

Main Components of a 100% Wind- Water-Solar System to Power the World for All Purposes

WWS Generation

WWS electricity generation

Onshore/offshore wind
Rooftop/utility PV
CSP
Geothermal electricity
Hydro
Tidal & wave

WWS heat generation

Solar thermal/CSP steam
Geothermal heat

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WWS Grid/Storage

Transmission/distribution (T&D)

HVAC/AC T&D
Extra-long distance HVDC
Grid management
Software/demand response

Electricity storage

Batteries
CSP storage
Pumped hydropower storage
Hydropower reservoirs
Flywheels, CAES, grav. storage

District heating storage

Water tank heat storage
Pit/borehole/aquifer heat storage

District cooling storage

Water tank/ice cold storage
Aquifer cold storage

Building heat storage

Water tank storage
Thermal mass

Hydrogen storage

Hydrogen storage tanks

Building/district air+water heating
Solar thermal/geothermal heat
Electric heat pumps. Heat source:
Air/ground/water/waste heat

Building/district cooling

Electric heat pumps. Cold source:
Air/ground/water/waste cold

Industrial heat

Arc/induction furnaces
Resistance/dielectric heaters
Electron beam heaters
Heat pumps/CSP steam

Hydrogen generation **WWS Use**

Electrolyzers

Transportation vehicles

Battery-electric (BE)
Hydrogen fuel cell-BE hybrids

Some appliances/machines

Induction cooktops
Electric leafblowers/lawnmowers

Efficiency/reduce energy use

Insulate/weatherize buildings
LED lights/efficient appliances
Telecommute/improve public transit