## Index

Titles of publications are in *italics*.

<table>
<thead>
<tr>
<th>access and purpose strategy</th>
<th>188</th>
</tr>
</thead>
<tbody>
<tr>
<td>adequacy to transactions</td>
<td>39</td>
</tr>
<tr>
<td>agency model and regulation, network industries</td>
<td>97</td>
</tr>
<tr>
<td>agency theory and contract choice</td>
<td>35</td>
</tr>
<tr>
<td>Agere Systems</td>
<td>125</td>
</tr>
<tr>
<td>Airgo</td>
<td>125</td>
</tr>
<tr>
<td>Apple</td>
<td>110, 115, 122, 129, 130</td>
</tr>
<tr>
<td>architectures</td>
<td>electricity energy systems 140–42</td>
</tr>
<tr>
<td></td>
<td>retail markets, electricity sector</td>
</tr>
<tr>
<td></td>
<td>wholesale markets, electricity sector</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>108</td>
</tr>
<tr>
<td>Beck Jørgensen, T.</td>
<td>174–6</td>
</tr>
<tr>
<td>borders retail design, electricity sector</td>
<td>58</td>
</tr>
<tr>
<td>bottom-up network modernization</td>
<td>16–17</td>
</tr>
<tr>
<td>Bozeman, B.</td>
<td>174–6</td>
</tr>
<tr>
<td>business responsiveness, see responsiveness strategy</td>
<td></td>
</tr>
<tr>
<td>business strategies, see strategy perspectives</td>
<td></td>
</tr>
<tr>
<td>canal industry</td>
<td>196–7</td>
</tr>
<tr>
<td>capacity, electricity industry</td>
<td>136–7</td>
</tr>
<tr>
<td>Casema</td>
<td>188</td>
</tr>
<tr>
<td>Coase, R.</td>
<td>53</td>
</tr>
<tr>
<td>collective management of contracts</td>
<td>50–53</td>
</tr>
<tr>
<td>competition</td>
<td>electricity industry 157–8</td>
</tr>
<tr>
<td>and network strategy</td>
<td>171</td>
</tr>
<tr>
<td>competitive forces map, electricity industry</td>
<td>137</td>
</tr>
<tr>
<td>concession model</td>
<td>14, 69–70, 72–3, 77–8</td>
</tr>
<tr>
<td>conflict resolution mechanisms</td>
<td>41</td>
</tr>
<tr>
<td>contracts</td>
<td>collective management 50–52</td>
</tr>
<tr>
<td></td>
<td>concession 33, 37, 67</td>
</tr>
<tr>
<td></td>
<td>congestion 147</td>
</tr>
<tr>
<td></td>
<td>electricity sector 49</td>
</tr>
<tr>
<td></td>
<td>retail 49–54</td>
</tr>
<tr>
<td></td>
<td>wholesale 54–8</td>
</tr>
<tr>
<td></td>
<td>individual, electricity sector 49–51</td>
</tr>
<tr>
<td></td>
<td>lease 33</td>
</tr>
<tr>
<td></td>
<td>management 33</td>
</tr>
<tr>
<td></td>
<td>maintenance 73–4</td>
</tr>
<tr>
<td></td>
<td>operation and maintain 67</td>
</tr>
<tr>
<td></td>
<td>public–private partnerships 30–36</td>
</tr>
<tr>
<td></td>
<td>supply 49–51, 130</td>
</tr>
<tr>
<td></td>
<td>as tool for reform 25–9</td>
</tr>
<tr>
<td></td>
<td>and transaction cost theory 31, 33–5, 38–9</td>
</tr>
<tr>
<td></td>
<td>water supply 30–36</td>
</tr>
<tr>
<td>Conway, P. I</td>
<td>cooperation network strategy 171–2</td>
</tr>
<tr>
<td></td>
<td>and public value creation 177</td>
</tr>
<tr>
<td></td>
<td>corporate strategy 169–71</td>
</tr>
<tr>
<td></td>
<td>and public values 176–8, 187–8</td>
</tr>
<tr>
<td></td>
<td>cost, see transaction cost</td>
</tr>
<tr>
<td></td>
<td>costs, electricity supply risks 147</td>
</tr>
<tr>
<td></td>
<td>countertrading 50</td>
</tr>
<tr>
<td>decision-making</td>
<td>electricity industry 150, 155</td>
</tr>
<tr>
<td></td>
<td>and strategic bias 168</td>
</tr>
<tr>
<td></td>
<td>delegation of regulatory powers 97–8</td>
</tr>
<tr>
<td></td>
<td>deregulation</td>
</tr>
<tr>
<td></td>
<td>electricity industry 136, 138</td>
</tr>
<tr>
<td></td>
<td>radio spectrum 105–6</td>
</tr>
<tr>
<td></td>
<td>design–bid–build structure, road contracting 65–7</td>
</tr>
</tbody>
</table>
design–build structure, road contracting 65–7
differentiated regulations 99
digital technology
  disruptive innovations 200–203
  see also Wi-Fi
direct sequence spread spectrum 106
disruptive technologies 20–21, 193–205
Dosi, G. 8
economic evolution and Wi-Fi development 120–21
economic factors, public utilities reform 27–8
Électricité de France 185
electricity industry 134–61
  architectures 140–42
  and competition 157–8
  homeostatic control 143–4
  and information technology 140, 142–3, 150–51, 153, 156, 159–60
  markets 11–13, 46–59
  new developments 142–3
  regulatory reform 151–6
  restructuring 138–48
  retail markets 11–12, 54–9
  sociotechnical environment 142–3
  technological innovation 148–51
  wholesale markets 12, 49–54
end users and disruptive technologies 201–3
England, retail electricity market design 56
Estonia, open public access networks 204–5
ETSI (European Telecommunication Standardization Institute) 110
European Air Safety Authority 94, 98
European Rail Authority 94, 98
European regulatory model, characteristics 89–94
European Telecommunication Network Operators Association 189
European Telecommunication Standardization Institute (ETSI) 110
European Union
  objectives for the electricity sector 173
  regulation of network industries 88–94
  regulators 98
  as regulatory state 88–9
  evolutionary theory and Wi-Fi development 120–21
  exchange of rights, electricity sector
  retail markets 54–8
  wholesale markets 49–54
  externalities 134
Finland, road management reform 13–14, 67–8, 69–71, 73–4, 75–6, 78–82
Finnish Road Administration (Finnra) 68, 70–71, 73–6
Finnish Road Enterprise (FRE) 70–71
formal institutions 7, 11–13
France, water sector 32–3
frequency hopping 106
Germany, retail electricity market design 58
  global spectrum standards 111–13
governance modes, road contracting 65–7
governance structures, readjustments 1–5; see also liberalization of
  network industries, Europe; privatization; reregulation, network industries
Groenewegen, J.P.M. 8
hardware needs, electricity industry 148, 154
Hayes, V. 112–13
HIPERLAN 110
Hogan, W. 47
homeostatic control, electricity industry 143–4, 153–4
HomeRF 108
Huet, F. 33
IBM 16, 107, 115, 129
ICT, see information technology
IEEE 802.4 standard 107
IEEE 802.11 standard 107–10, 115, 117, 122
incomplete contract theory 31, 35
independence of regulator, network industries 93
independent regulatory agencies (IRAs) 89
individual exchange of rights, electricity sector 49–50
informal institutions 7, 13–14
information technology 1–4
and electricity industry 140, 142–3, 150–51, 153, 156, 159–60
revolution 194
infrastructure companies and public values 176
strategy bias 169–73
infrastructure development model 118–19
infrastructure reform, water sector 25–43
Institute of Electrical and Electronic Engineers (IEEE) 16, 107, 111, 122, 129, 130
institutional arrangements 7, 9–11; see also public–private partnerships
institutional governance and technical systems 94–6
institutional structure of production 53
institutional structures, road contracting
Finland 67–8, 69–71, 73–5
Spain 69–70, 72–5
institutions 9–14
formal 11–13
informal 7, 13–14
layers of 6–7
and technology 9
Intel HomeRF 108
internalization of collective constraints 50–51
International Standard Organization (ISO) 108
International Telecommunication Union 205
Internet access, Wi-Fi 115–17
ISM (industrial, scientific and medical) bands 105
IT, see information technology
Joskow, P.L. 46
KPN 188
Künneke, R.W. 8
Laffont, J.-J. 35
liberalization of network industries, Europe 90–91
licensing, radio spectrum 103–4, 105, 114
Littlechild, S.C. 46
local access networks, open 204–5
local institutions, water supply sector 40
Lucent Technologies 108, 112, 115, 122, 125
Majone, G. 87, 88–9, 97
Marcus, M.J. 105–6
Markets for Power 46
markets, electricity industry 11–13, 46–59
retail 11–12, 54–9
wholesale 49–54
measurement system, electricity sector 53–4, 55
Ménard, C. 31
metroWireless 117
micro-institutions, water supply sector 40–42
Microsoft 115, 117, 122
mobile communication licences 114
Moore, G.A. 121
Moore’s Law 201–2
national interests and network industries 4
NCR and Wi-Fi development 107, 121
neighborhood area networks 116–17
Nelson, R.R. 9, 120, 121, 122
network industries regulatory practices 87–100
see also electricity industry; road management; telecommunications sector; water supply sector
network modernization, telecommunications 102–27
and Wi-Fi technology 103–4, 125–7
network strategy 171–2
and public values 177
and reliability 187
Nicoletti, G. 1
nodal retail design, electricity sector 55–6
Norsk Hydro 54
Norway, retail electricity market 57
Office of Canal Operations and Management (OCOM) 196–7
open public local access networks 204–5
open standard for telecom networks 106–11
operators
ownership of, and regulators 92–3
private, water 31–8
system operators 12, 50–54
opportunistic behaviour 34–5
Organisation for Economic Co-operation and Development (OECD) 1, 61, 114
organizational purpose strategy 172–3
own responsibility principle 74
ownership of operators, and regulation 92–3
Perez, C. 5, 20, 194
policy 8, 18–21
political aspects of reform 4–5
road management
Finland 67–8
Spain 69
water supply sector 28–30, 35–6, 41–2
Porter, M.E. 137
power of regulator, network industries 93–4
PPP, see public–private partnerships
principal–agent relationships 97
private firms
and public values 18–20, 167–91
and water supply sector 31–8
privatization 61–2
road management 61–82
see also public–private partnerships
public domain Wi-Fi 115–16
public–private partnerships
road contracting 67
water supply 10–11, 29–43
public utilities reform 25–6; see also electricity industry; road management; telecommunications sector; water supply sector
public values 4, 173–8
in infrastructure industries 176
measurement 181
and private infrastructure firms 18–20, 167–91
and strategy perspectives 176–91
universe of 174–6
purpose strategy
and access 188
and public values 178
quality and corporate strategy 187–8
radio spectrum allocation 103–4, 105, 114
global allocation 111–13
redispatching 50
reform of public utilities 25–6; see also electricity industry; road management; telecommunications sector; water supply sector
regional institutions, water supply sector 40
regulation
and change, electricity industry 137–8
and disruptive technologies 196–8
European Union 14–16, 87–100
framework design 96–8
network industries, Europe 87–100
reform, electricity industry 151–6
self-regulation 99
regulator independence, network industries 93
regulator power, network industries 93–4
reliability and network strategy 187
reregulation 1, 88–91, 95, 100
network industries 90–92
responsiveness strategy 170
and public value creation 177
Index

retail markets, electricity 11–13, 46–8, 54–9
retailers, involvement in electricity supply sector 48
Rittel, H.W.J. 169
road management 13–14, 61–82
routines 9
Sampat, B.N. 9
Saussier, S. 31
Savendoff, W. 32
Sawhney, H. 118
Schmalensee, R. 46
Schwepp, F. 143–4
self-regulation 99
shadow tolls 72, 81
Shirley, M. 32
Smith, A. 205
Société nationale des chemins de fer belge (SNCB) 187
Société nationale des chemins de fer français (SNCF) 187
sociotechnical environment, electricity industry 135–8, 142–3
software needs, electricity industry 150–51
Spain, road management reform 13–14, 69–70, 72–5, 76–82
spectrum allocation, see radio spectrum allocation
Spiller, P. 32
spread spectrum 106
storage capacity, electricity industry 142–3, 153
strategic business units 170
strategy perspectives 169–73
international comparison 182–5
measurement 180–81
and public values 168, 178–91
sectoral comparison 184–5
synergy strategy 170
and public value creation 176–7, 188
system operator 12, 50–54
system operator retail design, electricity sector 56
system reconfiguration, electricity industry 159–60
systems innovations, electricity industry 148–50
technological innovations, electricity industry 148–51
network industries 1–4
technological paradigms 8
technological revolutions 5–6, 193–4
technology 8–9, 14–18
definition 8
disruptive 20–21, 193–205
and institutional governance 94–6
and institutions 9
and regulatory practice 14–16
telecommunications sector
business model 198
and disruptive technologies 198–205
modernization 102–27
third-party access (TPA) 91
3G licenses 114
Tirole, J. 35
trajectories 8–9
transactions
cost 3, 15, 41, 54
cost theory 11, 30–31, 33–6, 38
implementation of 49–58
individual 12, 50, 52–3, 59
wholesale 53
trust relationships and regulation 97–8
uncertainty in decision-making, electricity industry 155
universe of public values 174–6
vertical integration 89–90
Wales, retail electricity market design 56
water supply sector 26–43
public–private partnerships 29–43
reasons for reform 26–30
type of contract 30–36
Webber, M.M. 169
wholesale markets 47
electricity 12, 49–54
Wi-Fi 16–17, 102–27
development 104–6, 117–25
neighbourhood area networks 116–17
and network modernization 103–4, 125–7
public networks 115–16
and spectrum assignment 111–13
standards 106–11
Wi-Fi Alliance 113
Williamson, O. 31, 39
Winter, S.G. 120, 121
Wireless Leiden 117, 130

wireless local area network (WLAN) 106–13
World Bank 26, 42, 43, 61–2, 76
World Radio Conference (WRC) 103, 112–3
Yarrow, G. 32

zonal pricing, electricity sector 51
zonal retail design, electricity sector 57