SAMSUNG

HYDROSYNC

MONIITORING SYSTEM OF H_2 PRODUCTION & TRANSPORTATION FOR SUSTAINABLE FUTURE

SIC IOT-501
Team 105

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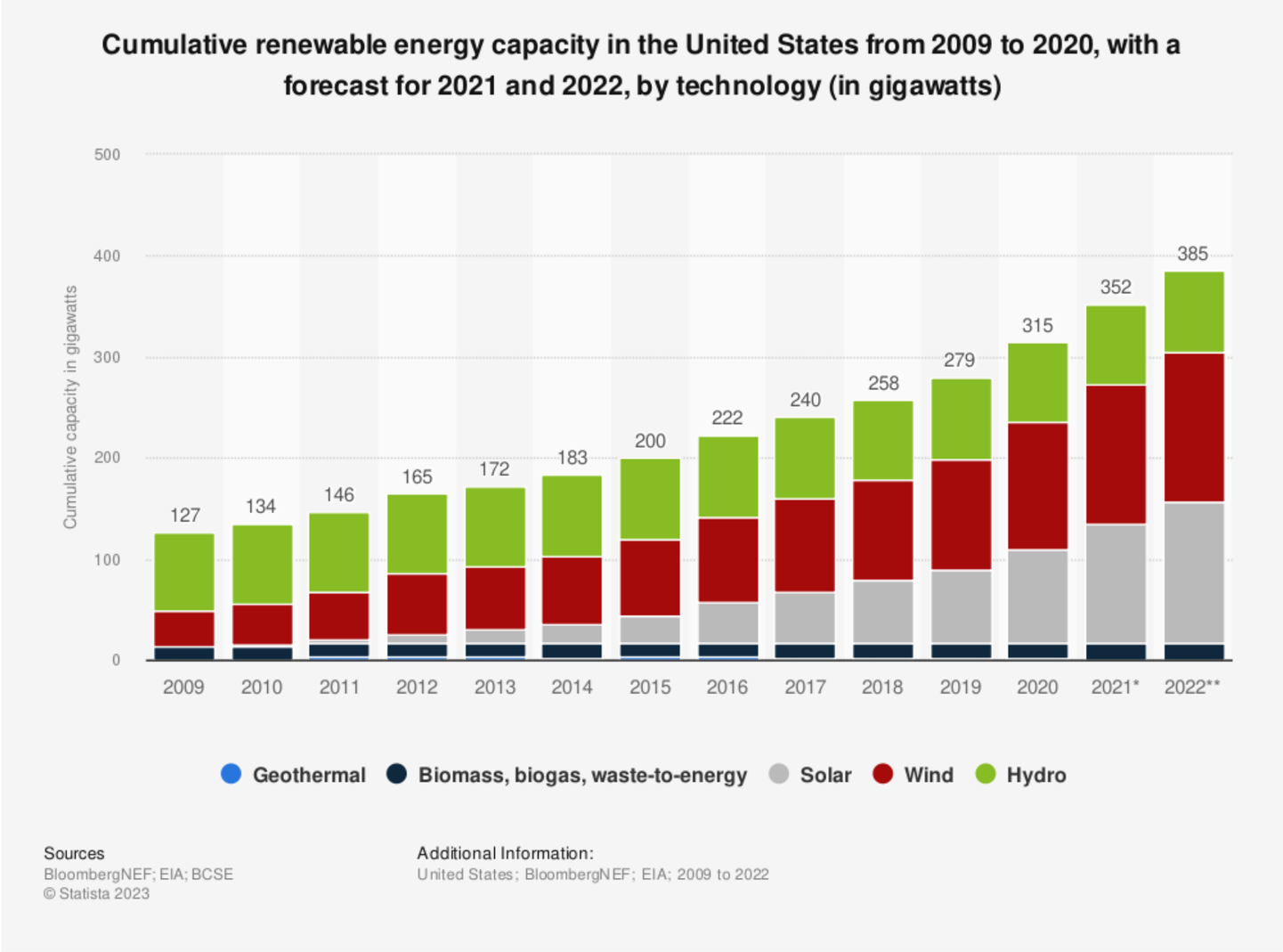
PRESENTATION

AGENDA

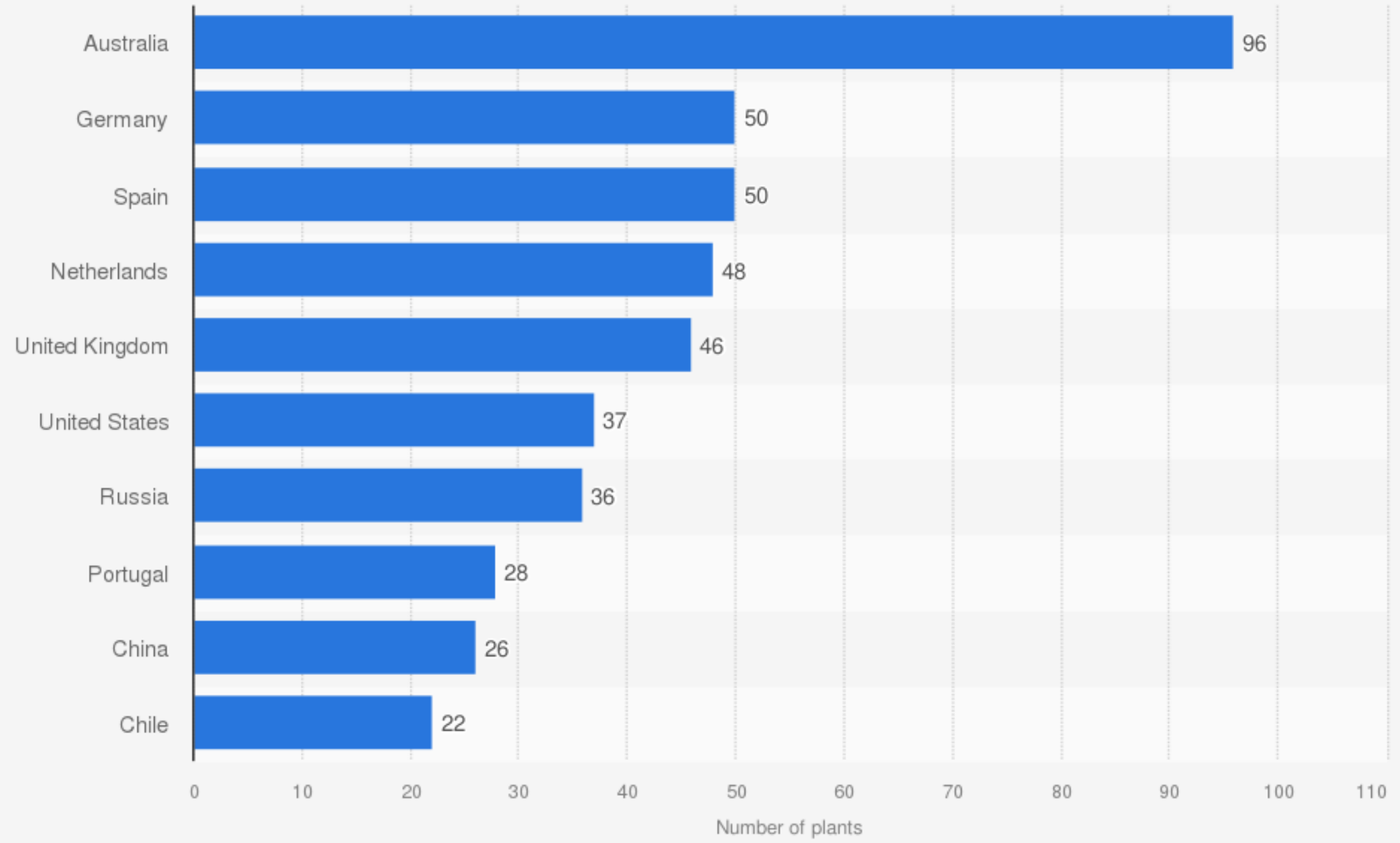
1	Introduction & Problems of energy sources
2	Components
3	MVP design & mechanism
4	Challenges & Addressed features
5	Results
6	Perspective & References

Do you know that the world consumes over 100 million barrels of oil per day, leading to devastating environmental and health impacts?

Due to the pollution caused by current energy sources, researchers across various fields have been compelled to seek out a sustainable and clean energy source. As a result, leading countries have begun to shift towards hydrogen production as an energy source.



Number of green hydrogen production facilities worldwide as of 2022, by country

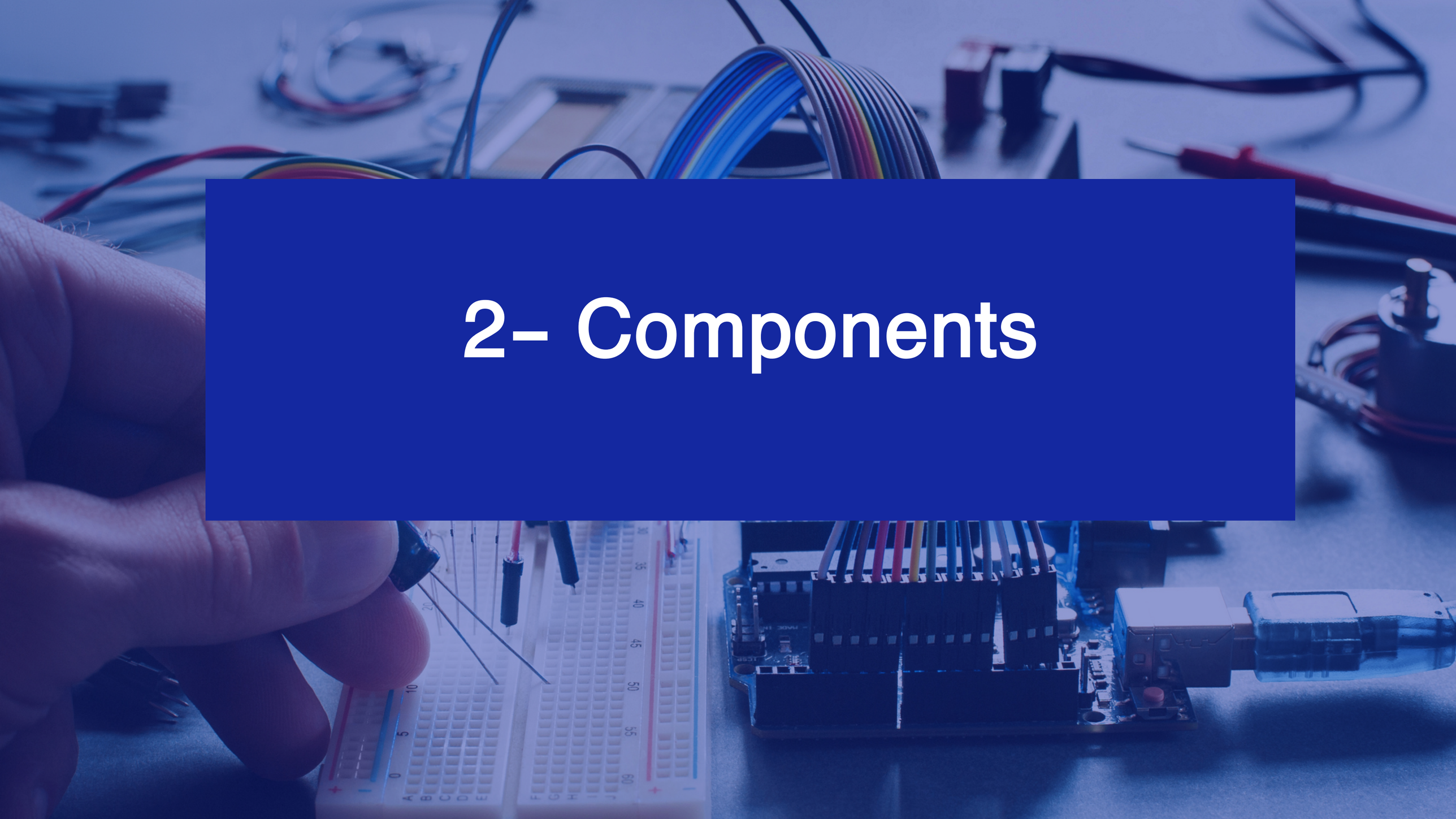


Sources
GlobalData; Energy Monitor

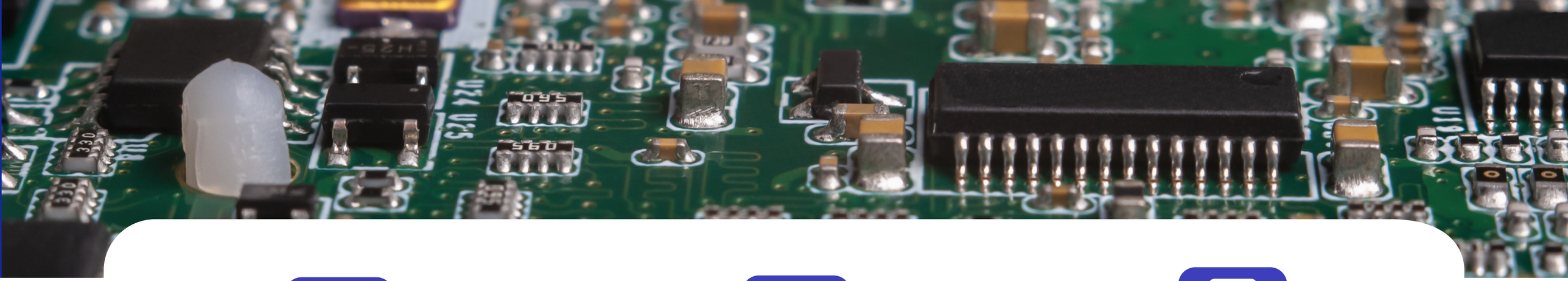
Additional Information:
Worldwide; GlobalData; 2022

- In 2022 during the 27th Conference of COP27 on Climate Change, Egypt identified key sources of future hydrogen demand for marine fuels, energy exports, jet fuel, road and rail transport.
- So extensive land near the Nile River has been designated for wind and solar power generation to support a planned $5.5 billion hydrogen project in Ain Sokhna port, And the EBRD lend Egypt $80 million to support its nascent green hydrogen industry.

- Our project focuses on one of the most efficient methods of hydrogen production with zero-emissions of harmful greenhouse gases(CO2,CH3,...).



2- Components



Solar Power & Solar Tracking System

Hydrogen production

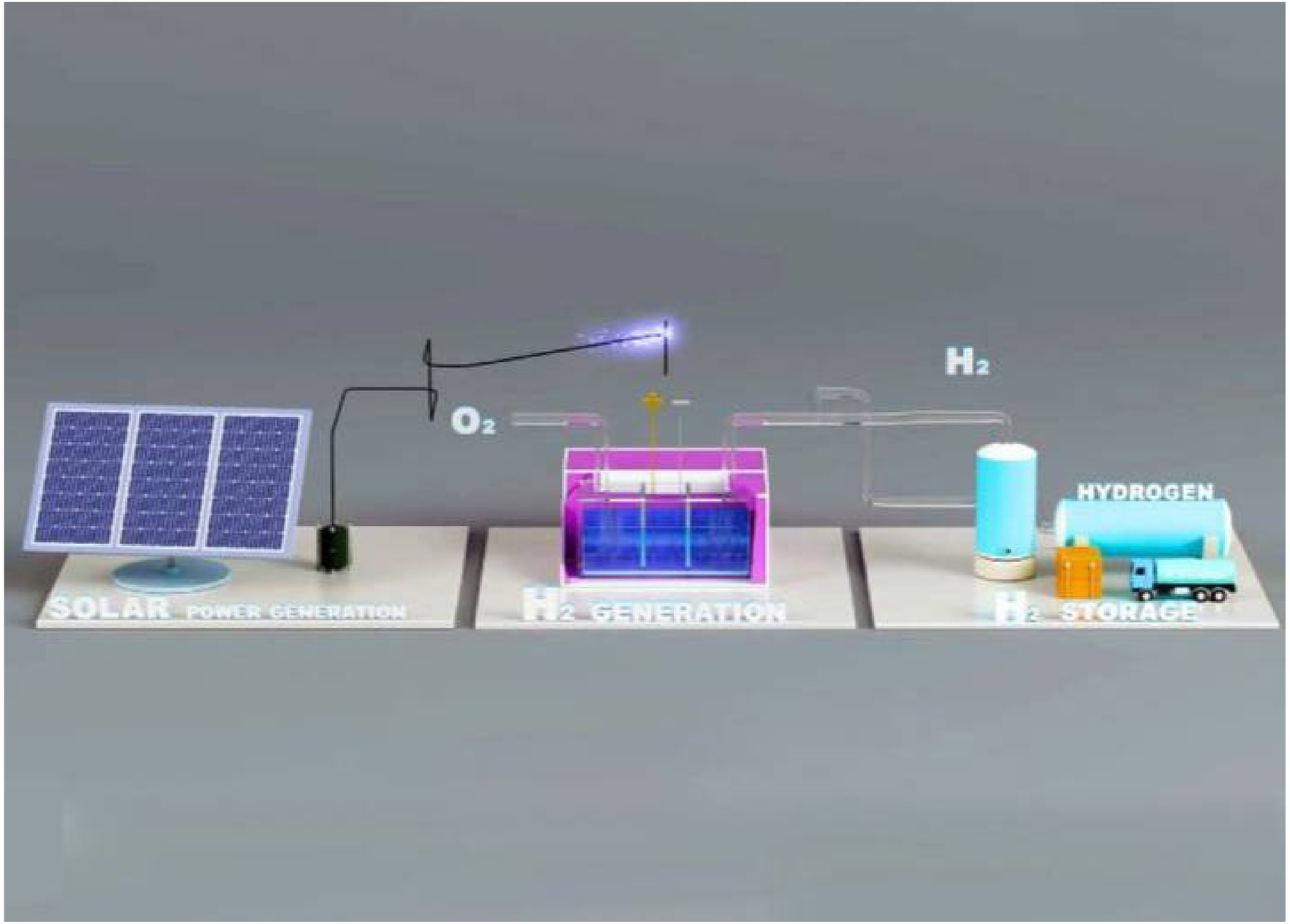
Data Acquisition and Processing

Environmental Monitoring & Alarm System

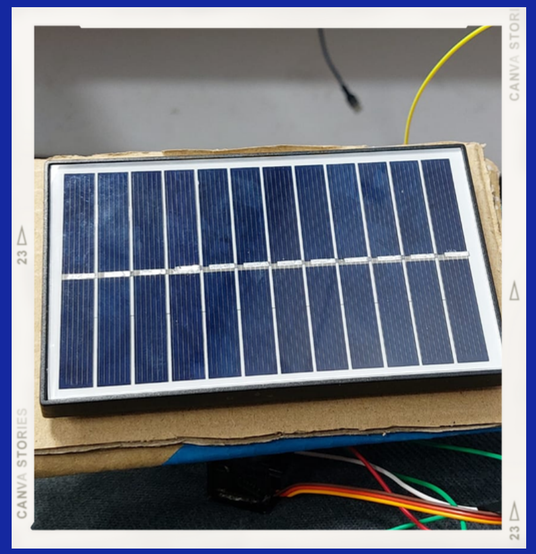
Machine Learning Model

Web Based Dashboard

3- MVP Design and Working Mechanism


O2
H2
HYDROGEN
SOLAR POWER GENERATION
H2 GENERATION
H2 STORAGE

WORKING MECHANISM

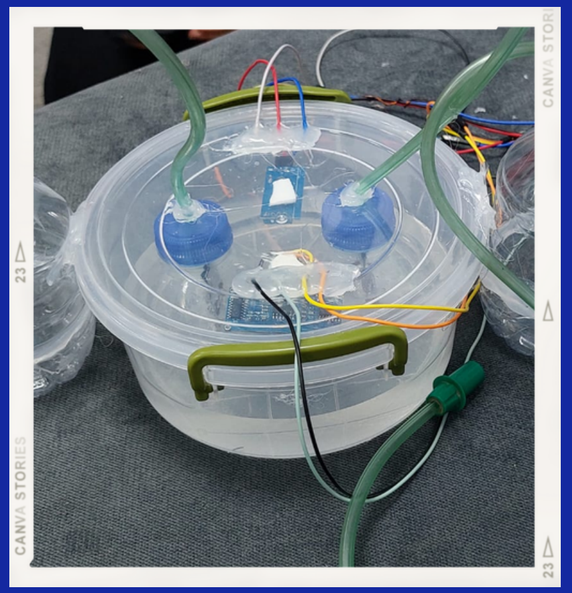


01 Solar Tracking System

The solar Tracking system works by having two LDRs placed on the sides of the solar panel measuring the light intensity on both sides, by comparing both readings through arduino code, we move the whole solar panel board towards the side with more light

02 Hydrogen Production

This feature facilitated seamless transfer of variables from Arduino to Raspberry Pi, ensuring smooth communication and streamlined data processing via serial communication.



03 Environmental Monitoring

Our IoT system includes multiple sensors for monitoring different Environmental aspects that affect the project, we included DHT sensor to monitor the Temperature and Humidity, Ultrasonic sensor to calculate the filling of the water container, and an MQ8 sensor to sense the hydrogen gas inside the hydrogen container.

04 Data Acquistion and Processing

The project utilizes both Arduino and Raspberry Pi to gather sensor data, necessitating a connection between the two systems. and selecting certain data from the Arduino output to use in the raspberry pi code.

05 Real Time Dashboard

Gauges displaying sensor readings done with Dash library on python.

4- Problems and Adressed Features

DURING THE IMPLEMENTATION

we have faced multiple challenges and we had to address them one by one, finding suitable solutions and

04 Real Time Data Monitoring Dashboard

Our system includes real time dashboard showing different Measurements to observe the live change of readings and monitor the performance of the electrolysis proccess

INNOVATIVE FEATURES

01 Analog Readings on Raspberry pi

An Arduino was added to the Solar Tracking System to process analog data from LDR sensors, bridging the gap in the Raspberry Pi's capabilities.

02 Necessary data transfer solution

This feature facilitated seamless transfer of variables from Arduino to Raspberry Pi, ensuring smooth communication and streamlined data processing via serial communication.

03 Flame and Explosion Hazard

Our system employs machine learning algorithms analyzing sensor data to predict flashbacks, ensuring real-time safety adjustments and preventing hydrogen gas-related hazards.

5- Final Test and Results

01 Connection

After assuring all the connections were implemented successfully we have turned on the raspberry pi and connected the Arduino to its USB port, which resulted in starting the first component of the project which is the Solar Tracking System, it detected the side with more light tilted towards it

02 Running the Script and Initial Readings

In the next step, we executed the python file inside the raspberry pi starting both retrieving the sensor readings and showing real-time data on the dashboard created. we have monitored the hydrogen levels and temperature before connecting the electricity to the terminals inside the water tank and found them averaging around 325 ppm for H2 and 20°C for temp.

03 Connecting The Electricity to The Terminal

After that we connected the battery both to the solar panel and to terminals inside the water container to start the electrolysis process.

04 Observing the Proccess

After a few minutes we have observed the success of the whole process visually through two measures, the first is watching the dashboard where the reading of the Hydrogen sensor gradually increased to the value of 411, and also by watching the gases in the form of bubbles move up from the water container to both hydrogen and oxygen containers.

6- References

- https://doi.org/10.1016/j.ijhydene.2023.08.157
- https://carnegieendowment.org/2023/10/09/positioning-egypt-as-global-green-hydrogen-leader-pub-90716
- https://www.statista.com/topics/7783/green-hydrogen/#topicOverview


THANK YOU!!!!