Power Supply System for Weather Monitoring Unit

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Problem Statement

- The New York State Department of Environmental Conservation needs a distributed weather network across New York State so that the impact of climate change on microclimates can be better understood.

System Requirements

- **Power Management:** The power subsystem should manage and distribute power to meet demand levels efficiently, making sure that the supply is stable and reliable without overloading the other subsystems.
- **Energy Storage:** Our power subsystem is going to store the excess energy from the solar panel in a battery for later use and to charge the battery. The excess energy can also be used as backup power when the solar panel isn't producing energy.
- **Reliability:** Power system must minimize downtime and ensure that the rest of the weathering system will operate, even during harsh weather or home power outage.
- **Efficiency:** The power subsystem should work with high efficiency, lowering energy loss and optimizing power usage.
- **Availability:** Power system should minimize downtime, maintain high availability, and ensures that the weathering system is always operational when active
- **Compatibility:** Power system should be compatible with the components of the other subsystems and a wide range of sensors

System Design

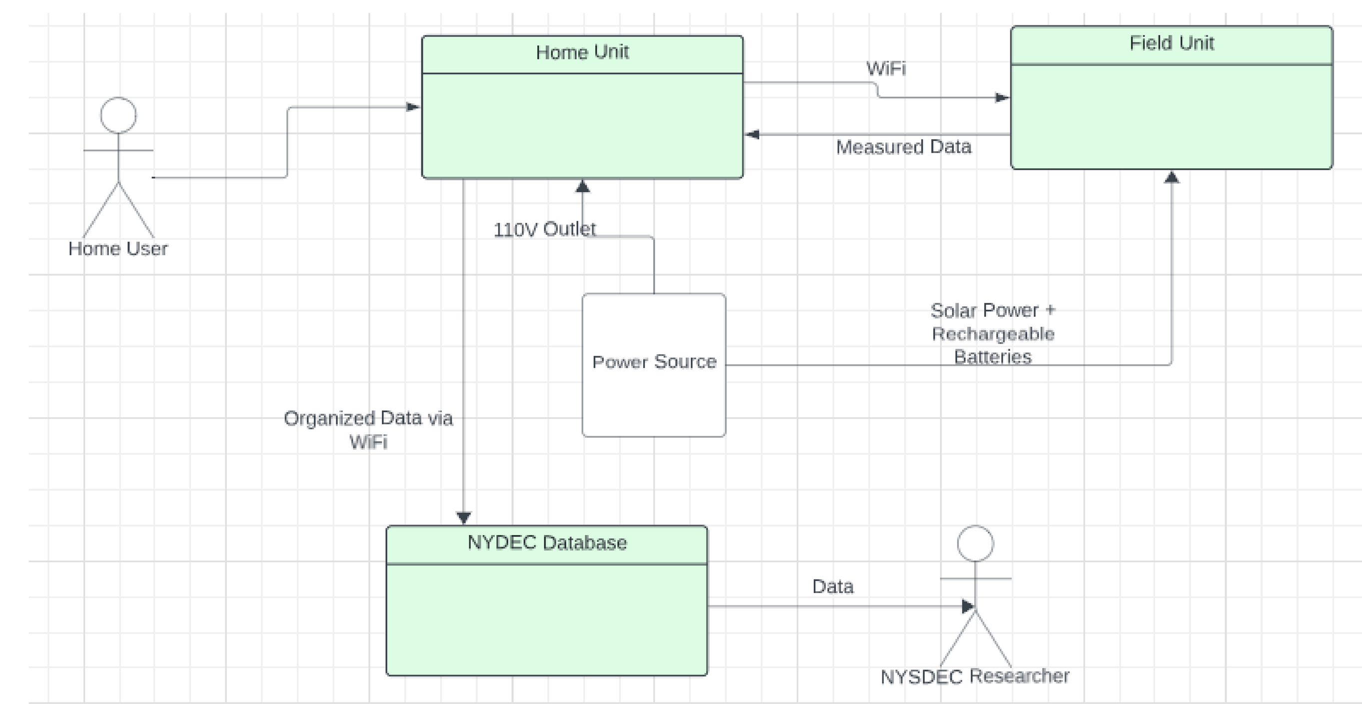

Fig 1. Weather Monitoring System

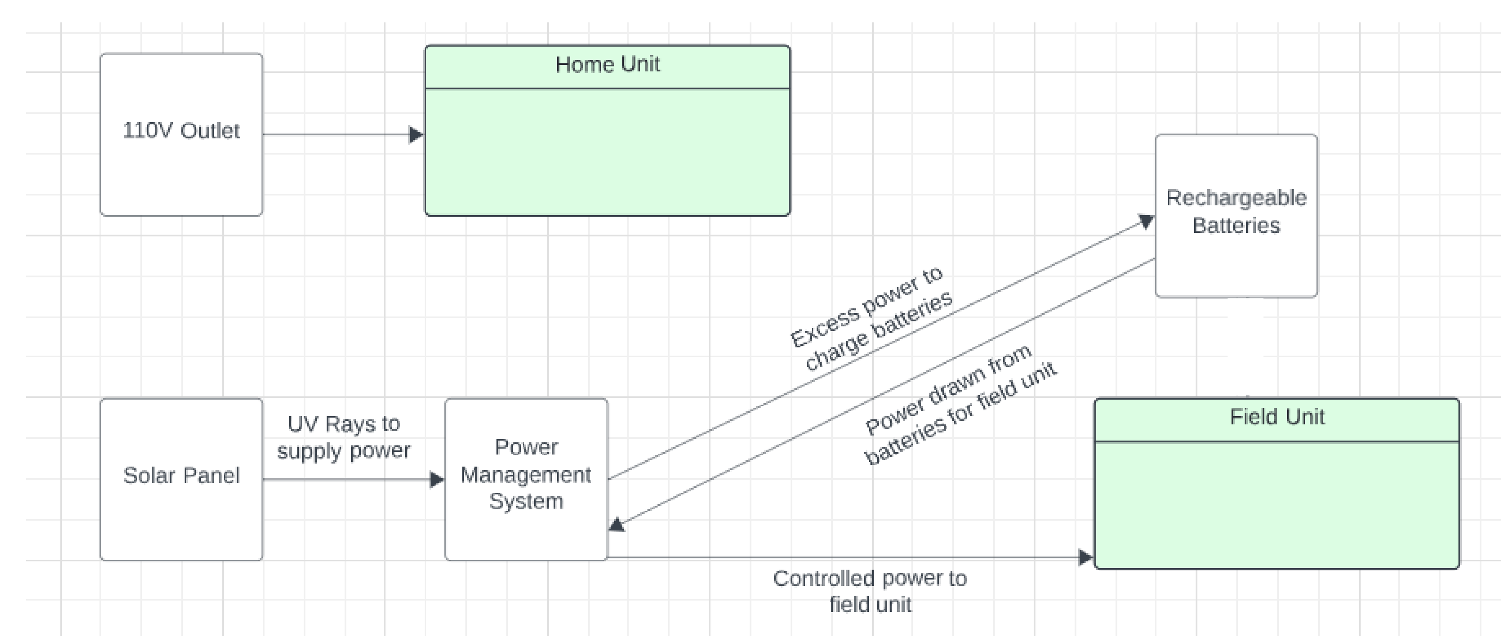

Fig 2. Power Subsystem Design

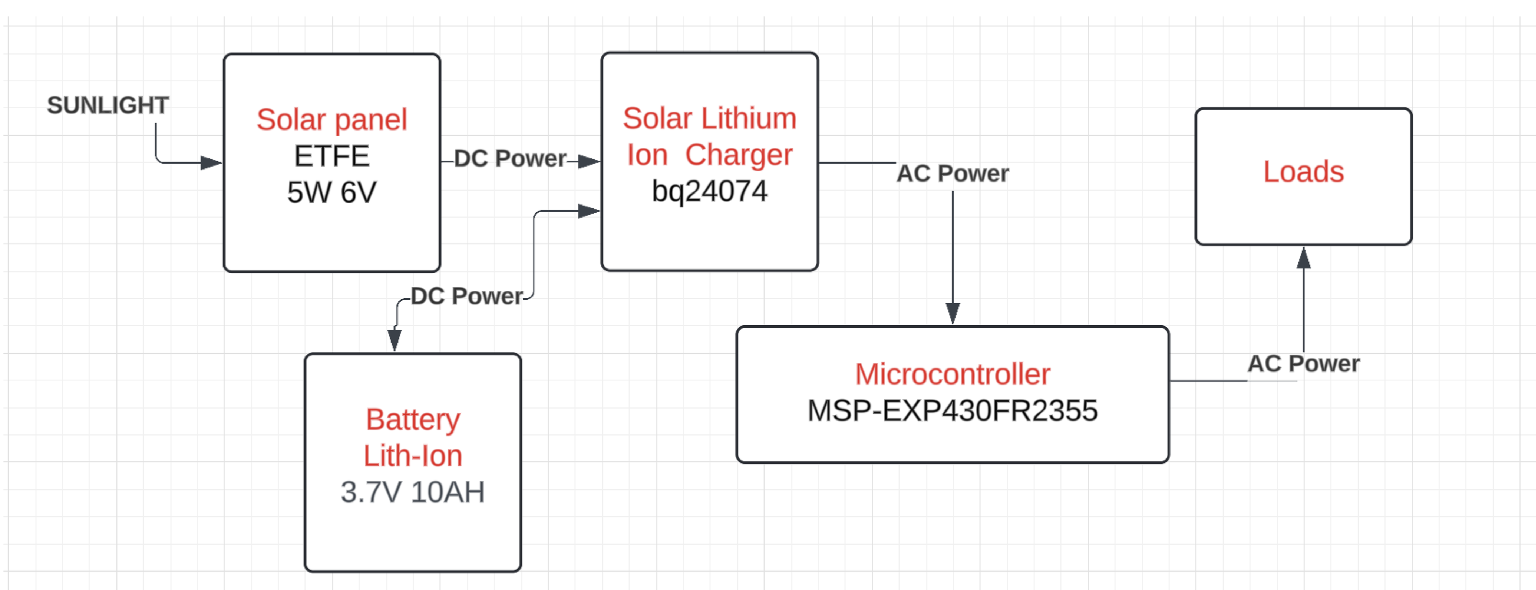

Fig 3. Physical Design Diagram

System Design

Key System Features

To satisfy system requirements, we incorporated the following design specifications:

- **Universal Lithium Charger**: Converts the energy from the solar panel to the battery and microcontroller.
- **Battery LITH_ION:** will store the extra energy from the solar panels, and be used to power the sensors when the solar panel isn't drawing energy
- **Texas Instrument MSP430FR2355:** Able to operate sensors on a low power mode running off a clock to maximize energy efficiency

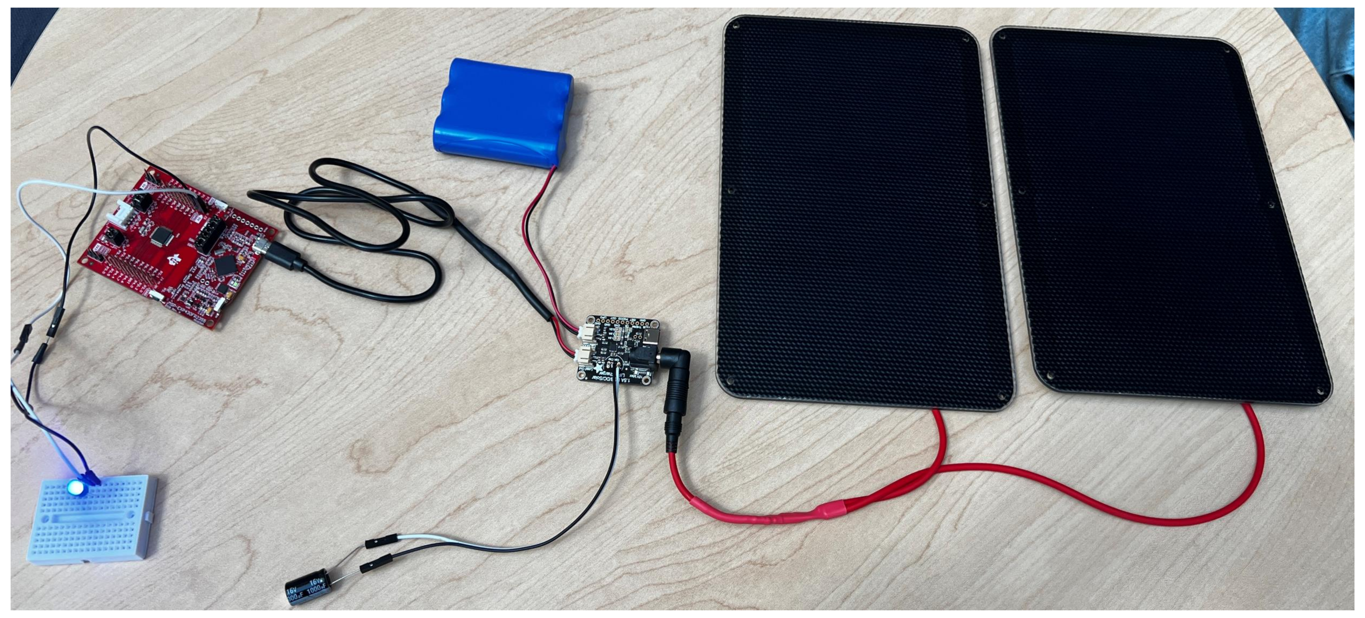

Fig 4. Real Components

Bill of Materials

Part	Purpose	Cost
Adafruit Universal USB/DC/Solar Lithium Ion/Polymer Charger	Inverts the DC power from the Solar Panel and converts it into AC to charge up the battery	$14.95
JST PH 2-Pin Cable – Female Connector 100mm	Soldered to a Micro USB cable to turn on the MCU from the the Solar Chargers LOAD OUT	$0.75
USB A to Micro B	Used in conjunction with the JST cable	$2.99
Battery LITH-ION 3.7V 10AH	Connected to the Solar charger to store the power	$29.95
2x 5 Watt 6 Volt Solar Panel – ETFE	Solar Panel to power the system	$70.00
Texas Instruments MSP430FR2355	The MCU to power on and control the sensors	$12.99
4700 µF Electrolytic Capacitor	Used to stabilize the DC input into the solar charger	$1.95
	TOTAL	$133.58