Weather monitor system of solar power

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The Problem

- The New York Department of Environmental Conservation needs a low-cost and accurate weather monitoring system that can be used by homes and businesses.
- Our goal is to provide a low-cost and sustainable power supply system.

Inspiration

- Sainlogic WS-0310 and AcuRite Iris 5-in-1 Home Weather Station
- Both are powered by batteries and a power adapter
- Both can measure temperature, air pressure, humidity, wind speed, and direction.

Idea:

- Why not utilize the battery as the system's power supply and utilize solar cells to charge the battery in the meantime?

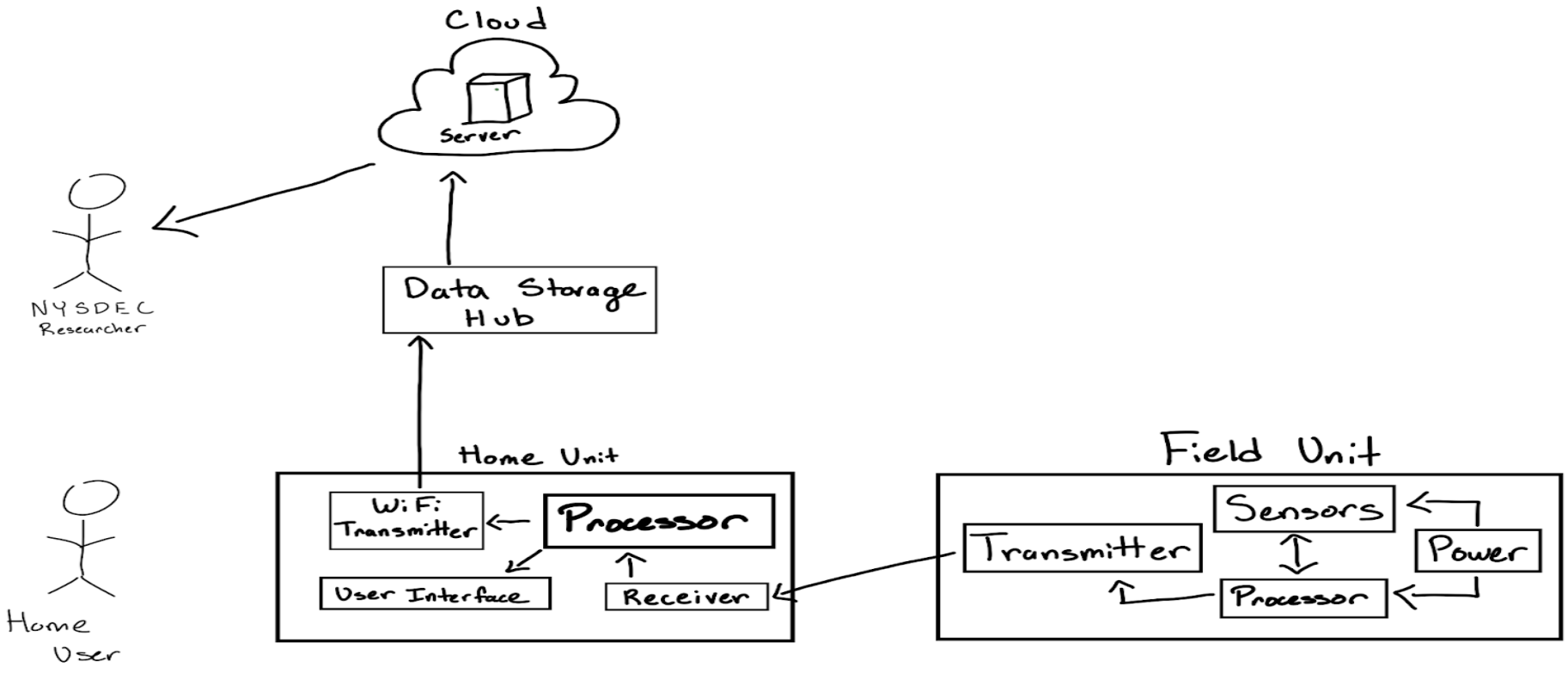
System Requirement

- Functional Requirement:
- Data collection: The system should be able to collect accurate weather data
- Data sharing: The system would let users share weather data with NYSDEC every hour without data loss.

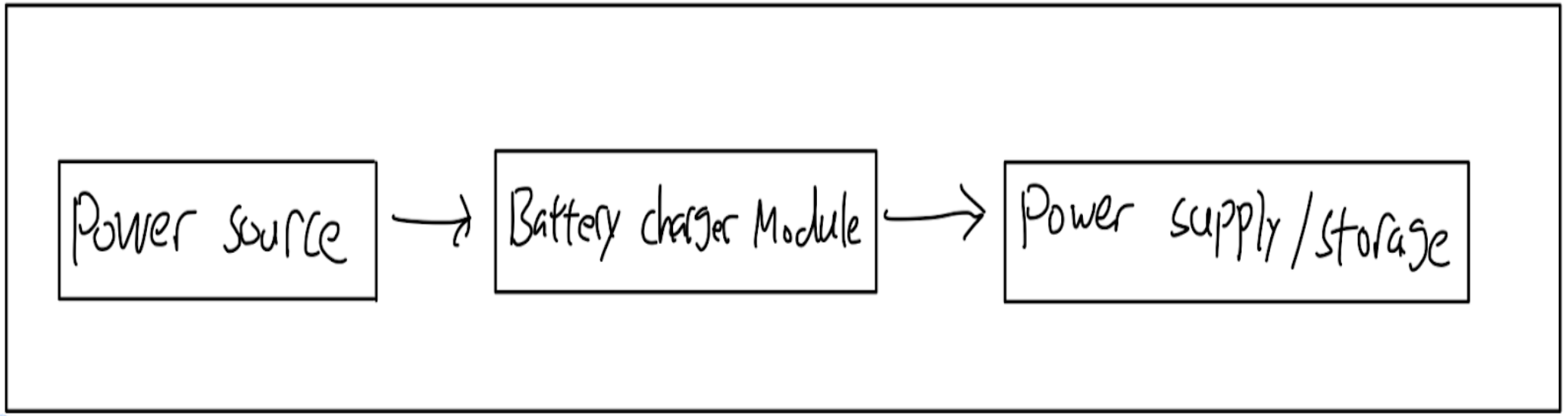
Subsystem requirement:

- Power Availability: The power system should be able to support power for at least 18 hours per days

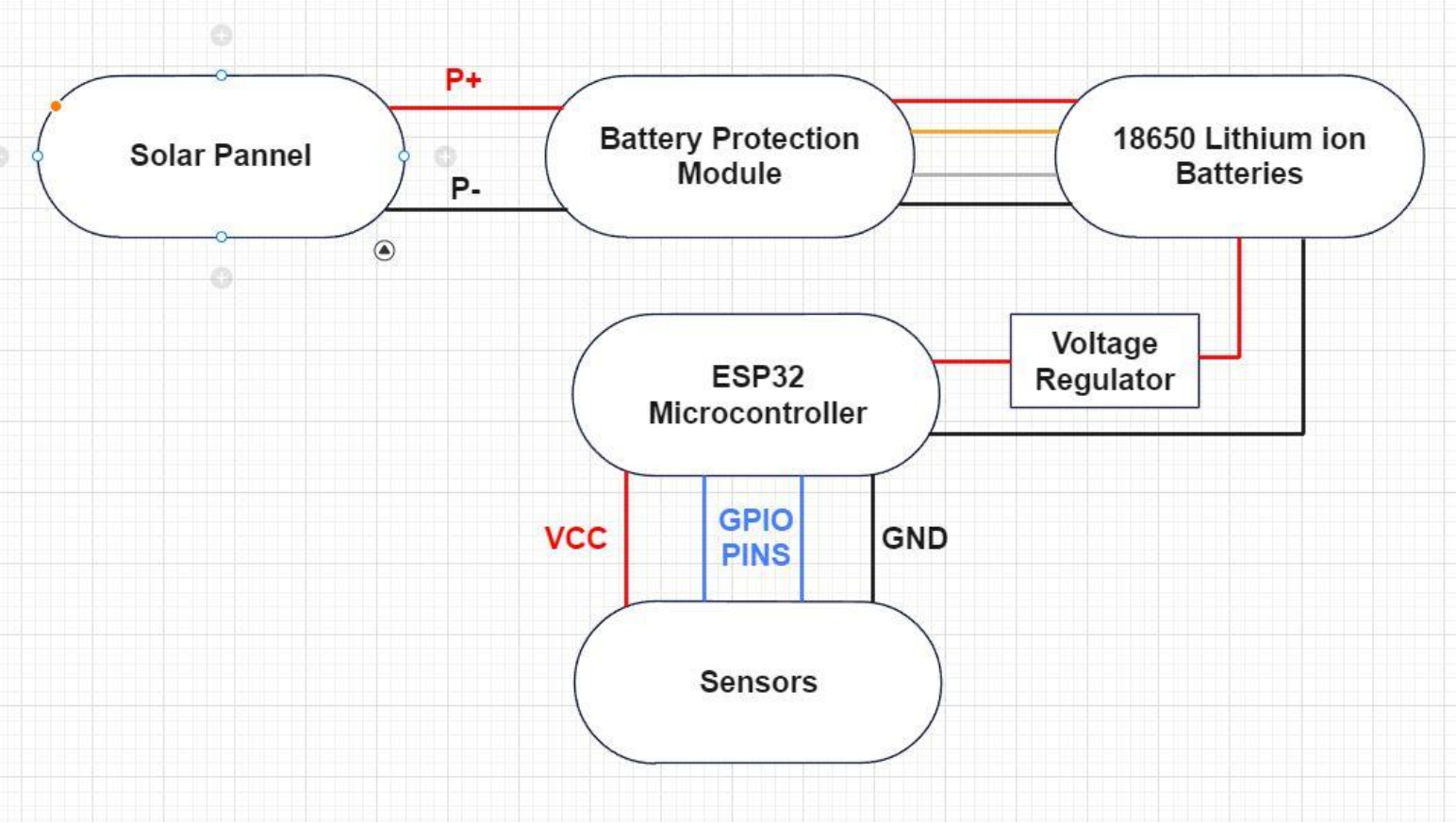
Logical Design



Sub-System



Physical Design



Key Design Decision

- Linear Power Distribution
- The system component draws power from the battery pack, and solar cells distribute power to the Battery protection module which charges the battery.

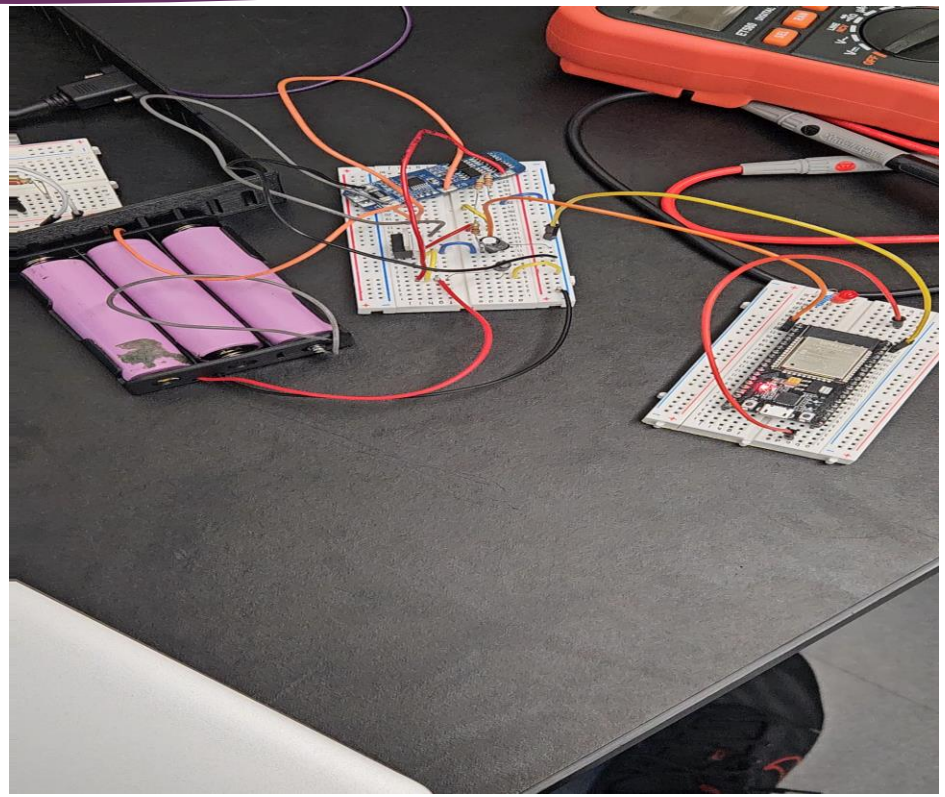
- Parallel Power Distribution
- The solar cells directly provides power to the full system while charging the battery pack simultaneously and switches power supply from the solar cells to the battery pack.

- Solar-Centric Power Distribution
- The solar cell serves as the sole power source for all system components

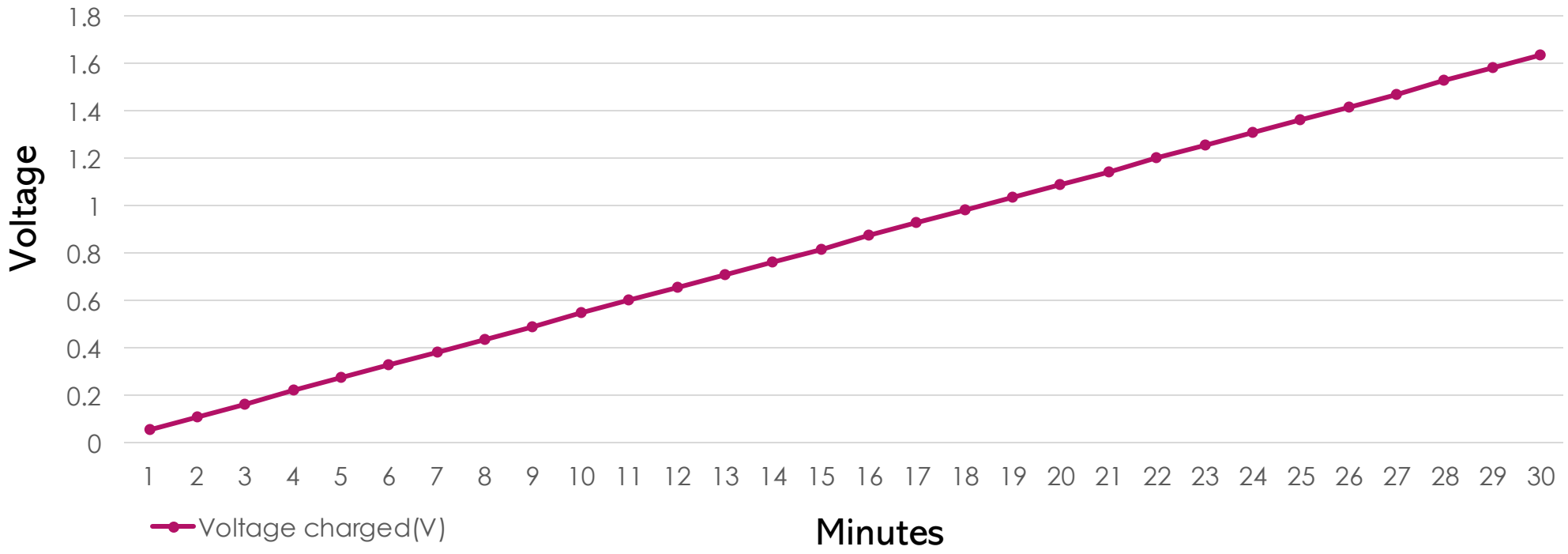
Decision Matrix

	Options		
Criteria	Linear Power Distribution	Parallel Power Distribution	Solar-Centric
Cost	4	2	5
Reliability	3	4	1
Usability	5	5	1
Maintenence	4	3	4
Ease of installation	4	2	5
Power Consumption	3	5	1
Totals	23	21	17

Demo

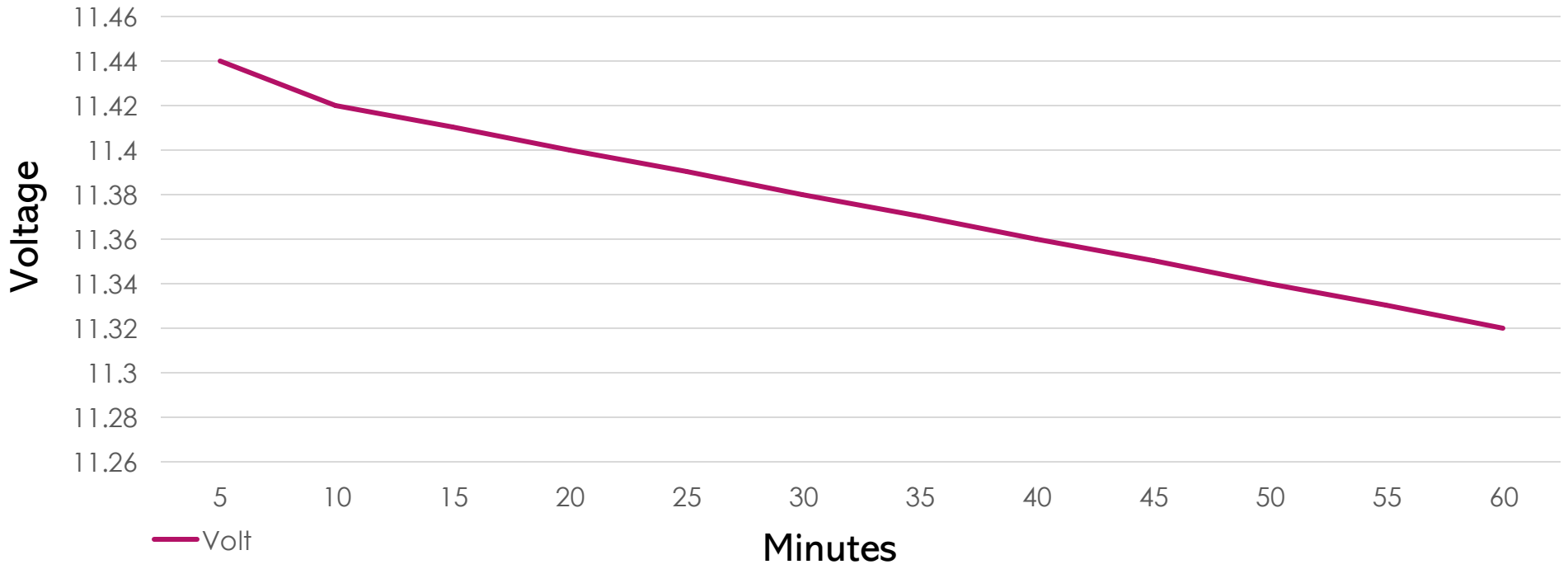


The voltage charge to the battery in 30 min (Cloudy day)



- The voltage charged to the battery in 30 minutes on a cloudy day

Esp32 led blinking Voltage consume



- The Voltage consumed by Esp32 in an hour when blinking the led

Component and Test Data

Component	Condition	Voltage/Current
Solar cells	Sunny Cloudy/rain	18V/0.156A 18V/0.015A
18650 Li-ion Batteries (3)	N/A	4.2V/Depend
ESP32	Using	3.3V or 5V/Depend
Battery Protection Module	Overcharge detection V Over-discharge detection V	4.25-4.35V 2.3-3.0V

Recommendation

- Enough research before starting anything
- Have a well-organized team schedules
- Buy extra parts