## CLAIMS

1. A solar system comprising a light receiving surface exposed to ambient air, a condensation subassembly, a water collection subassembly, and a cleaning subassembly, characterised in that:

the condensation subassembly comprises a compressed air expansion valve coupled to an expansion chamber;

the expansion chamber of the condensation subassembly is thermally coupled to the light receiving surface and thermally insulated from the ambient such that expansion of compressed air in the expansion chamber, as controlled by the compressed air expansion valve, encourages humidity condensation on the light receiving surface by reducing the temperature of the light receiving surface;

the water collection subassembly comprises a water collection vessel and water direction hardware positioned to direct condensed water on the light receiving surface to the water collection vessel;

the cleaning subassembly comprises a water dispensing unit fluidly coupled to the water collection vessel via a cleaning fluid duct; and

the water dispensing unit is positioned to dispense water from the water collection vessel over the light receiving surface of the solar system.

2. The solar system as claimed in claim 1 wherein the light receiving surface comprises a reflective face of a solar reflector module and the expansion chamber of the condensation subassembly is thermally coupled to a backside of the solar reflector module.

3. The solar system as claimed in claim 1 wherein the light receiving surface comprises an input face of a photovoltaic module and the expansion chamber of the condensation subassembly (20) is thermally coupled to a backside of the photovoltaic module.

4. The solar system as claimed in claim 3 wherein

the solar system further comprises a compressed air supply coupled to the compressed air expansion valve of the condensation subassembly; and

the photovoltaic module is configured to dedicate a portion of its photovoltaic output to the compressed air supply.

5. The solar system as claimed in claim 1 wherein the solar system further comprises a compressed air supply coupled to the compressed air expansion valve of the condensation subassembly; preferably wherein:

the compressed air supply comprises a water trap positioned to dehumidify compressed air from the compressed air supply; and

the water trap is placed in fluid communication with the water collection vessel of the water collection subassembly via a supplemental water collection valve.

6. The solar system as claimed in claim 1 wherein:

the light receiving surface comprises an input face of a photovoltaic or solar reflector module; and

one side of the expansion chamber of the condensation subassembly is thermally coupled to a backside of the module via a high thermal conductivity material; and preferably wherein an opposite side of the expansion chamber of the condensation subassembly carries a layer of thermally insulating material.

7. The solar system as claimed in claim 1 wherein the water dispensing unit of the cleaning subassembly terminates in one or more water spray nozzles directed at the light collection surface and comprises one or more cleaning accessories; and preferably wherein the cleaning subassembly comprises a water diversion valve positioned to selectively divert waste water from, or direct filtered wastewater to, the water collection vessel.

8. The solar system as claimed in claim 1 wherein:

the light receiving surface comprises an input face of a photovoltaic module;

the solar system comprises a photovoltaic module power monitor and a process controller; and

the process controller is programmed to control activation of the cleaning subassembly as a function of power generated by the photovoltaic module, as sensed by the power monitor.

9. The solar system as claimed in claim 1 wherein:

the solar system comprises a compressed air supply and a process controller;

the compressed air supply is coupled to the compressed air expansion valve of the condensation subassembly; and

the process controller is programmed to control activation of the cleaning subassembly as a function of air pressure in the compressed air supply.

10. The solar system as claimed in claim 1 wherein:

the solar system comprises one or more ambient sensors, a compressed air supply, and a process controller;

the compressed air supply is coupled to the compressed air expansion valve of the condensation subassembly; and

the process controller is programmed to control activation conditions of the water collection subassembly as a function of ambient sensor output by controlling the release of compressed air from the compressed air supply through the compressed air expansion valve;

the activation conditions comprise release duration, pressure drop, or a combination thereof.

11. A method of operating a solar system comprising a light receiving surface, a condensation subassembly, a water collection subassembly, a cleaning subassembly, one or more ambient sensors, a compressed air supply, and a process controller, wherein the method comprises:

receiving light at the light receiving surface of the solar system, wherein the light receiving surface is exposed to ambient air and the condensation subassembly comprises an expansion chamber that is thermally coupled to the light receiving surface and thermally insulated from the ambient air;

controlling a compressed air expansion valve to release compressed air from the compressed air supply into the expansion chamber of the condensation subassembly to thermally cool at least a portion of the light receiving surface below a dew point temperature of the ambient air to condense water from humidity in the ambient air on the light receiving surface by indirectly thermally cooling the light receiving surface via the thermal coupling of the light receiving surface and the expansion chamber of the condensation subassembly;

collecting the water from the light receiving surface into a water collection vessel of the water collection subassembly via water direction hardware positioned to direct the condensed water on the light receiving surface to the water collection vessel;

dispensing the collected water from the water collection vessel via a cleaning fluid duct of the cleaning subassembly over the light receiving surface via a water dispensing unit of the cleaning subassembly; and

controlling the release of the compressed air from the compressed air supply through the compressed air expansion valve as a function of at least one of a temperature condition, a humidity condition, and a wind speed condition of the ambient air based on an output of the one or more ambient sensors.

12. The method of claim 11 further comprising:

measuring a photovoltaic system performance level of a photovoltaic module on an input face of the light receiving surface using a photovoltaic module power monitor;

measuring a system performance degradation; and

determining a frequency, duration, or time-of-day for activation of the cleaning subassembly based on the photovoltaic system performance level and system performance degradation measurements.

13. The method of claim 11 wherein:

the solar system comprises the one or more ambient sensors, the compressed air supply, and the process controller;

the compressed air supply is coupled to the compressed air expansion valve of the condensation subassembly; and

the process controller controls the release of compressed air from the compressed air supply through the compressed air expansion valve by measuring activation conditions that comprise release duration, pressure drop, or a combination thereof, such that the release of compressed air is sufficient to lower the air temperature inside the expansion chamber and the surface temperature of the light receiving surface below the dew point temperature of the ambient air causing condensation to form on the light receiving surface.

14. The method of claim 11 further comprising operating the solar system by controlling activation conditions of the water collection subassembly as a function of air pressure in the compressed air supply and ambient sensor output and by the steps of controlling the release of compressed air from the compressed air supply through the compressed air expansion valve, wherein compressed air is not released from the compressed air supply until the water dispensing unit of the cleaning subassembly has cleaned the light receiving surface and the air pressure of the compressed air supply is sufficient to activate the condensation subassembly.

15. The method of claim 11 further comprising:

measuring the temperature, humidity, or wind speed using the one or more ambient sensors; and

determining a frequency, duration, or time-of-day for activation of the cleaning subassembly based on the measurements of the one or more ambient sensors.