End of master project (MSI) at the Western Norway University of Applied Science in Bergen



By Alexis Leignel

Period : 20th of August - 18th of december

Tutor : Richard Grant

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Høgskulen på Vestlandet

I/ The subject

My project is directed towards the creation of an adaptable solar energy laboratory. Specifically, tasks require the mounting of solar panels on specially created frames, network layout and installation, mounting and connection of electronic devices (inverters, battery unit...). The centre of this laboratory is based in a demonstration passive house.



II/ Methodology

The laboratory requires that the facility is highly adaptable whilst allowing the wiring to be understandable to the researcher and student alike.

The system will work with :

- 3 inverters,

- 1 battery unit,

- 3 firefighter switches.

- 12 crystalline panels and 14 thin flexible panels.

My job, in reflection with the technicians and Richard is to install those devices.

Flexible panels, using thin film technology



Tigo Optimiser



Tigo Cloud connect system



MPPT (Maximum Power Point Tracking); it is the process of optimizing the system by changing the load characteristic to keep the power transfer at highest efficiency.

Firefighter switch



Inverters “SMA Sunny Boy”



Battery Unit



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VIOLIN™

Crystalline PV Module
ASM6610M Series

Amount of power that could be harvested:

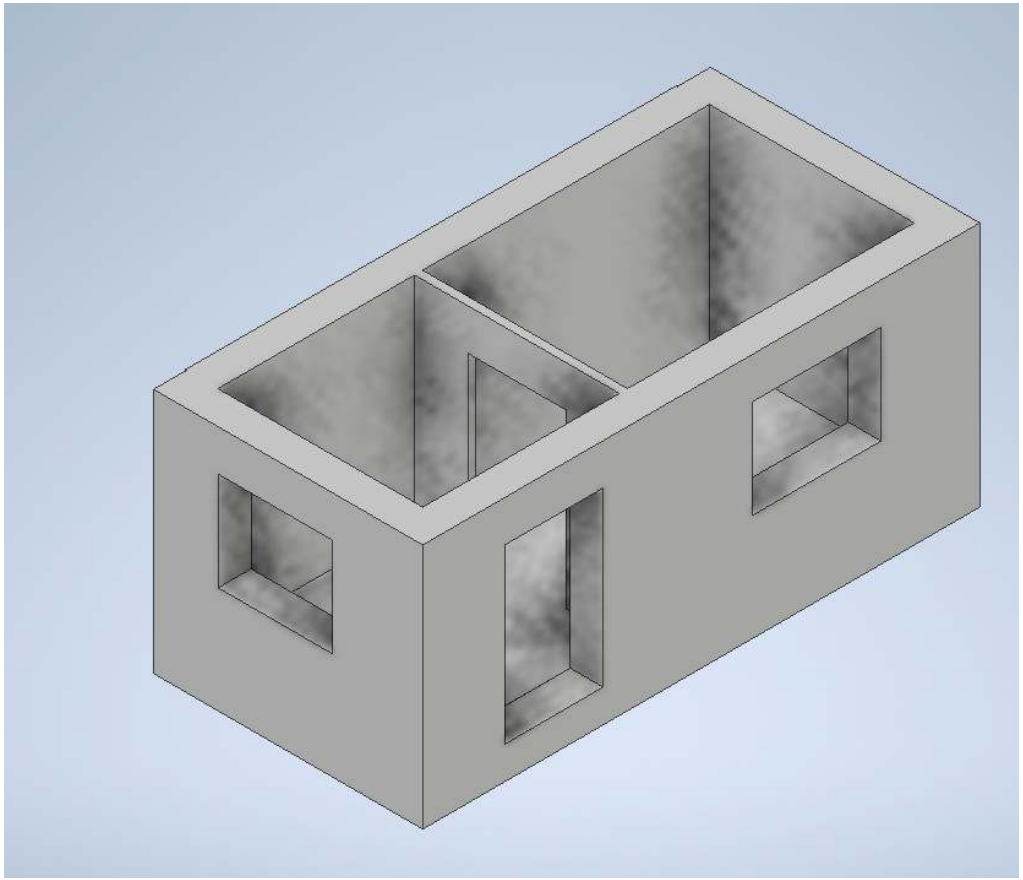
12 x 285 W + 14 x 120 W = **5,1 kW** produces in standard conditions.

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III/ Results

Aside from the overall comprehension of the system, the work asked is, as expected, very practical, some installation needs to be done to welcome the different equipment.



A/ Mounting the firefighters and how to link the equipment from outside to inside



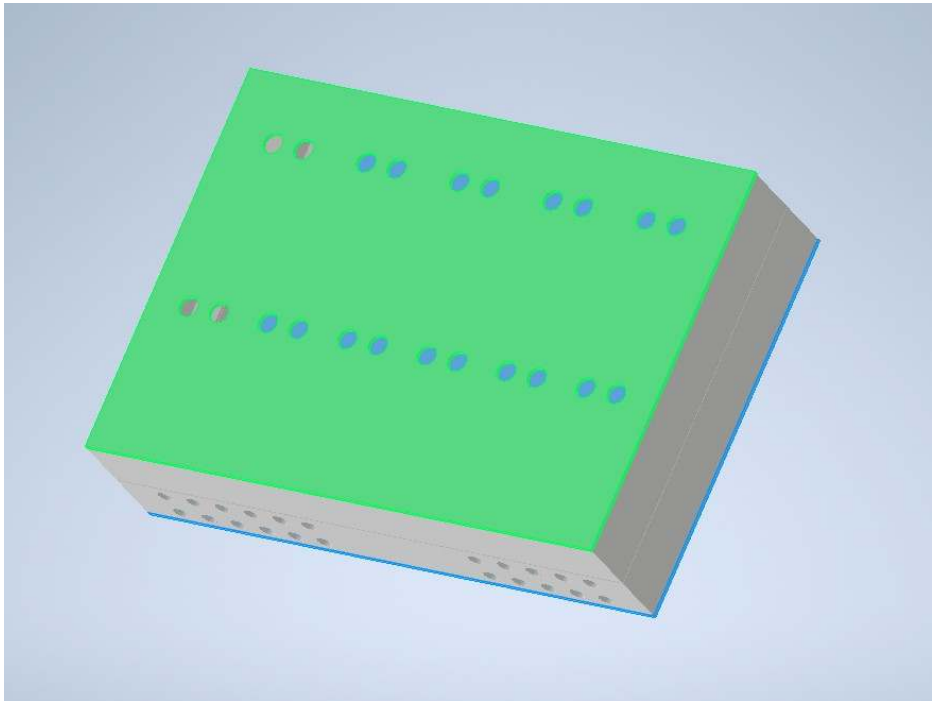


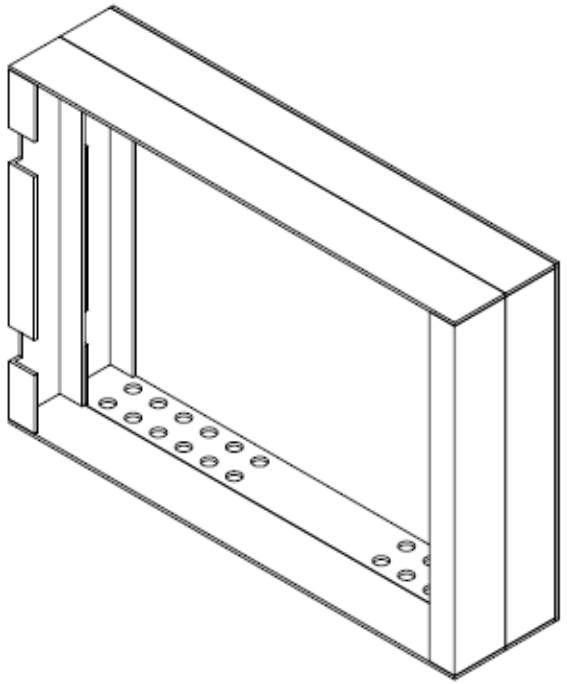
B/ The inverters and the battery unit



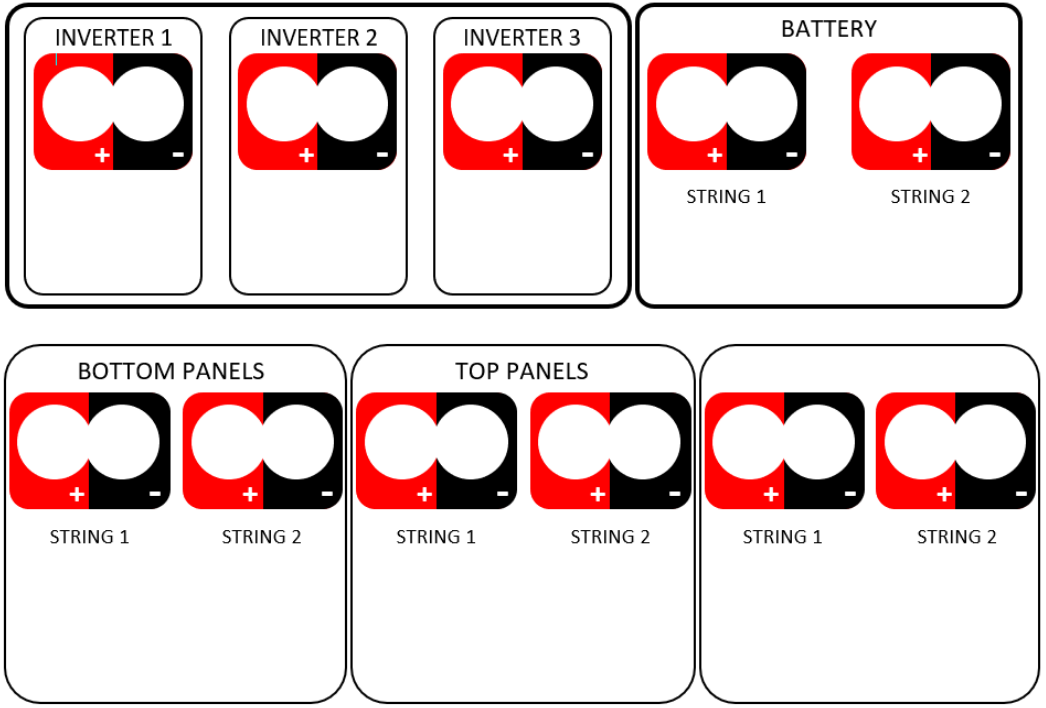


C/ The creation of a “patching board”








INVERTER 1
INVERTER 2
INVERTER 3
BATTERY
STRING 1
STRING 2
BOTTOM PANELS
STRING 1
STRING 2
TOP PANELS
STRING 1
STRING 2
STRING 1
STRING 2

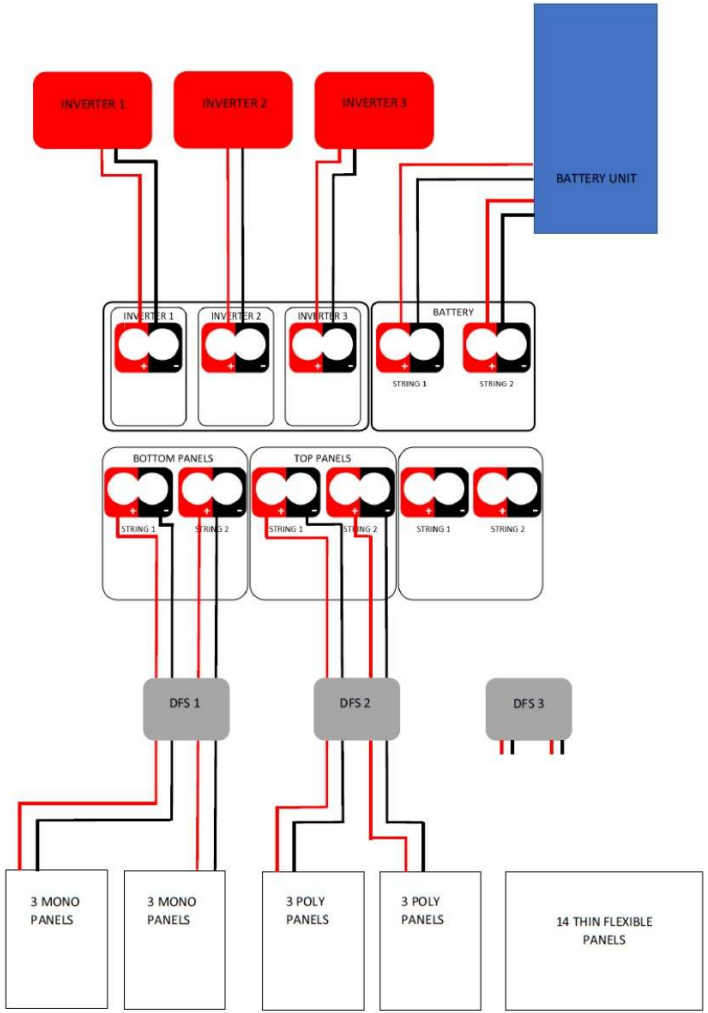

INVERTER 2
INVERTER 3
BOTTOM PANELS
STRING 1
STRING 2
STRING 1
STRING 2
STRING 1
STRING 2


INVERTER 1
INVERTER 2
INVERTER 3
BATTERY
STRING 1
STRING 2
BOTTOM PANELS
TOP PANELS
STRING 1
STRING 2
STRING 1
STRING 2
STRING 1
STRING 2

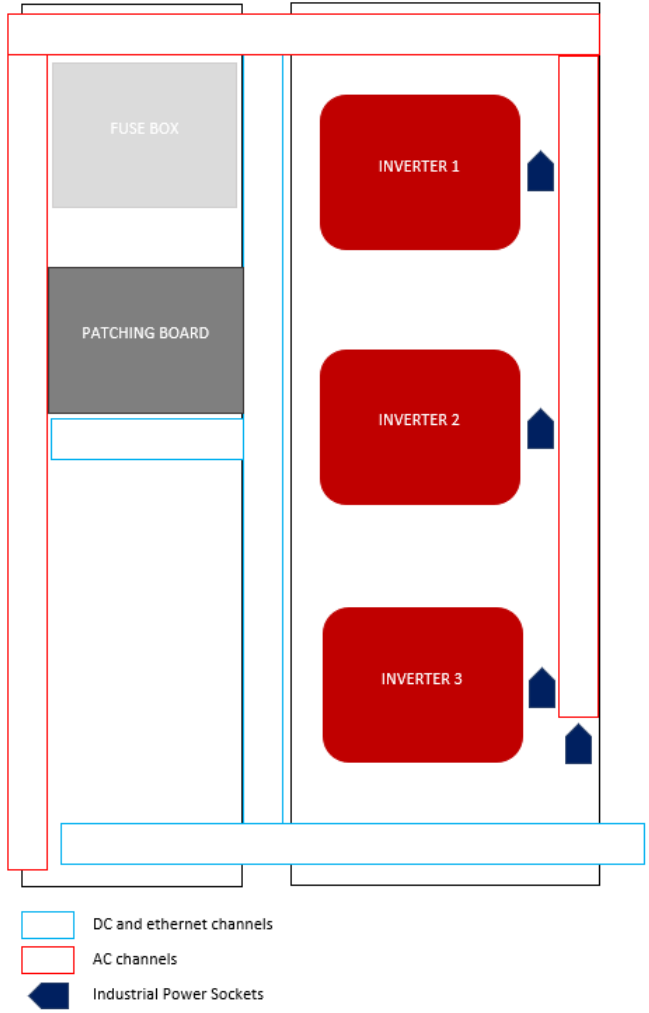
D/ The electrical part

Dispositions	Voltage (standard conditions)	Current (standard conditions)
1 crystalline panel (285W)	31.65V	9.09A
1 set of panels: 3x panels linked in series	94.95V	9.09A
6x panels linked in series	189.9V	9.09A
2x set of panels linked together in parallel	94.95V	18.18A

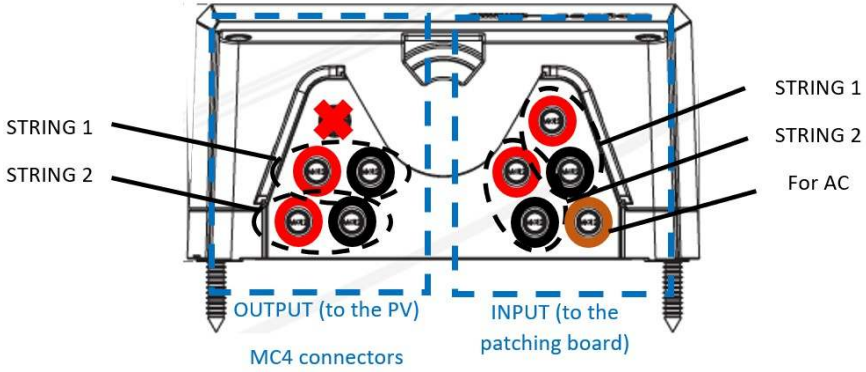
Devices	Voltage (V)	Current (A)
Fire Fighters (per string)	600	32
Inverters	Min: 50 Initial: 80 Maximum: 600 MPP range: 160 to 500	Maximum: 10
Battery (per string)	Initial: 85 Maximum: 150 MPP range: 70 to 140	Maximum: 39




SMA
SMA


FUSE BOX
INVERTER 1
PATCHING BOARD
INVERTER 2
INVERTER 3
DC and ethernet channels
AC channels
Industrial Power Sockets




STRING 1
STRING 2
STRING 1
STRING 2
For AC
OUTPUT (to the PV)
INPUT (to the patching board)
MC4 connectors





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IV/ What is planned next ?

- The AC side of the installation

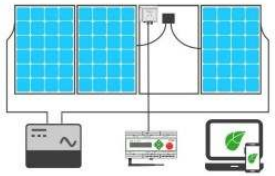
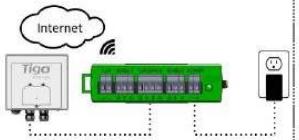
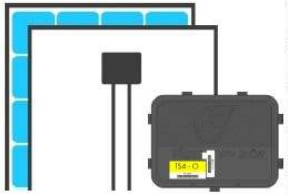
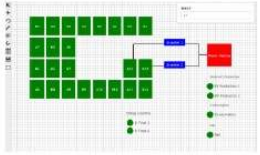
Installation of a fuse box

Device	Maximum current allowed	Fuse
Inverter	7 A Max current under fault condition: 12 A	10 A
Firefighter Computer, monitor and co	0.3 A	10 A
Battery	32.6 A	32 A

- Wiring, configuration and commissioning of the inverters, the battery and the tigo (optimiser) system.

- The Tigo Access Point devices

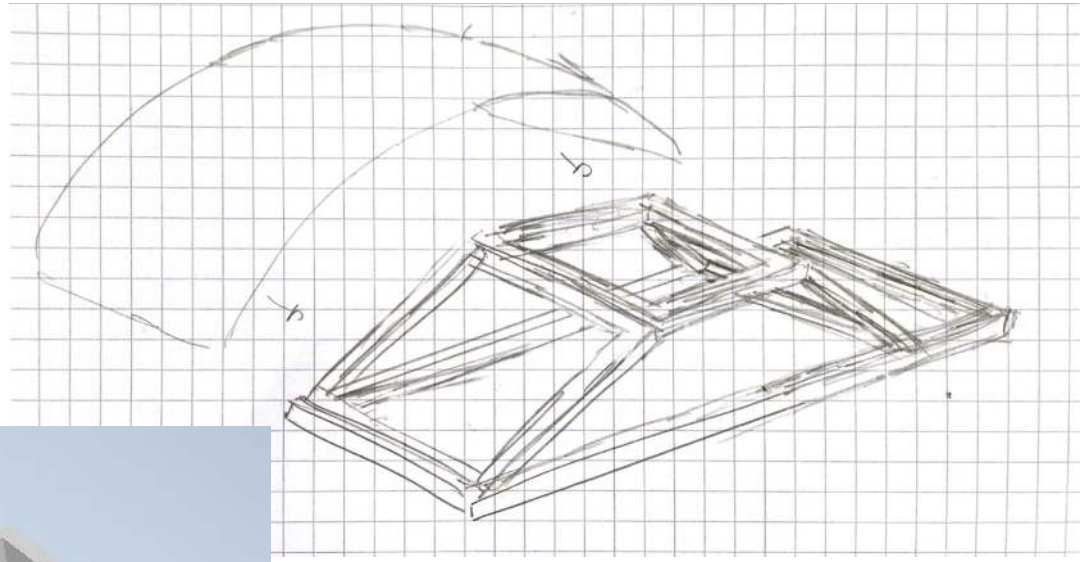
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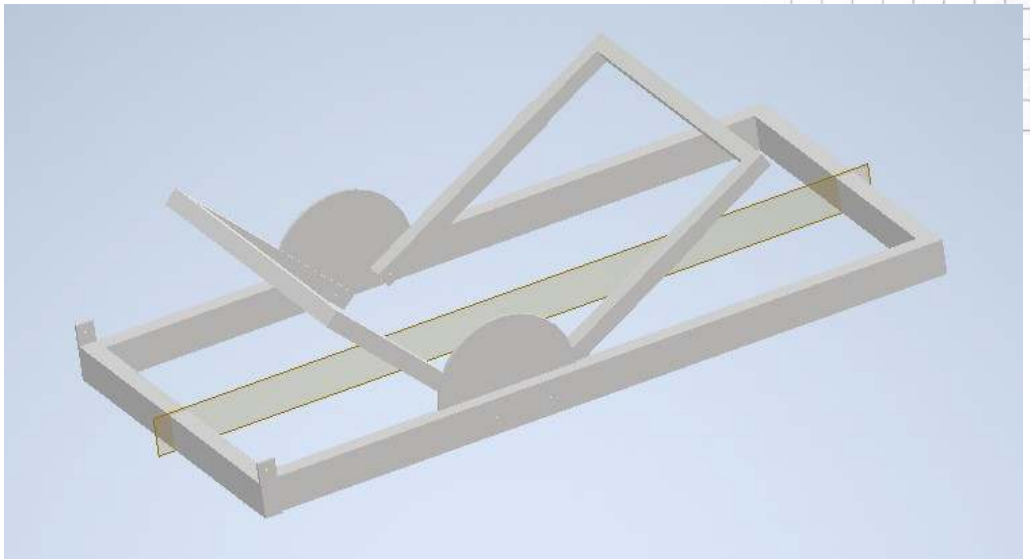
1. System Overview & Product Description	2. Installing Gateways	3. Installing CCA	4. Installing TS4-R
			
5. Online Configuration	6. Commissioning	7. Rapid Shutdown	8. Connecting Modbus Accessories
		PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN	



The Cloud Connect Advanced (CCA) is a compact, powerful data logger and the communication hub of the Tigo smart platform. It powers the monitoring and safety capabilities of Tigo smart modules.

- The thin flexible panels





Adding a thin metal sheet under the flexible panels and using scratch patches to fix it on the structures is for me the top one idea we had for the moment.

- A new logo…?



SOLAR LAB

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Høgskulen på Vestlandet

- Harvesting and using the datas
  - Creation of an interface
  - Used of a monitor placed behind the front window to share the informations/datas
  - Creation of a database, and a website
  - Need of a computer inside
  - And obviously an internet connection….



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Høgskulen på Vestlandet

Conclusion

This project is very interesting and educational. As it requires a lot of autonomy and some responsibilities, I feel that this project has rosen my degree of autonomy and confidence, on making choices, assuming my error…

I learn a lot about solar energy and solar installation, and about the general electrical installation. The difficulties that occured alongst my semester are, more or less, part of every project for me.

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