

Index

• A •

absorber, 248
absorption, 64
AC. *See* alternating current (AC)
active methods, 195
active systems, 159
aesthetics of solar room, 251–252
air
 density, 72
 heat capacity, 69
 movements and natural ventilation, 199–200
air-conditioning. *See also* cooling
 energy conservation, 48–49
 inspection, 32–33
alternating current (AC)
 DC *versus*, 279–280
 DC-to-AC inverters, 95, 261–262
 generator, 279
 loads controller, 279
 PV systems, 70
analyzing
 risk, 88
 solar investments, 83–89
antifreeze system. *See* closed-loop antifreeze system
appliances
 annual kWh usage, 28
 auditing, 36
 cooking, 44, 101, 348
 energy conservation, 42–45
 energy usage, 28
 solar home, 300
appreciation
 defined, 85
 home, 10, 93
 overview, 255
Army Corps of Engineers, 228
assessing, power needs, 219–222
atmospheric depth, 66–67
atmospheric light, 65–67

attic vent fans
 installing solar, 102, 208–212, 338, 340–341
 overview, 207
 as project, 340–341
 types, 211–212
attics, auditing, 34
auditing
 appliances, 36
 attics, 34
 details, 34–35
 insulation, 33–34
 leaks, 29–33
 overview, 29
 professional, 36–37
automatic retractable shades, 54
automatic systems, solar pool covers, 169
automobile project, 124
average kWh per day, calculating, 26, 221
averaging, 21
awnings
 energy conservation, 53–54
 installing, 341
 project, 120–121
azimuth, 76

• B •

back pressure, 218
ball valves, 158
banks
 battery, 278
 financial, 327–329
baseline usage, establishing, 26
batch collectors, 152–153
batteries
 capacity, 281
 chargers, 102, 343, 347
 efficiency, 281
 lifetime, 282
 maintenance, 282
 overview, 280
 projects, 135–136

- batteries (*continued*)
 - risks, 282–283
 - safety, 106
 - size specifications, 221
 - types, 281
- battery bank, 278
- battery-operated PV systems, 219
- benefits
 - environmental, 89
 - PV system, 254–255
- bids
 - comparing, 237–238
 - obtaining, 236
- billing systems, time-of-use (TOU), 26
- blinds and drapes
 - energy conservation, 52
 - indoors (interior), 102, 128
 - outdoor (exterior), 129
 - project, 128–129
 - retractable shades, 54–55
 - as solar investments, 336–337
- book
 - conventions, 1
 - icons, 4
 - organization, 2–4
- box fans, 203–204
- Brewster, Janice
 - Building Your Own Home For Dummies*, 291
- brick, heat capacity, 69
- budget considerations, 99–100
- building
 - basic rules for home, 292
 - process for solar homes, 291–301
 - solar fountains, 343–344
 - solar ovens, 342–343
 - solar space heaters, 212–213
- building codes. *See* codes
- Building Your Own Home For Dummies*
 - (Daum, Brewster, and Economy), 291
- bureaucracy, solar energy, 15–16
- buy-down, 319
- buying
 - existing solar homes, 307–312
 - homes to convert to solar, 304–306
- C •
 - calculations
 - average kWh per day, 26, 221
 - carbon footprints, 11–12
 - costs per kWh, 23–25
 - depreciation, 22
 - duty cycle, 219, 221
 - energy needs, 220
 - energy usage, 27–29
 - maximum instantaneous load, 221
 - net costs, 84–86
 - off-grid energy consumption, 284–286
 - online, 86
 - payback, 87–88
 - peak instantaneous power output, 219
 - savings, 86–87
 - sunlight, 220
 - total system capacity, 219
 - California (Northern), rate structures, 272
 - capacity
 - battery, 281
 - heat, 69
 - carbon dioxide, pollution, 278
 - carbon dioxide footprint, 10–12
 - carbon emissions, burnable energy
 - sources, 11
 - carbon footprint, 10–12
 - ceiling fans
 - overview, 204–206
 - powering, 207–208
 - changing
 - filters, 34–35
 - habits, 41–51
 - charge controller, 278
 - chargers, battery, 102, 343, 347
 - check valves, 158
 - chimney effect
 - natural ventilation, 198–199
 - overview, 245–246
 - reversing, 205
 - vent fans, 245–246
 - Christmas lights project, 125–126
 - Clean Power Estimator, 86

- climate
 - defined, 71
 - energy use, 75
 - solar potential, 71–75
- clip fans project, 123, 348
- closed-loop antifreeze system
 - defined, 149
 - installing, 190–192
 - limitations, 191–192
 - overview, 181
- cloud cover, 72
- coal, carbon emissions, 11
- codes
 - following, 233–234
 - overview, 232–233
 - passing, 234–235
 - solar home, 293–294
- collecting
 - data, 20–21, 84
 - sunlight, 149–156
- collector cross section, 79–81
- collectors
 - creating, 177–178
 - evacuated tube, 155–156
 - flat-plate solar, 153–155
 - mounting, 81–82
 - solar heat, 68–69
 - swimming pool heaters, 173–174
- combined rate structure, 272
- comparing, bids, 237–238
- compatibility, contractor, 237–238
- components
 - PV system, 260–263
 - solar water heater, 148–156
- concrete, heat capacity, 69
- conduction, 67
- conservation. *See also* energy efficiency
 - defined, 102
 - energy, 40
- consumer loans, 324
- contracting
 - do-it-yourself *versus*, 231–240
 - overview, 239–240
- contractor
 - abilities, 235–236, 301
 - bids, 236–238, 352
 - hiring process, 235–240
 - interviewing, 238
 - overview, 266
 - paying, 239
- control mechanisms, 250
- controllers
 - automatic thermostat, 56
 - charge, 278
 - delta, 185
 - differential temperature, 160
 - solar water heating systems, 159–160
- convection, 68
- convective cooling, creating, 204–205
- conventions, book, 1
- converting
 - sunlight into electricity, 70
 - sunlight to heat, 67–69
- cooking, solar oven, 44, 101, 348
- cooling. *See also* air-conditioning
 - controlling, 55–56
 - convective, 204–205
- copper, heat capacity, 69
- costs. *See also* energy costs
 - budget considerations, 99–100
 - contractors, 238
 - costs per kWh, calculating, 23–25
 - data collection, 84
 - equipment, 84
 - installation, 84, 99–100
 - interest, 84
 - net, 84–86
 - off-grid, 276–277
 - refuse, 84
 - solar energy, 14
 - solar homes, 305–306
 - swimming pool solar supplies, 172
 - water heating system, 162
 - wind turbines, 225–226
- county codes, water heating system, 162
- county engineer, 228
- cowling, 202–203
- craftsmanship, contractors, 237
- creating
 - collectors, 177–178
 - convective cooling, 204–205
 - screen retractors, 131
 - solar pool-heating systems, 175–177
- curtains. *See* blinds and drapes

• D •

data collection
 cost, 84
 energy bills, 20–21
 data interpretation, 25–26
 Database of State Incentives for Renewable Energy (DSIRE), 86
 Daum, Kevin
Building Your Own Home For Dummies, 291
 DC-to-AC inverters, 95, 261–262
 debt-to-income ratio, 329
 delta controller, 185
 depreciation, calculating, 22
 designing, solar homes, 18, 295–299
 differential temperature controllers, 160
 digital display, inverter, 262
 diminishing marginal utility, 29
 direct current (DC)
 AC *versus*, 279–280
 DC-to-AC inverters, 95, 261–262
 loads controller, 278
 PV systems, 70
 direct systems, 148
 disconnect switch, 261
 discounts, estimated, 85–86
 DOE. *See* U.S. Department of Energy (DOE)
 do-it-yourself, contracting *versus*, 231–240
 do-it-yourself projects
 awnings, 341
 installing, 101
 landscaping, 340
 off-grid reading lights, 343
 off-grid swimming pool heaters, 341–342
 overhangs, 341
 solar attic vent fans, 340–341
 solar battery chargers, 343
 solar fountains, 343–344
 solar ovens, 342–343
 solar water heaters, 339–340
 solar-powered sprinklers, 344
 trellises, 341
 water heating systems, 161–163
 water purifiers, 342
 dollhouse project, 124
 door seals, fixing, 31–32
 drain valves, 149, 158
 drainage, 295

drainback systems, water heaters,
 181, 189–190
 drapes. *See* blinds and drapes
 drawbacks, solar energy, 14–16
 DSIRE (Database of State Incentives for
 Renewable Energy), 86
 duty cycle, 219, 221, 283

• E •

Economy, Peter
Building Your Own Home For Dummies, 291
 EEM (energy efficient mortgages), 325
 efficiency. *See also* energy efficiency
 battery, 281
 fan, 201–203
 increasing swimming pool, 170–171
 inverter, 262
 electrical, safety, 104–105
 electricity, converting from sunlight, 70
 electronics, energy conservation, 45–46
 elevation, 76
 energy
 audits, 264–265
 bureaucracy, 14–16
 conserving, 40
 prices, 268–269
 production, 15
 renewable *versus* sustainable, 8
 thermal, 67
 energy bills
 allocating energy costs, 21–22
 anomalies, 26–27
 collecting data, 20–21
 sample, 22–26
 energy costs
 allocating, 21–22
 payback, 268–269
 rising, 92
 statistics, 87
 energy efficiency
 air conditioning, 48–49
 appliances, 42–45
 awnings, 53–54
 blinds, 52
 conserving energy, 40
 controlling heating and cooling, 55–56
 doors, 322
 electronics, 45–46

- financing program, 325
 - heating, 48–49
 - hot tubs, 51, 185–186
 - hot water, 46–48
 - lighting, 41–42
 - opening/closing windows and doors, 56–57
 - roofs, 49–50
 - r-value, 51
 - screens, 54–55
 - shades, 54–55
 - swimming pools, 51, 170
 - ventilation, 48–49
 - windows, 49–50
 - energy efficient mortgages (EEMs), 325
 - Energy Grid, The, 86. *See also* off-grid
 - Energy Information Administration, 25, 87
 - energy requirements, calculating, 15, 220
 - ENERGY STAR rating system, 42–43
 - energy usage
 - appliances, 28
 - calculating, 27–29
 - climate, 75
 - environmental benefits, 10–12, 89
 - equipment
 - cost, 84
 - leasing solar, 326
 - mounting, 261
 - overview, 266
 - tips, 103–104
 - establishing, baseline usage, 26
 - evacuated tube collectors, 155–156
 - evaluating, solar potential, 71–82
 - exhaust fans, 204
 - expandibility ports, inverter, 262
- F ●**
- fabric, heat capacity, 69
 - Fannie Mae mortgages, 325
 - fans. *See also* attic vent fans
 - box, 203–204
 - ceiling, 204–208
 - cowling, 202–203
 - efficiency, 201–203
 - exhaust, 204
 - operation, 201–203
 - oscillating, 203
 - as solar project, 95, 140
 - tabletop, 207–208
 - thermostats, 203
 - vent, 207, 211–212, 245–246
 - whole house, 206–207
 - window, 204
 - Farmer Mac mortgages, 325
 - Federal Home Mortgage Loan Corporation (Freddie Mac), 325
 - Federal National Mortgage Association (Fannie Mae), 325
 - fees, 84
 - filters
 - changing, 34–35
 - overview, 64–65
 - financial incentives, 9–10, 269
 - financing
 - alternative, 326–327
 - banks, 327–329
 - loans, 323–326
 - overview, 323
 - solar investments, 323–329
 - Find Solar, 86
 - fixing
 - attics, 34
 - door seals, 31–32
 - leaks, 29–33
 - window seals, 32
 - flashlights project, 124–125, 348
 - flat-plate solar collectors, 153–155
 - floors, materials, 299
 - flow meters, 158
 - fluid, 68
 - fluorescents, 41–42
 - fog (frequent), 72
 - footprint, carbon, 10–12
 - fountains. *See* solar fountains
 - Freddie Mac mortgages, 325
 - freeze damage, avoiding, 149
 - frequency, 61–62
 - Frowine, Steve
 - Gardening For Dummies*, 101
 - full-scale PV system. *See* PV systems
 - fuse box connections, 262
 - fuse size, specifications, 221–222

• G •

gains, estimated, 85–86
 garage, 298
Gardening For Dummies (Frowine and the National Gardening Association), 101
 gas, carbon emissions, 11
 gauges, pressure, 158
 government agencies, water rights, 228
 greenhouse effect, 65, 244
 greenhouses
 defined, 241
 overview, 18, 242–243
 projects overview, 246
 grid. *See* off-grid

• H •

habits, changing, 41–51
 hardware, PV systems, 263–264
 hat fans, 123, 348
 head pressure, 174, 217
 heat
 capacity of materials, 69
 converting from sunlight, 67–69
 distribution systems, 250
 overview, 67
 transfer modes, 67–68
 heat collectors, 68–69
 heating. *See also* swimming pool heaters,
 solar
 controlling, 55–56
 energy conservation, 48–49
 inspection, 32–33
 hedging
 defined, 83
 overview, 254–255
 high thermal conductivity, 68
 hiring, contractor, 235–240
 home
 appreciation, 10, 93
 basic building rules, 292
 energy ratings, 325
 solar office, 95
 Home Energy Saver, 37

home equity loans
 financing solar investments, 93–94
 overview, 324
 tax-deductible, 321
 hood awnings, 54
 hot tubs, 51, 185–186
 hot water, conservation habits, 46–47. *See also* water heaters
 household energy efficiency
 auditing, 29–37
 energy bills, 20–27
 energy usage, 27–29
 HUD (U.S. Department of Housing and Urban Development), 326
 HVAC systems, servicing, 35
 hydro power
 advantages, 226–227
 disadvantages, 227
 measurements, 227
 overview, 223, 226

• I •

icons, book, 4
 ICS. *See* integral collector storage (ICS)
 incandescents, 41
 incident, 65
 indirect systems, 148
 infrared light, 62
 installing
 awnings, 341
 closed-loop antifreeze systems, 190–192
 costs, 84, 99–100
 do-it-yourself projects, 101
 drainback systems, 189–190
 equipment tips, 103–104
 ICS systems, 186–188
 overhangs, 341
 photosynthesis, 101
 PV systems, 97, 264–267, 334
 recommended investments, 102–103
 safety, 104–106
 solar attic vent fans, 102, 208–212, 338,
 340–341
 solar light tubes, 138–140

solar water heaters, 335–336, 339–340
 solar-powered sprinklers, 344
 swimming pool covers, 335
 swimming pool heaters, 174–175,
 334–335, 341–342
 trellises, 341
 tubular skylights, 138–140
 water heaters, 97
 water purifiers, 342
 insulation
 auditing, 33–34
 window, 34
 insurance
 lifestyle, 255
 water heating system, 162
 intangibles, 89, 255
 integral collector storage (ICS)
 collectors, for pools, 150–152, 154
 comparing water heating systems, 183
 installing bath system, 186–188
 overview, 180–181
 interest, cost, 84
 interior blinds, 102
 Internet. *See* Web sites
 inertia
 defined, 96
 net metering, 256–259
 overview, 102, 255–256
 PV systems, 104, 253
 system utilization, 257
 variable rate structure, 273–274
 interviewing, contractors, 238
 inverters
 DC-to-AC, 95, 261–262
 efficiency, 262
 overview, 259–260, 262, 278
 investments
 financing with home equity loan, 93–94
 full-scale PV system, 96
 overview, 265
 recommended, 102–103

• K •

kerosene, carbon emissions, 11

• L •

lamps, 137–138, 348
 landscaping
 lighting, 42, 345–346
 overview, 102, 340
 projects, 109–121
 solar investment, 333–334
 lattices, project, 120–121
 laundry, energy conservation, 46
 leaks, auditing, 29–33
 leasing, solar equipment, 326
 legal rights, solar power, 13
 lifestyle insurance, 255
 lifetime, battery, 282
 light tubes, 103, 138–140
 light(ing)
 adjusting, 35
 atmospheric, 65–67
 conserving energy, 41–42
 infrared, 62
 interaction, 64–65
 landscape, 42, 336, 345–346
 off-grid reading, 343
 overview, 61–63
 ultraviolet, 62
 lights project, 116–117, 336
 liquid propane, carbon emissions, 11
 living space, increasing, 337–338
 loans
 overview, 323–324
 types, 324
 loan-to-value ratio, 311, 329
 local climate, 269
 location, solar home, 292–295

• M •

maintenance
 battery, 282
 cost, 84
 off-grid, 276–277
 manual systems, solar pool covers, 169

materials
 floors, 299
 roofing, 300–301
 windows, 299

maximum instantaneous load, calculating, 221

meters. *See also* net metering
 flow, 158
 power, 263
 thermometers, 159

mistakes, solar, 349–352

mitigation, pollution, 254, 268

mixing valves, 158–159

mobile locations, powering, 222

modes, heat transfer, 67–68

monitoring functions, inverter, 262

monitors, solar water heater system, 158–159

mortgage options, 325–326

motorized valves, 159

motors, directly powering, 216–219

mounting
 collectors, 81–82
 considerations, 270
 equipment, 261
 Murphy's Law, 352

• N •

National Association of Energy Service Companies (NAESCO), 37

National Association of Real Estate Appraisers (NAREA), 10

National Climatic Data Center (NCDC), 75

National Gardening Association
Gardening For Dummies, 101

National Renewable Energy Laboratory (NREL), 75

natural gas, carbon emissions, 11

natural ventilation. *See also* ventilation
 chimney effect, 198–199
 enhancing, 201–207
 optimizing air movements, 199–200
 overview, 195–196
 prevailing winds, 196–198
 seasonal variations, 200–201

NCDC (National Climatic Data Center), 75

net costs, calculating, 84–86

net metering
 intertie, 256–259
 overview, 321
 time-of-use (TOU) rate scheduling, 258–259, 263

net total, 273

novelties, solar, 123–126

NREL (National Renewable Energy Laboratory), 75

• O •

obtaining, bids, 236

off-grid
 batteries, 280–283
 costs, 276–277
 defined, 275
 disadvantages, 350
 energy consumption calculations, 284–286
 living overview, 18
 maintenance, 276–277
 overview, 275–276
 pollution, 277–278
 pricing systems, 283
 projects, 137–140
 real-life scenario, 284–287
 solar options, 278–280
 system components, 286–287

oil, carbon emissions, 11

on-demand water heaters, 48

online calculations, 86

open-loop flooded systems, 182

operating schedules, optimizing, 55–57

optimizing
 air movements, 199–200
 operating schedules, 55–57

organization, book, 2–4

orientation, solar home, 292–295

oscillating fans, 203

ovens. *See* solar ovens

overhangs
 installing, 341
 project, 120–121
 solar investment, 337

ozone, 65

• **p** •

- passing, code, 234–235
- passive methods, natural ventilation, 195
- passive systems, 159
- payback
 - calculating, 87–88
 - defined, 87
 - energy prices, 268–269
 - financial incentives, 269
 - income taxes, 89
 - local climate, 269
 - mounting, 270
 - overview, 267–268
 - period, 9
 - pollution mitigation, 268
 - utility rates, 268–274
- paying, contractors, 239
- peak instantaneous power output,
 - calculating, 219
- performing, energy audits, 264–265
- permits, 84. *See also* codes
- photons, 61
- photosynthesis, 101
- photovoltaic cells (PV cells), 70. *See also*
 - PV systems
- pipes
 - energy conservation, 48
 - pipe unions, 158
 - solar water heater system, 157
 - tips, 157
- planting trees, project, 117–120
- plastic, heat capacity, 69
- plumbing, safety, 104–105
- pollution
 - carbon dioxide, 278
 - mitigation, 254, 268
 - off-grid, 277–278
 - overview, 91
- pools. *See* swimming pools
- portable showers, 124, 346
- power meters, utility, 263
- power needs, assessing, 219–222
- power use, statistics, 8
- powering
 - ceiling fans, 207–208
 - mobile locations, 222
 - motors, 216–219
 - pumps, 216–219
 - remote locations, 222
 - swimming pool pump systems, 218–219
 - tabletop fans, 207–208
 - water supply systems, 216–218
- practical test conditions (PTC), 264
- pressure
 - back, 218
 - gauges, 158
 - head, 174, 217
 - test, 30–31
- prevailing winds, natural ventilation,
 - 196–198, 295
- pricing, off-grid systems, 283
- professional auditing, 36–37
- projects. *See* solar projects
- propane, 11
- property tax, 320
- PTC (practical test conditions), 264
- pumps
 - directly powering, 216–219
 - solar water heater systems, 159
 - specifications, 217–218
- purifiers, water, 164–165, 342
- PV cells (photovoltaic cells), 70. *See also*
 - PV systems
- PV modules, 259
- PV panels, 260–261
- PV systems
 - battery operated, 219
 - benefits, 254–255
 - components, 259–263
 - full-scale, 96–97
 - hardware, 263–264
 - installing, 97, 264–267, 334
 - off-grid, 278–280
 - payback, 267–268
 - photovoltaic cells (PV cells), 70
 - standalone, 253
 - types, 253

• **R** •

- radiant barriers, project, 132–133
- radiant heat floor systems, 192–194
- radiation, 68
- radiation (sun), reactions with matter, 63–67
- rate structures
 - Northern California, 272
 - overview, 270
 - time-of-use (TOU), 87, 96, 271–273
 - types, 271–273

- reading lamp, project, 137–138
 - Real Goods, batteries, 281
 - rebates, 318–319
 - recirculation
 - defined, 149
 - systems, 182
 - reflection, 64
 - refrigerators, energy conservation, 44–45
 - refuse, cost, 84
 - regulations. *See* codes
 - reliability
 - PV system, 263
 - solar power, 14–15
 - relief valves, 158
 - remote locations, powering, 222
 - remote ownership plans, 327
 - renewable, forms of energy, 8
 - researching
 - projects, 231–232
 - subsidies, 322
 - Residential Energy Services Network (RESNET), 325
 - retractable shades, 54–55
 - risk
 - analyzing, 88
 - battery, 282–283
 - profile, 83–84
 - roof exposure, 297
 - roofing materials, 300–301
 - Rule of 72, 91
 - RV appliances, project, 137
 - r-value, 51
- S •**
- safety
 - electrical, 104–105
 - installation, 104–106
 - inverter features, 262
 - plumbing, 104–105
 - water heater system risks, 162
 - salvage, 85
 - savings, calculating, 86–87
 - scattering, 64
 - scenarios
 - energy costs, 92
 - home equity loans, 93–94
 - home office, 95
 - home value, 93
 - investments, 90–91
 - off-grid home, 284–287
 - pollution, 91
 - PV system, 96–97
 - solar fan, 95
 - swimming pool, 94–95
 - tiered rate structures, 92–93
 - water heater, 90, 94, 97
 - screen retractor, creating manual, 130–132
 - screens
 - creating manual retractor, 130–132
 - energy efficiency, 54–55
 - sunscreens, 102, 129–131, 346
 - seasonal rate structure, 271
 - seasonal variations, natural ventilation, 200–201
 - security system, projects, 133–135
 - selling, solar homes, 313–314
 - semiconductor, 70
 - servicing, HVAC systems, 35
 - shade cloth, 54
 - shades, energy conservation, 54–55
 - showers (portable), 124, 346
 - simple rate structure, 271
 - size, project, 16–18
 - skylights, 103, 138–140
 - skyline, 76
 - small-scale PV systems, project, 136–137
 - smog, 72
 - snowfall, 72
 - solar car project, 124
 - solar equipment, leasing, 326
 - solar fountains
 - building, 343–344
 - overview, 101, 347
 - pond, 124
 - project, 109–116, 124
 - solar home
 - appliances, 300
 - basic home building rules, 292
 - building codes, 293–294
 - building process, 291–301
 - buying, 304–312
 - construction process, 301
 - designing, 18, 295–299
 - determining value, 311–312
 - location, 292–295
 - materials, 299–301
 - orientation, 292–295
 - selling, 313–314
 - utilities, 300

- solar investments
 - analyzing, 83–89
 - financing, 93–94, 323–326
 - increasing living space, 337–338
 - landscaping, 333–334
 - overhangs, 337
 - PV systems, 334
 - real-life scenarios, 89–97
 - solar attic vent fan, 338
 - solar water heaters, 335–336
 - swimming pool cover, 335
 - swimming pool heater, 334–335
 - window blinds, 336–337
 - yard lighting, 336
- solar ovens
 - building, 342–343
 - cooking, 44, 101, 348
 - project, 141–145
- solar panel
 - output specifications, 221
 - safety, 105
- solar pool covers
 - automatic systems, 169
 - disadvantages, 350
 - manual systems, 169
 - project, 167–169
- solar pool heaters. *See* swimming pool heaters, solar
- solar potential
 - collector cross sections, 79–81
 - evaluating, 71–82
 - plotting sun charts, 75–79
 - solar home, 294–295
- solar power
 - environmental benefits, 10–12
 - financial benefits, 9–10
 - legal rights, 13
 - unlimited supply, 12
 - versatility, 13–14
 - water, 226–228
 - wind, 223–226
- solar projects
 - awnings, 120–121
 - battery power, 135–136
 - blinds and drapes, 128–129
 - budget considerations, 99–100
 - christmas lights, 125–126
 - do-it-yourself, 101
 - greenhouses, 246
 - landscaping, 109–121
 - lattices, 120–121
 - manual screen retractor, 130–132
 - off-grid, 137–140
 - overhangs, 120–121
 - portable showers, 124
 - radiant barriers, 132–133
 - reading lamp, 137–138
 - researching, 231–232
 - RV appliances, 137
 - security systems, 133–135
 - size, 16–18
 - small-scale PV systems, 136–137
 - solar fans, 140
 - solar flashlights, 124–125, 348
 - solar fountain, 109–116, 124
 - solar light tubes, 138–140
 - solar lights, 116–117
 - solar novelties, 123–126
 - solar oven, 141–145
 - solar space heater, 212–213
 - solar yard machinery, 125
 - subsidizing, 317–322
 - sunrooms, 246
 - sunscreen, 129–132
 - swimming pool, 125, 167–177
 - tubular skylights, 138–140
 - water purifier systems, 164–165
 - windows coverings overview, 126–128
- solar rooms
 - aesthetics, 251–252
 - anatomy, 247–252
 - overview, 241
 - types, 242–243
- solar systems, 15–18. *See also specific topics*
- solar water heaters, 101, 335–336, 339–340
- solar-powered sprinklers, installing, 344
- specifications
 - battery size, 221
 - fuse size, 221–222
 - pumps, 217–218
 - solar panel output, 221
 - swimming pool pump, 219
 - voltage output, 221
- spinning prism, project, 124
- standalone PV system, 253
- standard test conditions (STC), 264
- statistics
 - Department of Energy (DOE), 27
 - energy costs, 87
 - power use, 8

- STC (standard test conditions), 264
 - steel, heat capacity, 69
 - subsidies
 - defined, 318
 - home-operated business incentives, 320–321
 - net metering, 321
 - overview, 254, 317–318
 - property tax, 320
 - rebates, 318–319
 - researching, 322
 - tax credits, 320
 - tax-deductible home equity loans, 321
 - subsidizing, solar projects, 317–322
 - sun, 62
 - sun charts
 - adding skyline effects, 76–78
 - basic path of the sun, 76
 - defined, 75
 - plotting, 75–79
 - sunlight intensity, 78–79
 - sun tea, 347
 - sunlight
 - calculating, 220
 - climate, 72
 - collecting, 149–156
 - converting into electricity, 70
 - converting into heat, 67–69
 - intensity, 78–79
 - sunrooms, 241, 243, 246
 - sunscreens, 102, 129–131, 346
 - supplementing, water heaters, 179–194
 - supplier loans, 324
 - supply, solar power, 12
 - sustainable forms of energy, 8
 - swimming pool covers
 - automatic systems, 169
 - disadvantages, 350
 - manual systems, 169
 - project, 167–169
 - swimming pool heaters, solar
 - creating, 175–177
 - installing, 174–175, 334–335, 341–342
 - overview, 94–95
 - swimming pools
 - energy conservation, 51
 - increasing efficiency, 170–171
 - installing covers, 335
 - lights project, 125
 - powering pump systems, 218–219
 - pump specifications, 219
 - solar pool covers, 167–169, 350
 - solar pros and cons, 169–170
 - starter system, 171–173
 - swing valves, 158
 - system output, 269
 - system utilization, intermittency, 257
- T •**
- tabletop fans, powering, 207–208
 - taxes
 - as cost, 84
 - credits, 320
 - incentives, 162
 - property, 320
 - tea, brewed in the sun, 347
 - temperature, 72
 - tempering valves, 158–159
 - test, pressure, 30–31
 - thermal energy, 67
 - thermometers, 159
 - thermosiphon, 68, 159, 182
 - thermostats
 - fans, 203
 - programming, 56
 - Third World countries, 150, 164, 182
 - tiered rate structures, 92–93, 271
 - time-of-use (TOU)
 - billing system, 26
 - net metering rewards, 258–259, 263
 - rate structure, 87, 96, 271–273
 - tips
 - equipment, 103–104
 - lighting energy conservation, 41–42
 - pipes, 157
 - solar light tube, 138–140
 - water heating systems, 184–185
 - total system capacity, calculating, 219
 - TOU. *See* time-of-use (TOU)
 - transfer switch, 279
 - transmission, 64
 - transparent cover, 247
 - trees, planting project, 117–120
 - trellises, installing, 341
 - tubes, solar light, 138–140
 - tubular skylights, 103, 138–140
 - turbines, wind, 223–225

• U •

ultraviolet light, 62
 upkeep, solar energy, 16
 U.S. Army Corps of Engineers, 228
 U.S. Department of Agriculture (USDA),
 228, 325
 U.S. Department of Energy (DOE)
 Consumer Guide, 32
 guide to energy efficiency, 39
 mortgage option, 326
 statistics, 27
 U.S. Department of Housing and Urban
 Development (HUD), 326
 U.S. Department of Veterans Affairs (VA), 326
 U.S. Geological Survey, 228
 USDA (U.S. Department of Agriculture),
 228, 325
 utilities, 300
 utility
 company overview, 266–267
 diminishing marginal, 29
 power meters overview, 263
 rates, 268–273
 utilization, 310

• V •

VA (U.S. Department of Veterans Affairs), 326
 vacuum breakers, 159
 vacuuming, energy conservation, 46
 value, solar home, 311–312
 valves
 ball, 158
 check, 158
 drain, 149, 158
 mixing, 158–159
 relief, 158
 solar water heater system, 158–159
 swing, 158
 tempering, 158–159
 variable rate structure, inertia systems,
 273–274
 Venetian awning, 53
 vent fans, 207, 211–212, 245–246. *See also*
 attic vent fans

ventilation, 300–301. *See also* natural
 ventilation
 ceiling fans, 207–208
 energy conservation, 48–49
 fan efficiency, 201–203
 fan operation, 201–203
 fan types, 203–207
 inspection, 32–33
 natural, 195–201
 rules, 200
 solar attic vent fan, 208–212
 solar space heater, 212–213
 tabletop fans, 207–208
 voltage output, specifications, 221

• W •

warranties, water heater system, 162
 water
 drainage, 295
 heat capacity, 69
 rights, 228, 295
 solar power, 223–228
 supply systems, 216–218
 wall, 248
 water heaters
 energy conservation, 48
 hot water supply, 180
 installing, 97
 on-demand, 48
 replacing, 94
 safety, 106
 solar, 101, 335–336, 339–340
 supplementing, 90, 179–194
 water heating systems
 closed-loop antifreeze system
 installation, 190–192
 components, 148–156
 concerns, 160–161
 considerations, 160–161
 controllers, 159–160
 cost, 351
 do-it-yourself, 162–163
 drainback systems, 181, 189–190
 hot tubs, 51, 185–186
 ICS system installation, 186–188
 insurance, 162

- water heating systems (*continued*)
 - overview, 147–148
 - pipes, 157
 - pumps and thermosiphons, 159
 - radiant heat floor systems, 192–194
 - risks, 162
 - solar collectors, 149–156
 - solar water heaters, 101, 335–336, 339–340
 - supplementing, 179–194
 - system types, 180–183
 - tips, 184–185
 - valves and monitors, 158–159
 - warranties, 162
 - water power. *See* hydro power
 - water purifiers, 164–165, 342
 - wavelength, 61–62
 - weather concerns, 160, 182–183
 - Web sites
 - Army Corps of Engineers, 228
 - Clean Power Estimator, 86
 - Database of State Incentives for Renewable Energy (DSIRE), 86
 - Department of Agriculture (USDA), 228, 325
 - Department of Energy (DOE), 32, 39, 326
 - Department of Housing and Urban Development (HUD), 326
 - Department of Veterans Affairs (VA), 326
 - Energy Grid, The, 86
 - Energy Information Administration, 25
 - ENERGY STAR, 42
 - Federal Home Mortgage Loan Corporation, 325
 - Federal National Mortgage Association, 325
 - Find Solar, 86
 - Home Energy Saver, 37
 - National Association of Energy Service Companies (NAESCO), 37
 - National Climatic Data Center, 75
 - National Renewable Energy Laboratory, 75
 - Real Goods, 281
 - Residential Energy Services Network (RESNET), 325
 - U.S. Geological Survey, 228
 - white night, 80
 - whole house fans, 206–207
 - wind
 - climate, 72
 - solar power, 223–226
 - wind turbines, 223–225
 - window coverings
 - choosing locations, 126–127
 - energy conservation, 52
 - indoors (interior), 102, 128
 - options, 52, 127–129, 336–337
 - outdoor (exterior), 129
 - overview, 102
 - project, 128–129
 - as solar investments, 336–337
 - windows
 - energy conservation, 49–50
 - fans, 204
 - insulation, 34
 - materials, 299
 - seals, 32
 - solar home, 298
 - wiring, 262
 - wood
 - carbon emissions, 11
 - heat capacity, 69
 - wool, heat capacity, 69
- ♪ •
- yard machinery, project, 125