 174	scenario 2, 160-163, 164, 176,
and generating systems, 68-69, 75, 148	201–202
incentives for, 146-147	scenario 3, 163–166, 176
issues raised by, 71, 75	scenario 4, 163-166
loose pools defined, 67	distribution cost component of, 157-158
and maintenance scheduling, 57, 65, 75,	generating capacity component of, 160
147–148	monopoly, 154-156
peak loads of, 70	operating cost component of, 160
and planning, 141-144, 151	and public power impact on reform of,
and reforms proposed, 218	165–166
and regulation, 15, 16, 83-84, 113, 118,	structure, 80-82, 88-90, 155, 157-158,
174	160-164, 165-166, 213, 234n36
and spinning reserves, 39-40, 228n9	and wholesale power costs, 163-165
tight pools, 67, 69, 71, 75	Regulation, 13, 14. See also Antitrust
and transmission systems, 71, 75	laws; Federal Energy Regulatory
types of, 66-67	Commission (FERC); Justice Depart-
and wheeling defined, 225n7	ment, U.S.
Prices. See Rates	and capital costs, 158-159
Primeaux, Walter J., Jr., 61, 62	versus contractual relationships, 168
Production efficiency. See Economic	and cross-subsidization, 158, 162, 164,
efficiency	165
Publicly-owned utilities (POUs). See also	and demand-based rates, 157–158
Tennessee Valley Authority (TVA)	under deregulation, 96, 104, 195–196,
characteristics of, 12, 16-17	212–213
deregulation under, 203	scenario 1, 97, 154, 155
energy accounts of, 14	scenario 2, 98–99, 100, 167–168
importance of, 19	scenario 3, 101, 102, 103, 164, 169,
regulation of, 14	170
structure of, 16-20, 113, 204-205	scenario 4, 105, 164, 174, 175
subsidy to, 17	and distribution system costs, 157–158
Public policy	extent of, 195–196
and economic efficiency, 8-9	and fuel adjustment clauses, 84-85, 138
and natural monopolies, 30-31	incentives
and public power, 190	for cost minimization, 169, 170
Public power, 105–107	for investment, 144
and competition, 106, 188, 190, 202	for production efficiency, 167-168
economic efficiency of, 106-107, 190	of natural monopolies, 30–32
as investment capital source, 19	necessity for, 196, 198
and monopolistic behavior, 190	of power pools, 83–84, 174

problems with, 4-7, 13, 178 of publicly-owned utilities (POUs), 14 and rate of return constraints, 167 reforms proposed, 215, 217-218, 220 and revenue requirements, 138 transition restrictions on, 203 of wholesale power transactions, 14-15, 102, 241-242n24 and yardstick competition, 21-22 Reliability, 227n8 of base-load units, 47 and capacity, 85 decline in, 84 and scale, 48, 52, 53-54 and spinning reserves, 39-40, 228n9 and technical barriers, 51 of transmission systems, 64 and unity of system, 41 Rozanski, George A., 53 Rural Electrification Act of 1936, 17 Rural Electrification Administration (REA), 17

Schmalensee, Richard, 182
Schuler, Richard E., 181
Securities and Exchange Commission (SEC), 15
Sherman Act, 98
Simon, Herbert A., 110
Smith, V. Kerry, 49, 54
Stewart, John F., 51
System lambda, 36–37, 227n2

Technological change, 49, 50, 51-53, 58, 79, 80, 86-88, 234n33 Tennessee Valley Authority (TVA), 16, 146 and central dispatch, 83 and contracts, 60, 140, 145 and government guaranteed loans, 106 internal design and construction by, 191, 192 and municipal distribution systems, 150 and public power debate, 20, 22 structure of, 16 Transition issues financial, 204-205 and income redistribution, 206 and phases of deregulation, 208-209 and public power role, 202-203 and regulation restriction, 203 speed of change, 214 structural change, 204-208 and wholesale power, 199-204, 245n4 Transmission systems, 62, 63. See also Capacity; Distribution systems; Generating systems; Power pools

and access to facilities, 195 capacity constraints, 183, 185, 190, 200 components of, 35-37 coordination by, 64-66, 132-134 and demand fluctuations, 37-40, 47 economic characteristics of, 124-125 and economies of scale, 58, 64, 65, 66 and economy interchanges, 37, 64, 75 and interdependence of components, and interrelationship with generating system, 63-65 investment in, 4, 65, 120, 124-126, 174 as natural monopolies, 65, 125, 126 opportunistic behavior by, 132, 133, 134. 141. 144. 172. 174. 195 and power pooling, 71, 75 production inefficiencies of, 85 and reliability, 64 and static equilibrium, 35-37 and system lambda, 36-37

U.S. Energy Department. See Energy Department, U.S.
U.S. General Accounting Office, 19
U.S. Justice Department. See Justice Department, U.S.

Virginia Electric Power Company (VEPCO), 119

Weiss, Leonard W., 101, 180, 181, 182 Wholesale power and antitrust laws, 23, 101 competition for, 22-23, 147, 200-201, 213 contracts for, 129-152, 158-160, 163 under deregulation, 201-202, 213, 235n5, 245n2, 245n4 scenario 1, 97 scenario 2, 98, 99-100 scenario 3, 100-103, 170 scenario 4, 104-105 federal sales of, 16 and public power advantages, 106-107 and reforms proposed, 215-217, 220 regulation of, 14-15, 241-242n24 transition issues, 199-204 Williamson, Oliver E., 27, 31, 109, 110, 111, 120, 124, 126, 192 Wills, Hugh R., 51