

internship Proposal / Internship proposal 2023

Group G4: Renewable energy

Research Team or Component component		DNIIT
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internship Category / Internship category		IUT/Bachelor <input type="checkbox"/> Master1/I 4 X Master2/I5 <input type="checkbox"/>
Specialty / Specialty		IT+electromechanics+Energy
Student's name and contact information(if known / Student name and contact information if known		5 students: Paul LARHANTEC, Benoit GAUDET, Florian LATAPIE, Leo LE BIHAN, Thomas BILLEQUIN
proposal title / Title of the proposal		HRES: Hybrid renewable energy system

Proposal description / Description of the proposal

Sun, wind, biogas and water (hydro) are currently the most promising renewable energy sources in the world. Countries, aiming to reduce the carbon emissions that cause climate change, are building huge solar and wind farms that power millions of homes and homeowners. Experiences of using hydro in liquid, biogas are more and more numerous.

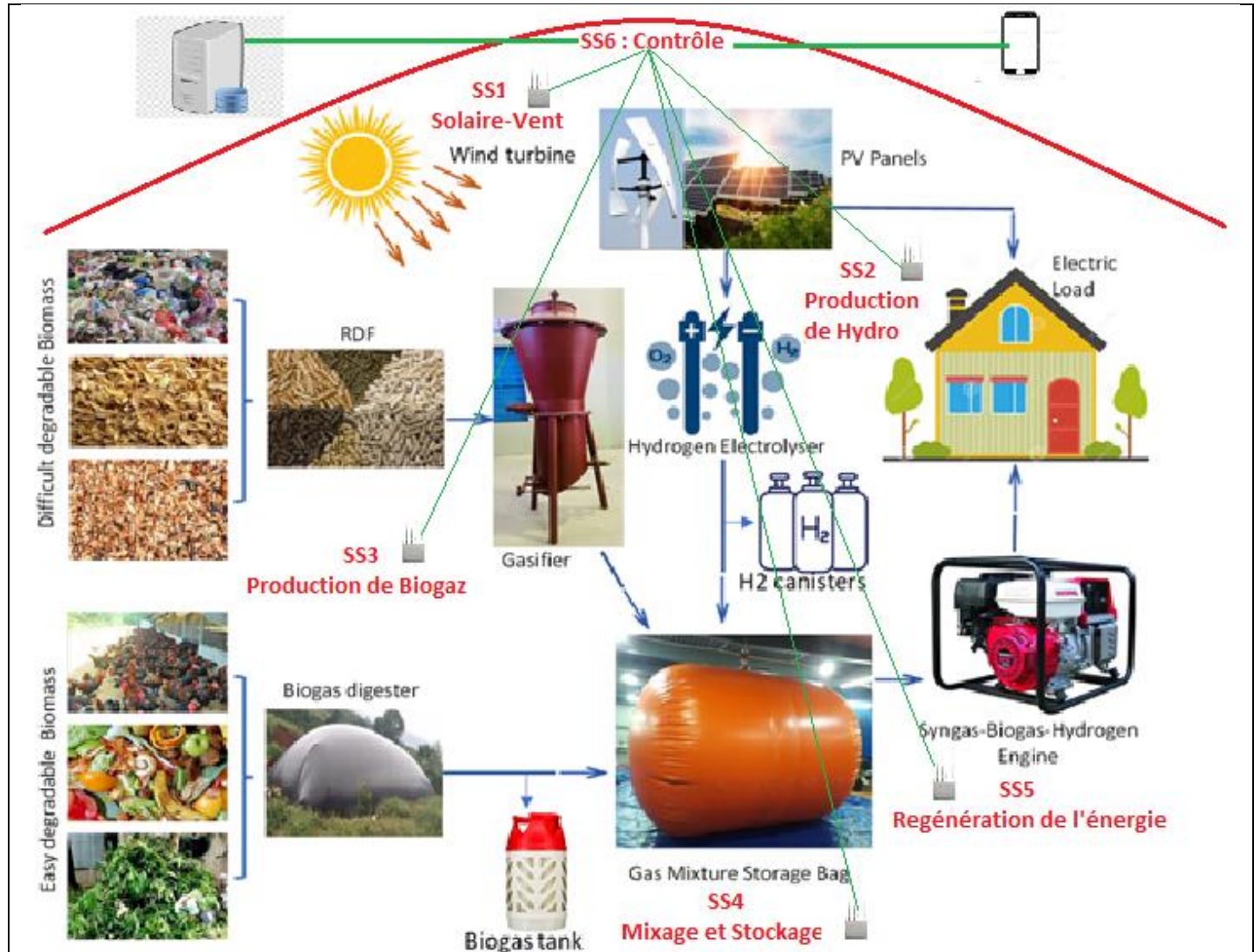
However, even with many methods of harnessing these renewables, the big problem of disruption in power generation still exists. Science can't really have the technology to reduce the effects of cloudy skies on a solar farm or find an alternative when the wind slows down over the sea.

In addition, the energy produced in surplus must be stored to be stored to be reused on demand. Utilities are investing in massive battery designs to overcome this hurdle, but when the world is fully renewable, conventional batteries may not be mature and mature enough to handle the task. In addition, this method of storage is very dangerous for the environment.

Finally, single-family homes are also looking for energy-saving solutions, choosing smaller energy systems that can generate enough power for their homes, independent of the grid. Transport is also looking for solutions to replace fossil fuels with other cleaner energies.

Objective

The objective of this project is to find a suitable solution answering these questions. The idea is to build a prototype of a hybrid energy production and storage system having several complementary subsystems of different types of renewable energies allowing a continuous and almost automatic production of energy as illustrated in the following diagram:



1. - SS1: A mixed Solar-Wind subsystem consisting of a mini-wind turbine and some energy production panels (to be built). Solar panels provided, Wind turbines are to be manufactured (design of wings, 3D printing of wings, wind turbine installation). Installation of wind-solar clusters (Converter, battery, etc.).
2. - SS2: A Hydro production subsystem using the energy of SS1 (existing module to be integrated): SS1 energy control group to electrolyze hydrogen
3. BioGas production subsystem (existing module to be integrated): Research on the automatic control of available gasifiers , control of the gasification furnace
4. - SS 4: A subsystem for mixing and storing BioGas and Hydrogen in metal hydride form (existing module to be integrated): Storage of solar-wind-gas energy in the form of hydrogen (metal hydride)
5. - SS 5: A subsystem regenerating hydrogen from the SS4 metal hydride form (existing module to be

integrated) to operate a heat engine: for example, a water pump or a scooter, ...: engine control using gas of synthesis-hydrogen.

6. - SS6: A remote control subsystem that fully controls the hybrid renewable energy system, based on controllers, IoT sensors and LoRaWAN and Internet transmission allowing the prototype to be operated synchronously between the subsystems. systems, to observe the operating status of the prototype and to intervene remotely, ...

The work of this internship will take place in two groups:

1. Energy Group (G4E group): including Paul LARHANTEC, Vietnamese doctoral students and students in the underlying fields who deal with the study and development of SS1, SS2, SS3, SS4, SS5 subsystems.
2. Control Group (G4C group): including Benoit GAUDET, Florian LATAPIE, Leo LE BIHAN, Thomas BILLEQUIN who take care of the study and development of the SS6 control subsystem with some students from the FAST department. The G4C group will be specially followed by Dr LE QUOC HUY.

Paul LARHANTEC has a connection role between the two groups G4E and G4C.

Global manager of the HRES project (Hybrid renewable energy system) is PR BUI VAN GA who is supported by Dr DO THE CAN (Mechanical-Automatic-Computer) and LE QUOC HUY (Electronics-Telecommunication-Computer).

This project is very useful and ambitious which requires increased monitoring. The work organization will be defined by the supervisors and trainees of the group. The student of the specialty of Energy can be leader of the group.

Appendices:

1. Example of Unéole :

Unéole 's design provides an integrated structure in the event of a drop in renewable energy production. The equipment can automatically switch to another renewable generation source or use part of the energy from both sources to meet energy needs.



2. Some types of mini vertical wind turbines



Useful links

- [1] Solution Uneole : <https://uneole.fr/>
- [2] LoRa Navigation Quick search. <https://lora.readthedocs.io/en/latest/>
- [3] LoRa Alliance - <https://lora-alliance.org/>
- [4] The Things Network <https://www.thethingsnetwork.org/>