



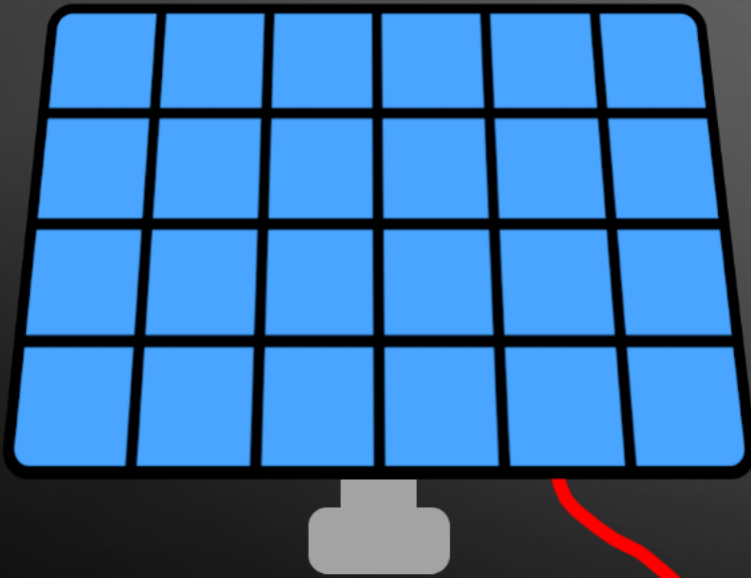
HOME ENERGY MONITORING DEVICE

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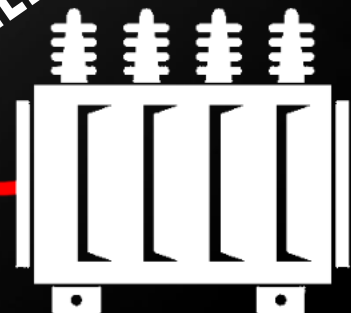
INTRODUCTION




- Project goal:
Home energy monitoring device with WEB GUI

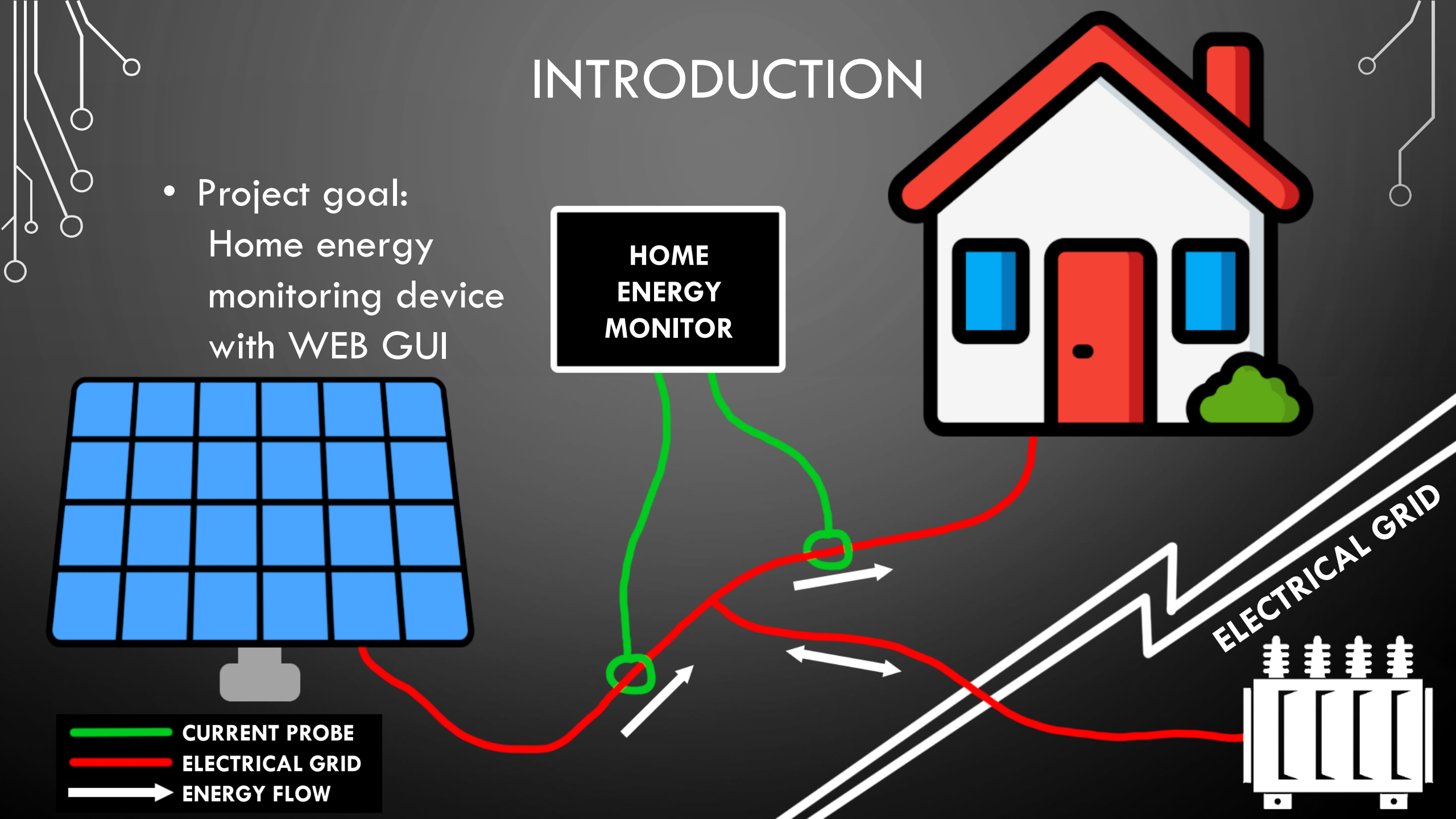
HOME ENERGY MONITOR



ELECTRICAL GRID

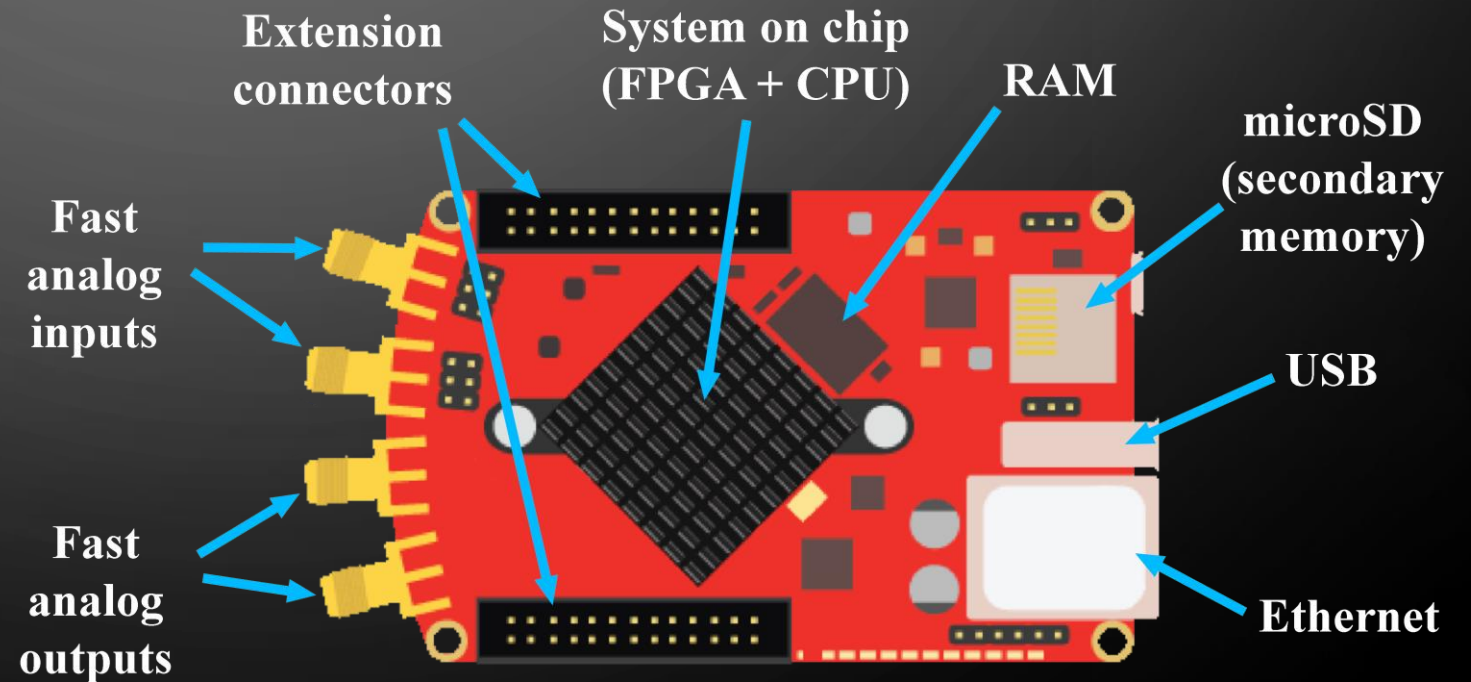
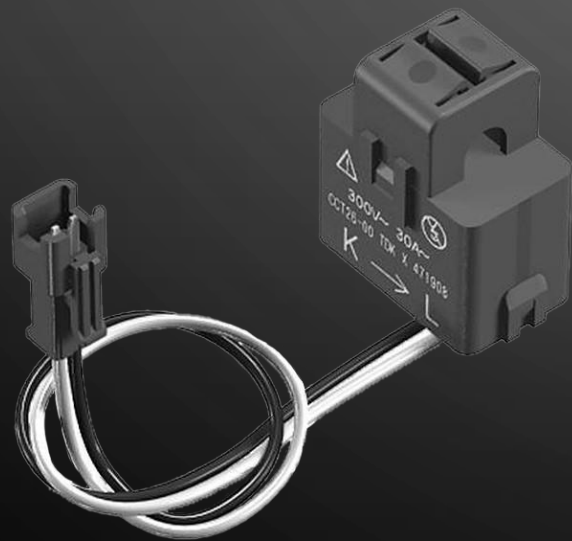
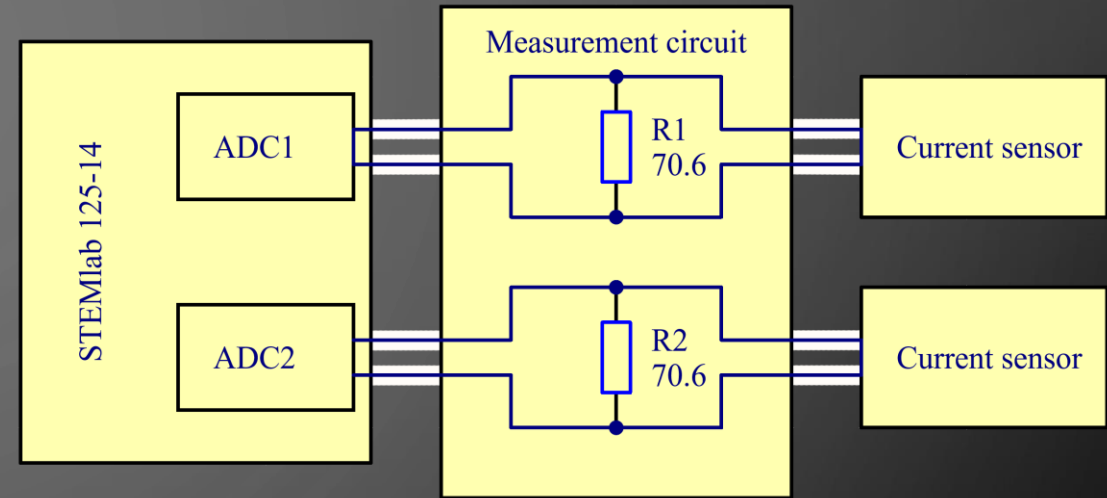


 CURRENT PROBE
 ELECTRICAL GRID
 ENERGY FLOW

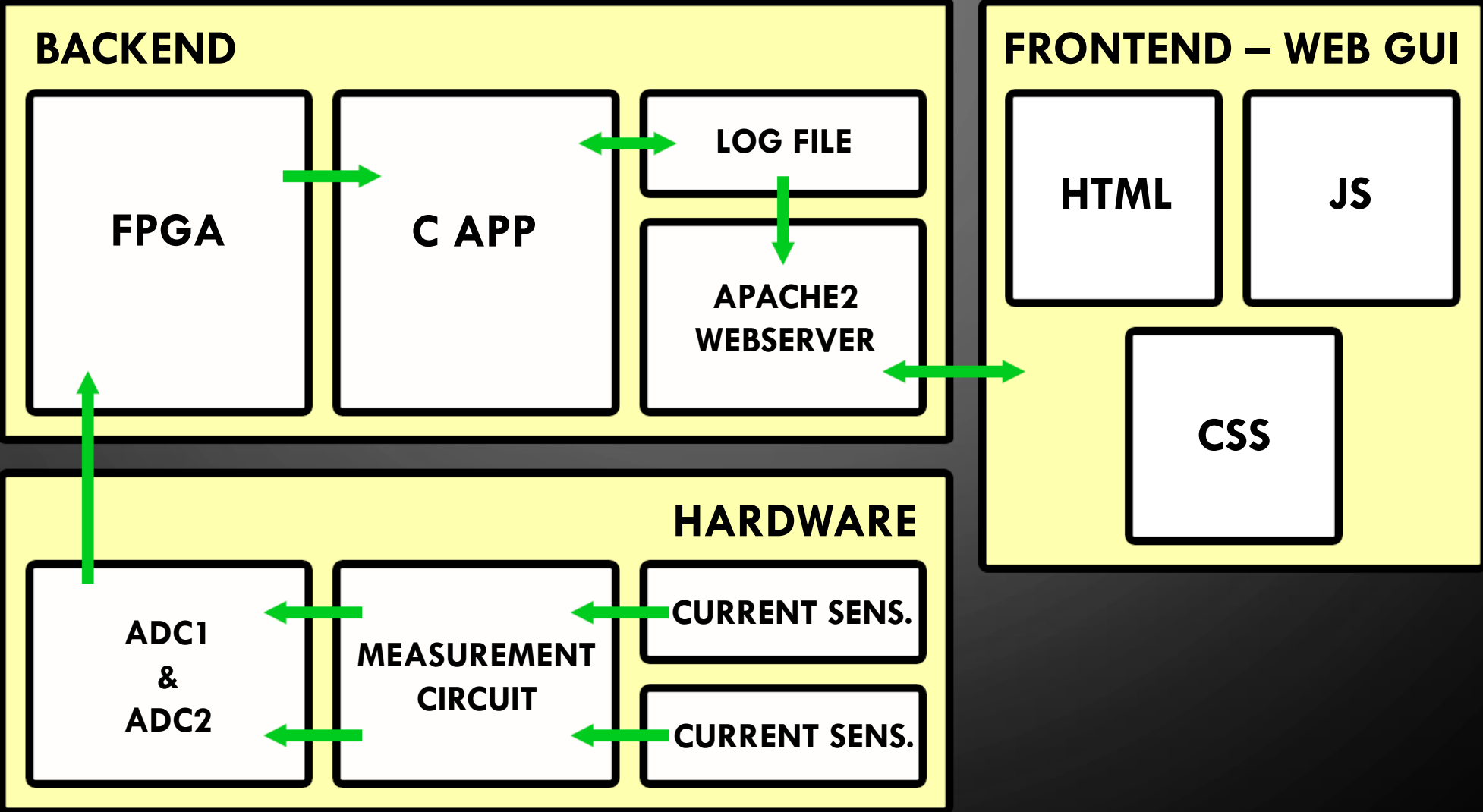


HARDWARE

- RedPitaya STEMLab 125-14
 - Xilinx Zynq 7010 SoC
 - modified Ubuntu 16.04
- 2x 30 A_{RMS} current sensor
- Measurement circuit

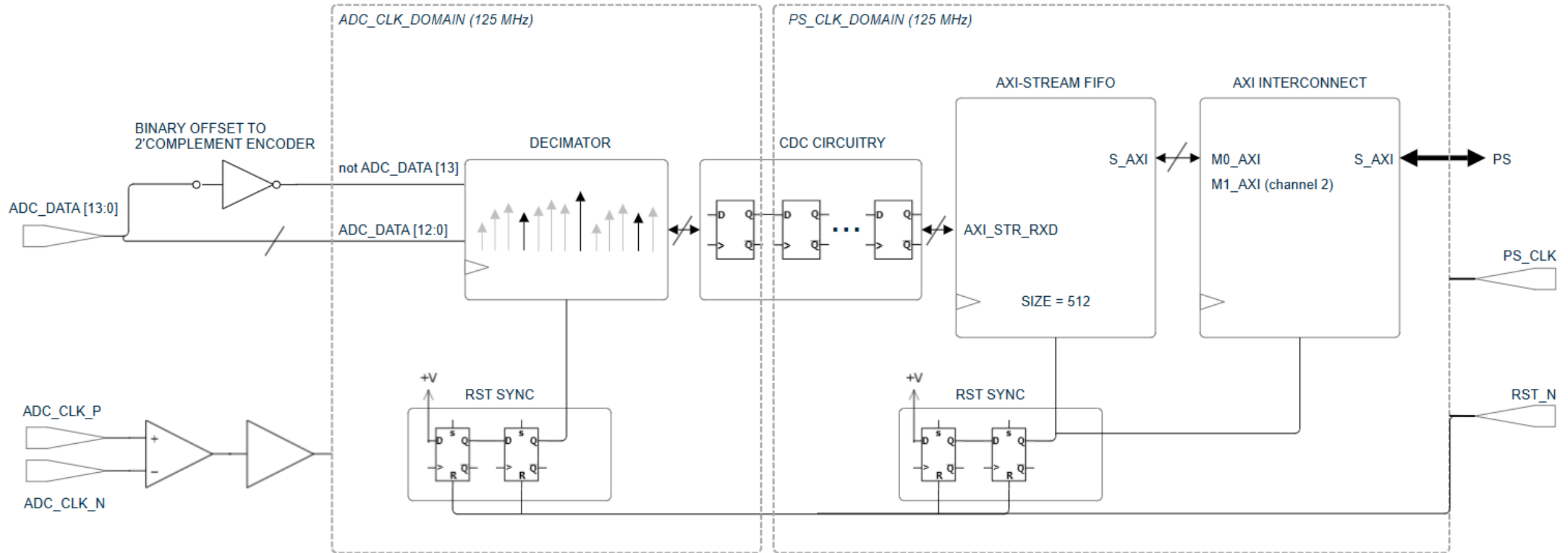


PROJECT OVERVIEW



FPGA LOGIC BLOCK DIAGRAM

CHANNEL 1



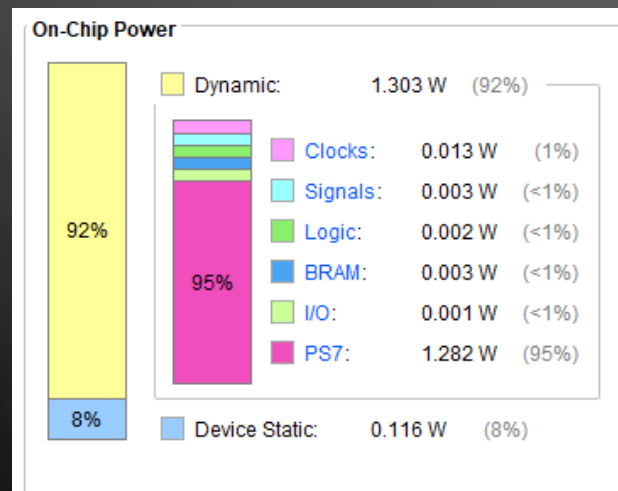
POST IMPLEMENTATION RESULTS

- Timing

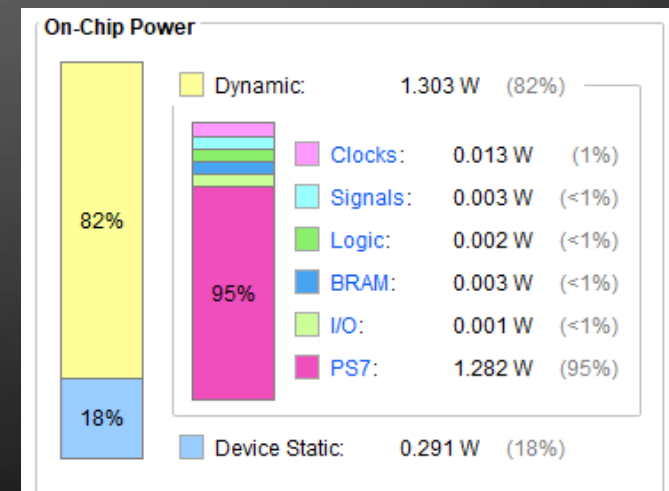
	SETUP (ns)	HOLD (ns)
WNS	1.631	0.020
TNS	0.000	0.000

All timing constraints are met ✓

- Power



Typical corner (Total = 1.420 W)



Maximum corner (Total = 1.595 W)

POST IMPLEMENTATION RESULTS

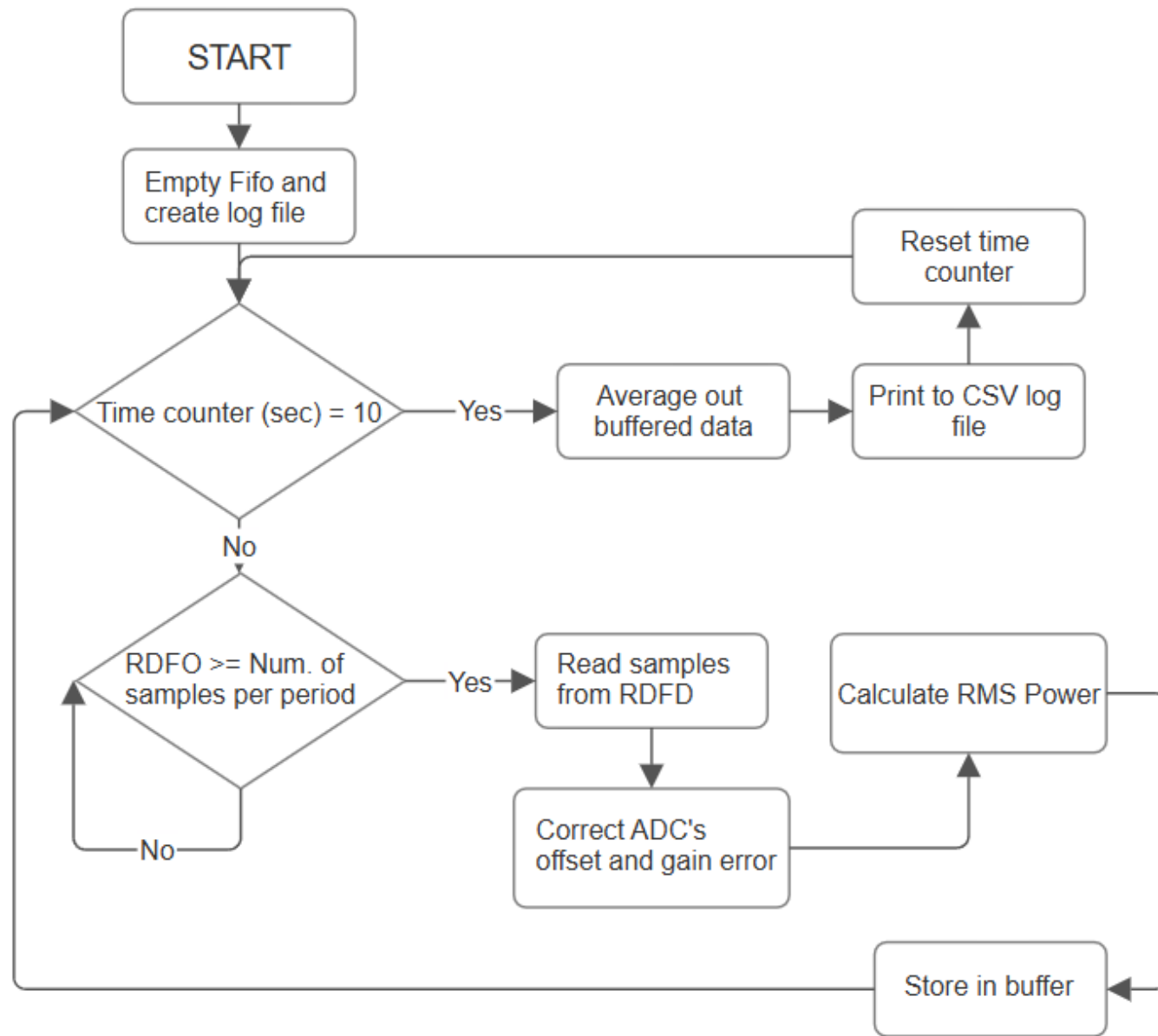
- Resource utilization

	LUT	REG	BRAM
Used resources	1341	1753	2
Total resources	17600	35200	60
Utilization (%)	7.62	4.98	3.33

ACCESSING RX FIFO DATA FROM PS

- Receive Data FIFO Occupancy Register (RDFO) : $C_BASEADDR + 0x1C$
→ Stores the current snapshot of the number of locations in use for data storage in the RX Data FIFO.
- Receive Data FIFO Data Read Port (RDFD) : $C_BASEADDR + 0x20$

C APPLICATION



FRONTEND – WEB GUI

- WEB application with bar charts:

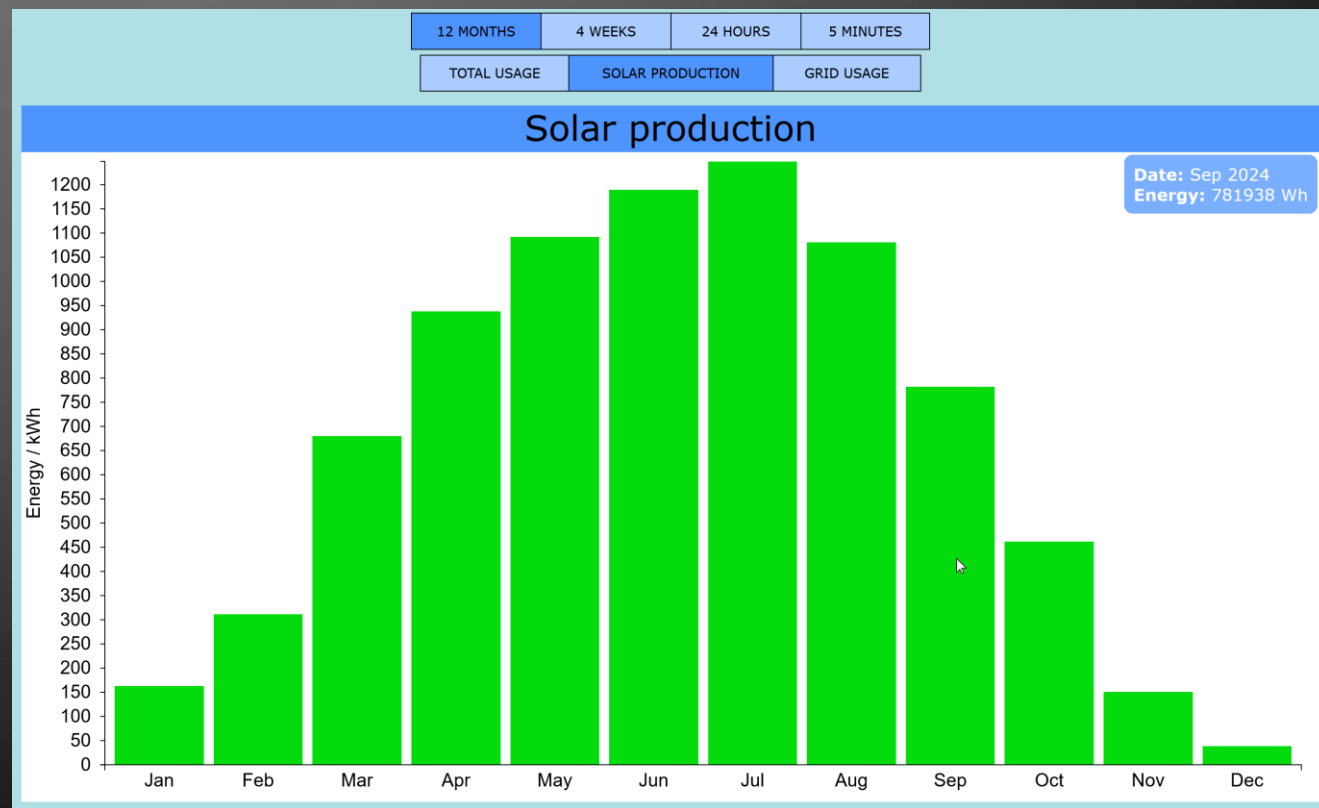
- household usage (measured)
- solar power plant production (measured)
- grid usage (calculated)

- 4 time ranges:

- last 12 months
- last 4 weeks
- last 24 hours
- last 5 minutes

- Dynamic charts:

- JavaScript
- D3.js open-source library



* DATA ON CHART IS NOT REAL

CONCLUSION

- State of the project:
 - Currently only allows for data display of the last 5 minutes.
 - The remaining graphs could be added easily, if more time was available.
- Possible upgrades:
 - Detection of the power peaks