

## 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