

design process



user requirements

Explicit

- Sustainable
- Scalable
- Autonomous
- Energy Efficient

Implicit

- Minimal maintenance
- Low environmental impact
- Easy installation
- Compact and modular
- If statement loop code
- Ardunio uno
- Solar panels used to power the radiator

conclusion

This device meets our user needs as well as address the problem statements we identified. It is affordable as well as sustainable and self-sufficient. It will regulate the temperature of lakes, rivers, and municipal water sources that are used to cool AI data centers. It can be used in public parks, reservations, or even people's backyards in addition.

"Guau! You all really did great putting the prototype together and the proposal has a lot of great information!" - Sonya Patino

TEAM MAPO

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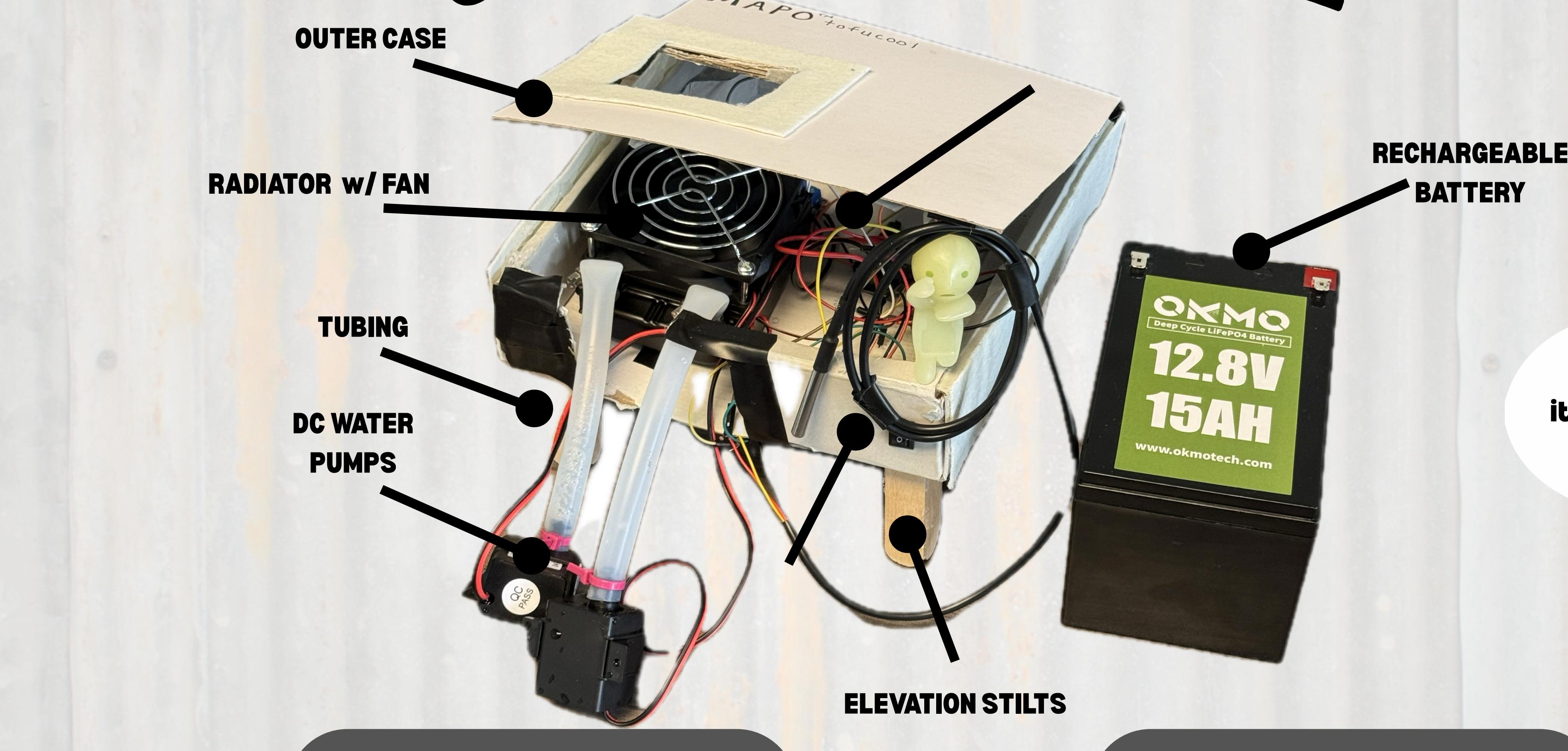
tofucool

A Solar-Powered Water Temperature Regulation System Designed to Offset Thermal Pollution and Water Scarcity

problem statements

- AI and quantum data centers use excessive energy
- Heat discharge causes thermal pollution in water sources
- Aquatic ecosystems are negatively impacted
- Addressing U.N. Sustainable Development Goals: 6, 7, 11, 14:
 - Clean Water & Energy, Sustainable Cities, Life Below Water

CURRENT PROTOTYPE



first iteration



first iteration

STRENGTHS

- Quick visualization of layout and water flow concept
- Helped team map input/output relationship early

WEAKNESSES

- Non-functioning
- Not durable

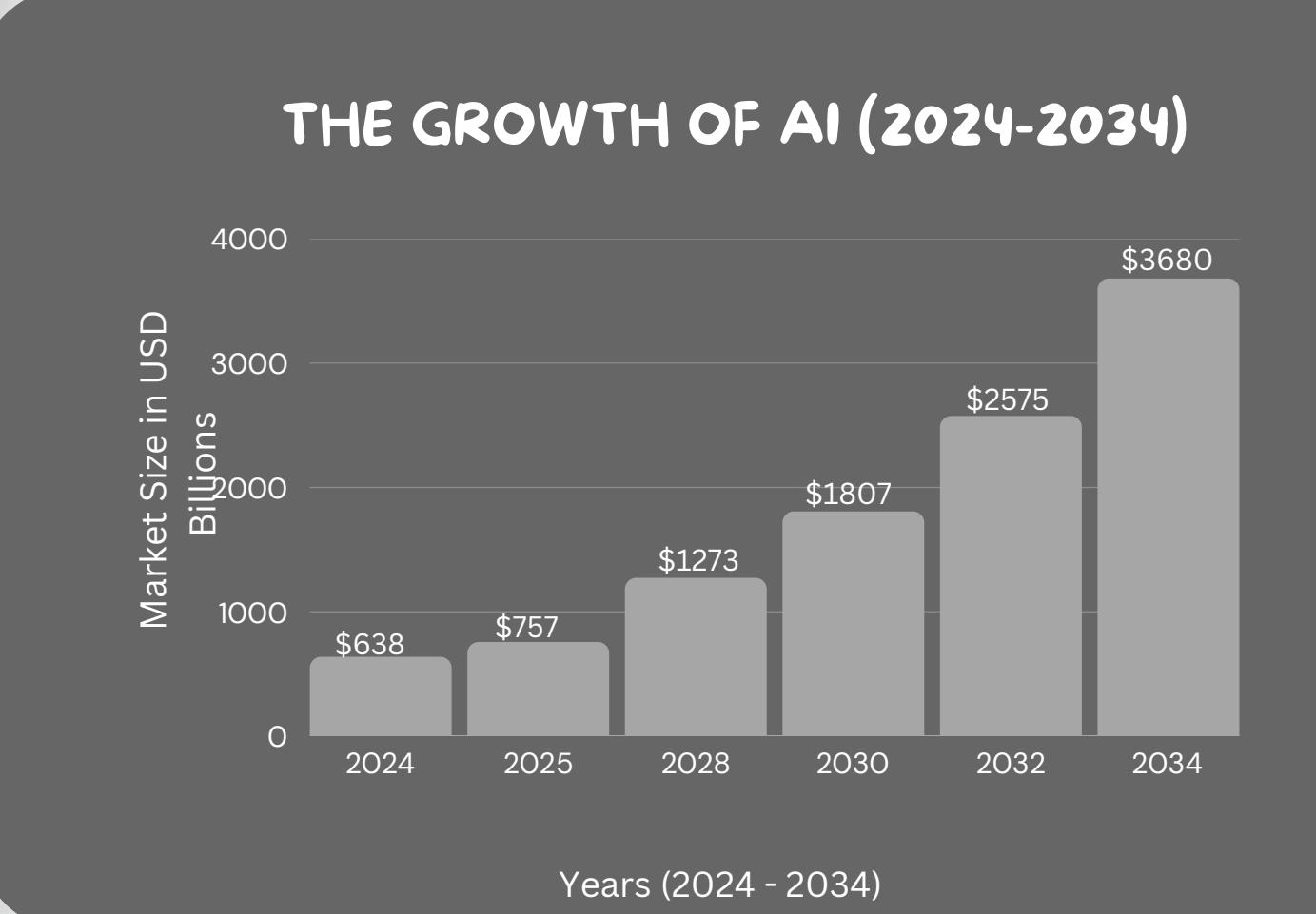
second iteration

STRENGTHS

- Functionally complete; system turned on/off based on temp
- Demonstrated successful sensor logic and automation
- Compact, reliable circuit
- Real-time testing possible

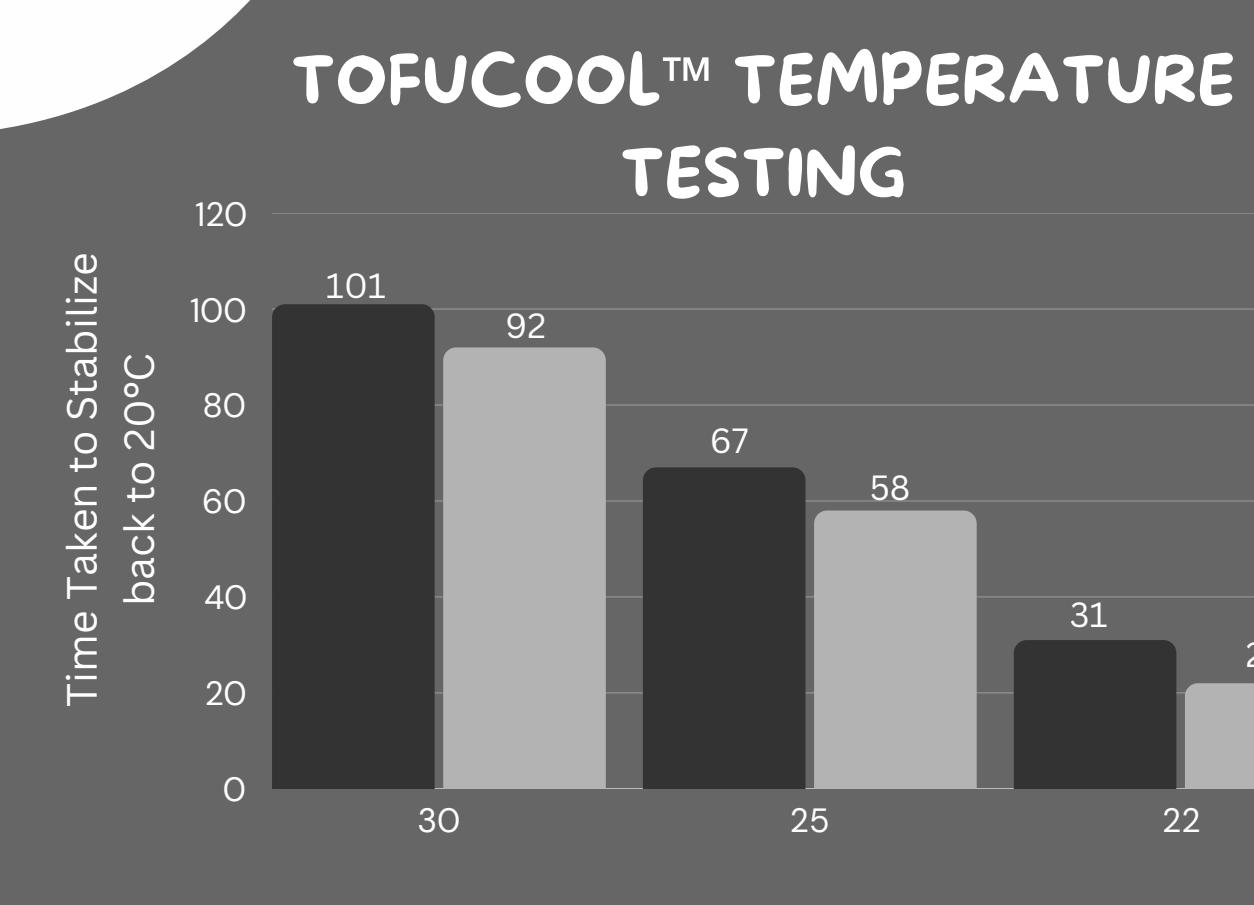
WEAKNESSES

- Housed in simple enclosure; lacked structural elevation
- Fan cooling effectiveness was limited due to poor ventilation
- No solar controller or LCD implemented
- Aesthetic and durability were still low



After conducting research, we determined AI data centers and their effects were relevant and could have a major impact to our environment.

The results of our testing show that our current iteration has improved in cooling speed, increasing the overall efficiency of our device.



current iteration

STRENGTHS

- Elevation improved gravity-fed flow + cooling efficiency
- Better air circulation around radiator/fan
- User control enhanced with switch
- Appearance more aligned with deployable device
- Modular form easier to install in field sites

WEAKNESSES

- Still lacks integrated solar controller and panel
- LCD and data display not yet added
- No long-term field data
- Not waterproofed for extended outdoor deployment

code

```

1 #include <OneWire.h>
2 #include <DallasTemperature.h>
3 #include <LiquidCrystal.h>
4 #include <Relay.h>
5
6 #define ONE_WIRE_BUS 2
7 #define DHT11_PIN 4
8 #define DHT11_CLOCK 3
9
10 #define relayPin 10
11 #define fanPin 11
12
13 void setup() {
14   // Set relay pin as output
15   pinMode(relayPin, OUTPUT);
16   // Set fan pin as output
17   pinMode(fanPin, OUTPUT);
18
19   // Set temp sensor
20   sensor.begin();
21
22   // Set relay pin as output
23   digitalWrite(relayPin, HIGH); // Start with relay OFF (active LOW relay)
24   // Set fan pin as output
25   digitalWrite(fanPin, HIGH); // Start with relay OFF (active LOW relay)
26
27   // Request new temperature
28   float temp = sensor.getTempCIndex(0); // Read temp in Celsius
29
30   // Print current temperature
31   Serial.print("Current Temp: ");
32   Serial.print(temp);
33
34   if (temp > threshold) {
35     // Turn on relay
36     digitalWrite(relayPin, LOW); // Turn on relay to turn on fan
37     digitalWrite(fanPin, HIGH); // Turn on fan
38
39     // Turn off relay
40     digitalWrite(relayPin, HIGH); // Turn off relay
41     // Turn off fan
42     digitalWrite(fanPin, LOW); // Turn off fan
43
44     // Wait 1 second before checking again
45   }
46 }

```

next steps

Things we want to implement next are:

- LCD display
- 3D printed case
- Voltage regulation
- Experimenting with different tubing materials
- Wiring solar panel

