

Index

A

Amorphous silicon, 4, 70, 73, 82, 88, 113, 114, 138

B

Balance-of-System (BOS), 72, 143, 146

C

Copper Indium Gallium Selenide (CIGS), 4, 70, 74, 75, 94, 113, 132, 138

Copper Zinc Tin Sulde (CZTS), 4, 88, 113, 114, 140

Cost structure

hybrid photovoltaic-thermoelectric generators, 146, 149

photovoltaic cells, 143, 144

thermoelectric generators, 143

D

Domenicali equation, 23

Dye Sensitized Solar Cells (DSSC), 7, 77, 83, 84, 104, 105, 138

E

Economic issues

system scaling, 132

Economic sustainability, 140, 145

Endoreversible heat engine, 11, 12, 37, 38

Curzon–Ahlborn efficiency of, 37, 38

Van den Broeck efficiency of, 38

Exoreversible heat engine

Schmiedl–Seiffert efficiency of, 38

F

Fixed costs, 6, 146

H

Heat dissipater, 52, 54, 147

Heat Mirrors (HMs), 93, 114, 139, 149

Hybrid photovoltaic-thermoelectric generators

dye-sensitized, 104, 105

efficiency, 11, 17, 18, 27, 30, 40, 41, 113, 139, 146

fully hybridized, 91, 99–101

materials, 103

multi-junction concentrated, 113

non-silicon-based, 113

perovskite-based, 110

polymer-based, 107

polysilicon-based, 111

technological challenges, 137, 140

thermally hybridized, 104

Hybridization figure of merit, 147

I

Investment costs, 2

O

Onsager relations, 15

Optical collector, 45, 50, 52, 91, 92

Optical concentration, 46, 50, 52, 55, 56, 92, 95–97, 112, 113, 118, 123, 146

Opto-thermal converters, 92

P

Pay-back period, 145, 149

Peltier effect, 12
 Perovskites, 80, 86, 111, 113, 138
 Photon management, 94, 111, 112, 118, 119, 143, 146
 Photothermally activated pyroelectrics, 109
 Photovoltaic cells
 conjugated polymer-based, 85
 current-voltage characteristics, 65
 first-generation, 71
 multiple-junction, 70, 75
 perovskite-based, 88
 second-generation, 70, 73, 137
 silicon-based, 73, 137
 single-junction, 70, 74
 Photovoltaic efficiency, 6, 95, 96, 98, 103, 112–114, 119, 140, 146
 temperature dependence, 98
 Photovoltaic filling factor, 99, 104
 Power cost, 1, 141, 143, 145
 Power factor, 21, 34, 57
 Profitability, 146–149

Q

Quantum Dot Sensitized Solar Cells (QDSS-Cs), 78, 84

S

Seebeck effect, 105

Solar spectrum, 64, 69, 91, 93, 94, 104, 112, 115, 117, 118, 120, 131, 134, 135
 Solar thermoelectric generators, 7, 45
 efficiency of, 52, 57, 58

T

Tandem solar cells, 123
 Thermal collector, 45, 50, 53, 91, 92
 Thermal storage, 117, 118, 123, 126, 127, 135
 Thermoelectric compatibility, 30, 31, 41
 Thermoelectric efficiency, 30, 41, 47
 constant-Property Limit, 17
 Dirichlet boundary conditions, 17
 finite-rate, 36
 Neumann boundary conditions, 17
 non-steady state conditions, 40
 Thermoelectric figure of merit, 12, 17, 34, 57
 engineering, 34, 35, 41
 Thermoelectric filling factor, 56
 Thermoelectric potential, 32, 115
 Thermophotovoltaic generation, 132, 134
 Thermophotovoltaic integrated systems, 132
 Thomson effect, 17, 35, 40
 Triple co-generation, 7, 117–119
 efficiency, 127