

## Index

- Australia
  - hydropower, 39
  - planning permission and approvals, 87–88
  - woody biomass, 29–32
- Australian Greenhouse Office, 31
- Australian Productivity Commission, 84
- bioelectricity. *See also* biomass
  - producers, 28
- biogas, 34–35
  - definition, legislative, 34
- biomass, 27–34
  - advantages, 28
  - China, 27–34
  - definition, 27, 29
  - definition, legislative, 28, 34
  - direct combustion, 27
  - disadvantages, 28
  - generally, 28
  - health impacts, 34
  - liquefaction, 27
  - non-plantation native
    - forest, 29–32
  - old growth forest, 29–32
  - regulatory issues, 30
  - sustainability criteria, 29
  - traditional, 32–34
  - woody, 29–32
- biopower. *See* biomass
- Brayton cycle, 26
- Brazil
  - bioelectricity producer, 28
  - concentrated solar thermal technology, 26
  - hydropower, 39
  - photovoltaic solar, 24
- carbon tax, 95
- China
  - bioelectricity producer, 28
  - grid-connected projects versus installed capacity, 171
  - hydropower, 39, 41
  - regulatory competition, 16
  - wind farms, 171
- climate change, 1
- concentrated solar thermal technology. *See* solar energy
- current energy, 49
- distribution networks, 86
- Ecuador
  - nuclear energy, 58–59
- electricity. *See also* electricity sector; regulation; renewable energy sector
  - characteristic warranting regulatory treatment, 65–73
  - demand, 66, 71
  - economic development, 66–67
  - generation, interdependent with other fuel sources, 66, 68–69
  - geopolitical volatility, 68
  - individual welfare, 66–67
  - interdependent, 66
  - Large Combustion Plant Directive, 68
  - market concentration, 66, 72–73
  - national markets, 66
  - regulatory treatment, characteristics warranting, 65–73
  - stakeholders, 67
  - storage systems, 71–72
  - transmission and distribution networks, 71

- electricity pricing
  - externalities, social and environmental, 69
  - inaccurate, 66
  - information asymmetries, 66
- electricity sector
  - concentration, 72–73
  - high barriers to entry, 72–73
  - highly politicised, 67
  - market barriers, 79–93
  - market failures, 73–79
  - storage systems, 71–72
  - subsidies to fossil fuel, 80–82
  - supply, global, 1
- energy security, 1, 112–118, 264
  - definition, 112
  - diversify supply, 115
  - exporters, 114
  - fossil fuel imports, reduce the use of, 116
  - geopolitical and economic factors, 113
  - importers, 115
  - indigenous energy sources, 118
- energy storage systems, 71–72
- feed-in tariffs, 167–223, *See also* regulatory support mechanisms
- Finland
  - concentrated solar thermal technology, 26
  - peat, 55
  - photovoltaic solar, 24
- forest, native
  - degradation, 29
  - old growth, 29–32
  - regulatory issues, 30
  - sustainable logging, 32
- fossil fuels
  - costs, 3
  - indigenous, 66
  - nuclear generation, 80–82
  - subsidies for, 80–82
- fuel cells, 53–54, *See also* regulatory support mechanisms
- geothermal energy, 43–47, *See also* regulatory support mechanisms
  - aquifers, 44–45
  - definition, legislative, 43
  - environmental impacts, 46–47
  - generally, 43
  - hot fractured rock technology, 45–46
  - hot springs, 44–45
  - Iceland, 45
  - impacts, 46–47
  - Kenya, 45
  - Philippines, 45
  - risks, 46–47
- Germany
  - bioelectricity producer, 28
- governance. *See* regulatory systems
- green
  - certificate trading, 13, 187–193
  - power schemes, 13, 214–216
- harmonious construction, 161
- hydrogen fuel cells, 53–54
- hydropower, 36–43, *See also* renewable energy sources
  - advantages and disadvantages, 37
  - Australia, 39
  - Brazil, 39
  - China, 39, 41
  - classification of projects, 37, 42
  - definition, legislative, 37, 38, 39, 42
  - environmental impacts, 39–40
  - generally, 36
  - large scale, 38–39, 42, 61
  - mature technology, 36
  - pumped, 42–43
  - small scale, 36–38
  - social impacts, 40–41
  - super profits, 41–42
  - wildlife impact, 40
- hydrothermal energy, 50–53
  - definition, legislative, 53
  - inconsistent use of terminology, 52
- Iceland
  - geothermal energy, 45
- India
  - bioelectricity producer, 28
  - labour, lack of skilled, 91–92
- Japan
  - bioelectricity producer, 28
  - planning permission and approvals, 87–88
  - regulatory competition, 16
- Kenya
  - geothermal energy, 45
  - traditional biomass, 33

- landfill gas, 34–35, *See also* renewable energy sources
  - definition, legislative, 34
- Large Combustion Plant Directive, 68
- laws. *See* renewable energy laws
- legal mechanisms. *See* regulatory support mechanisms
- legislative objectives in renewable energy law, 250–253, 264, *See also* renewable energy laws
  - diversify supply, 112–118
  - economic, 122–132
  - education, training and research, 132–135
  - energy security, 112–118
  - environmental, 138–144
  - harmonious construction, 161
  - industrial policy, 145–152
  - international agreements, 135–138
  - regional integration, 135–138
  - research, 103–112
  - sectoral, 118–122
  - security, 112–118
  - social, 152–159
- Malaysia
  - concentrated solar thermal technology, 26
  - wind energy, 20
- market barriers, 79–93, *See also* renewable energy sector
  - addressing, 99
  - Australian Productivity Commission, 84
  - economies of scale, 89
  - fossil fuels, subsidies for, 80–82
  - impact on renewable generation, 85
  - labour, lack of skilled, 91–92
  - nuclear generation, subsidies for, 80–82
  - planning permission and approvals, 87–88
  - policy instrument, 83
  - policy uncertainty, 82–85
  - principal-agent problem, 90–91
  - regulatory uncertainty, 82–85
  - split incentives, 90–91
  - subsidies, 80–82
  - transmission and distribution networks, access to, 85–87
- market failures
  - addressing, 94–96, 99
  - finance, limited access to, 89–90
  - risk, appropriately pricing, 89–90
- mechanisms. *See* regulatory support mechanisms
- Netherlands
  - planning permission and approvals, 87–88
- nuclear energy, 56–60, *See also* renewable energy sources
  - Ecuador, 59
  - low-carbon energy source, 58
  - non-renewable, 57, 60
  - regulatory support, 56
  - subsidies for, 80–82
  - United Kingdom, 56
- ocean currents. *See* tides, waves and ocean currents
- Paris Agreement, 1
  - Nationally Determined Contributions, 1, 70
- peat, 55, *See also* renewable energy sources
  - definition, legislative, 55
  - Finland, 55
  - Sweden, 55
- Philippines
  - geothermal energy, 45
- photovoltaic solar energy, 24–26
  - advantages, 24–25
  - Brazil, 24
  - disadvantages, 25–26
  - Finland, 24
- planning permission and approvals. *See also* renewable energy sector
  - Australia, 87–88
  - Japan, 87–88
  - Netherlands, 87–88
  - wind projects, onshore, 88
- power generation
  - global, 1
- Rankine cycle, 26
- regulation. *See also* electricity sector; regulatory systems; renewable energy laws; renewable energy sector
  - agencies, 85
  - economic justification, 65–97
  - economic perspective, warranted from, 94
  - electricity, characteristics that warrant, 65–73
  - market failures, 73–79
  - regulatory agencies, 85
  - regulatory support mechanisms, 3, 4, 8, 13–14
  - auction bidding, 193–198
  - capped, 168
  - classification, 13, 167–175

- regulatory support mechanisms (cont.)  
   clean energy loans, 205–207  
   coase theorem, 94–96  
   competitive tendering, 13, 193–198  
   compulsory or voluntary, 168  
   development, 14  
   energy storage systems, 72  
   evaluating, 219–222  
   feed-in premiums, 13, 185–187  
   feed-in tariffs, 13, 176–185  
   future development, 224–230  
   green certificate trading, 13  
   green power schemes, 13, 214–216  
   indirect, 13, 175  
   industry-wide, 168  
   investment tax credits, 13, 210  
   investments versus operating support, 170  
   multiple, 13  
   net metering, 198–200  
   pigovian taxes, 94, 99  
   price driven, 167, 168, 173–175  
   primary or secondary instrument, 170  
   quantity driven, 167, 173–175  
   quota system, 13, 187–193  
   rebates, 207–208  
   regulatory competition, 241–248  
   renewable energy targets, 200–202  
   renewable portfolio standards, 13, 187–193  
   renewal energy credits, 13  
   research and development support, 212–214  
   role, 167–223  
   selection, 167–175  
   storage systems, 72  
   subsidies, 202–204  
   supply or demand, 167  
   tax incentives, 208–211  
   technology neutral, 168  
   tradeable green certificates, 187–193  
   types, 176–219  
 regulatory systems. *See also* renewable energy laws  
   competition, 241–248, 264  
   convergence, 237–240, 250–264  
   divergence, 240–241, 255–260  
   harmonisation, 231–237, 250–264  
   regulatory competition, 264  
   support mechanisms. *See* regulatory support mechanisms  
   unification, 230  
 renewable energy. *See also* regulatory systems  
   definition, 19–20, 29–32  
   definition, legislative, 7–10, 19, 60–62  
   national law, analysis of all countries, 7–10  
   scientific meaning, 62  
 renewable energy laws, 7, 98–163, *See also*  
   regulatory systems  
     analysis, 10, 65, 250–264  
     convergence, 237–240, 250–264  
     definition, legislation, 7–10  
     divergence, 240–241, 255–260  
     economic objectives, 122–132  
     education, training and research objectives, 132–135  
     environmental objectives, 138–144  
     harmonisation, 7–10, 231–237  
     industrial policy objectives, 145–152  
     international and regional objectives, 135–138  
     legislative objectives, 98–163  
     rationale for legislating, 98–163  
     regulatory competition, 241–248  
     regulatory support mechanisms. *See* regulatory support mechanisms  
     resolving conflict between competing, 159–161  
     sectoral objectives, 118–122  
     security objectives, 112–118  
     social objectives, 152–159, 264  
     unification, 230  
 renewable energy sector, 1–7, *See also*  
   electricity; electricity sector  
   connect then manage, 87  
   fossil fuel costs, 3  
   government intervention, 4, 65, 94  
   growth, 1–2, 65  
   information asymmetries, 3–4, 74, 77–79  
   investment, 1–3  
   Large Combustion Plant Directive, 68  
   market barriers, 79–93  
   market failures, 3–4, 66, 73–79  
   planning permission and approvals, 87–88  
   principal-agent problem, 90–91  
   reforms, 82  
   regulatory models, 5  
   regulatory support mechanisms, 3  
   spillovers and learning effects, 3–4, 74–76, 82  
   split incentives, 90–91  
   subsidies to fossil fuel, 80–82  
   technology and equipment costs, 3  
   unpriced externalities, 3–4, 74, 76–77, 92, 99  
 renewable energy sources, 8, 19–62, *See also*  
   energy security

- biogas, 34–35
- biomass, 27–34
- commercialised, highly, 60–62
- definition, 19–20, 29–32
- environmental impacts, 19
- fuel cells, 53–54
- generally, 19–20
- geothermal energy, 43–47
- hydrogen fuel cells, 53–54
- hydropower, 36–43
- landfill gas, 34–35
- non-renewable, 60–62
- nuclear energy, 56–60
- peat, 55
- sewage treatment gas, 34–35
- solar energy, 24–27
- sustainable, 60–62
- tides, waves and ocean currents, 47–53
- wind energy, 20–23
- riverine energy. *See* tides, waves and ocean currents
- security. *See* energy security
- sewage treatment gas, 34–35
  - definition, legislative, 34
- solar energy
  - advantages, 27
  - Brazil, 26
  - categories, 26
  - definition, legislative, 26
  - Finland, 26
  - generally, 24, 26
  - Malaysia, 26
  - photovoltaic, 24–26
- Stirling cycle, 26
- Sweden
  - peat, 55
- tax
  - incentives, 208–211
  - investment, 210
  - pigovian, 94, 99
- tidal power, 49
- tides, waves and ocean currents, 47–53, *See also*
  - renewable energy sources
  - definition, legislative, 48, 49
  - hydrothermal energy, 50–53
  - maremotermica, 50–53
  - ocean thermal layering, 50–53
  - osmotic energy, 53
  - salt gradient, 53
  - tidal power, 49
  - wave energy, 49–50
- transmission and distribution networks, 85–87
- United Kingdom
  - bioelectricity producer, 28
  - nuclear energy, 56
  - Transmission Access Review, 87
  - transmission and distribution networks, 86
- wave energy, 49–50, *See also* tides, waves and ocean currents
  - definition, legislative, 50
- wet biomass conversion, 34, *See also* biomass
- wind energy, 20–23
  - acceptance, lack of, 92–93
  - definition, legislative, 20
  - environmental impacts, 22–23
  - floating platforms, 21
  - generally, 20
  - health impacts, 23
  - innovations, 21
  - Malaysia, 20
  - noise emissions, 23
  - onshore and offshore, 21–22
  - planning permission and approvals, 88
  - process, 21
  - types, 21
  - unpriced externalities, 92–93
  - wind farm siting, 21–22
  - wind power and, 21–22
  - Wind Turbine Syndrome, 23
- Wind Turbine Syndrome, 23