

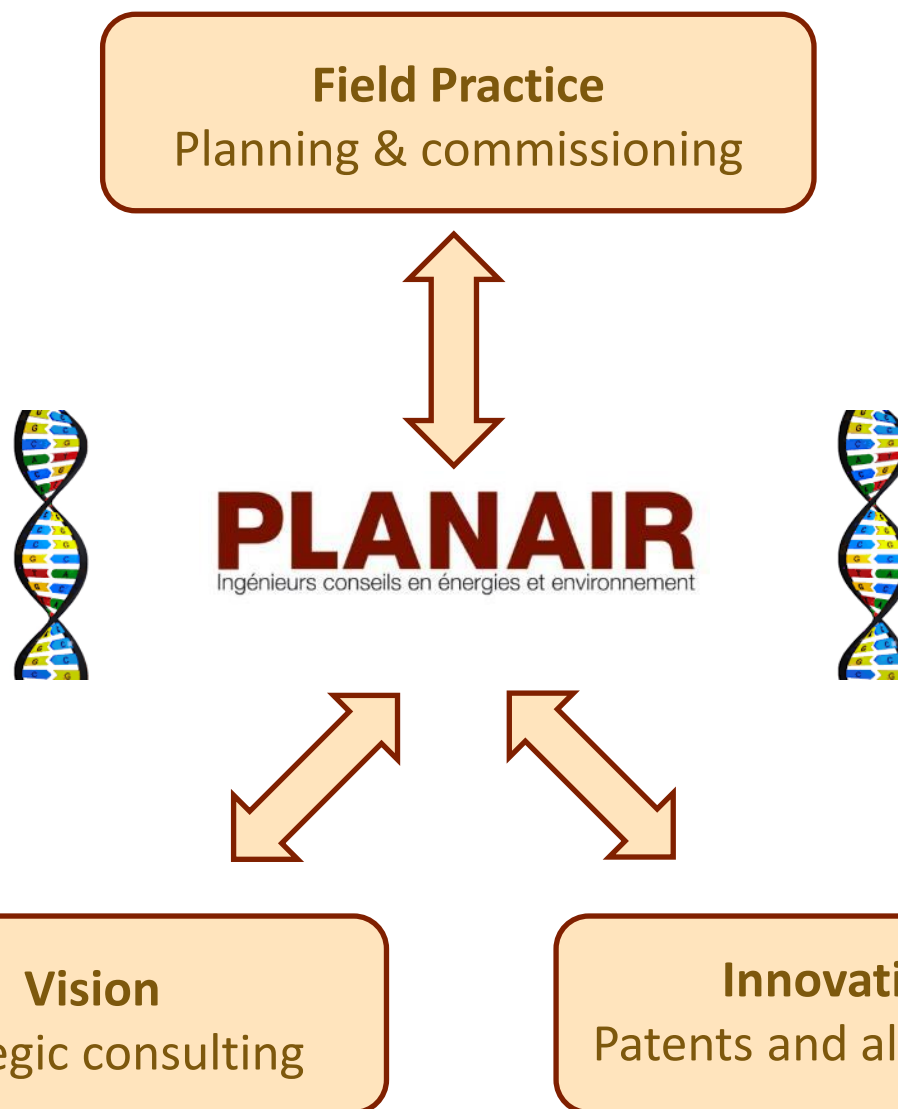
# Hydrogen Hybrid Applications

**IEA Wind Hybrid TEM**  
**Technology talks**

Lionel Perret

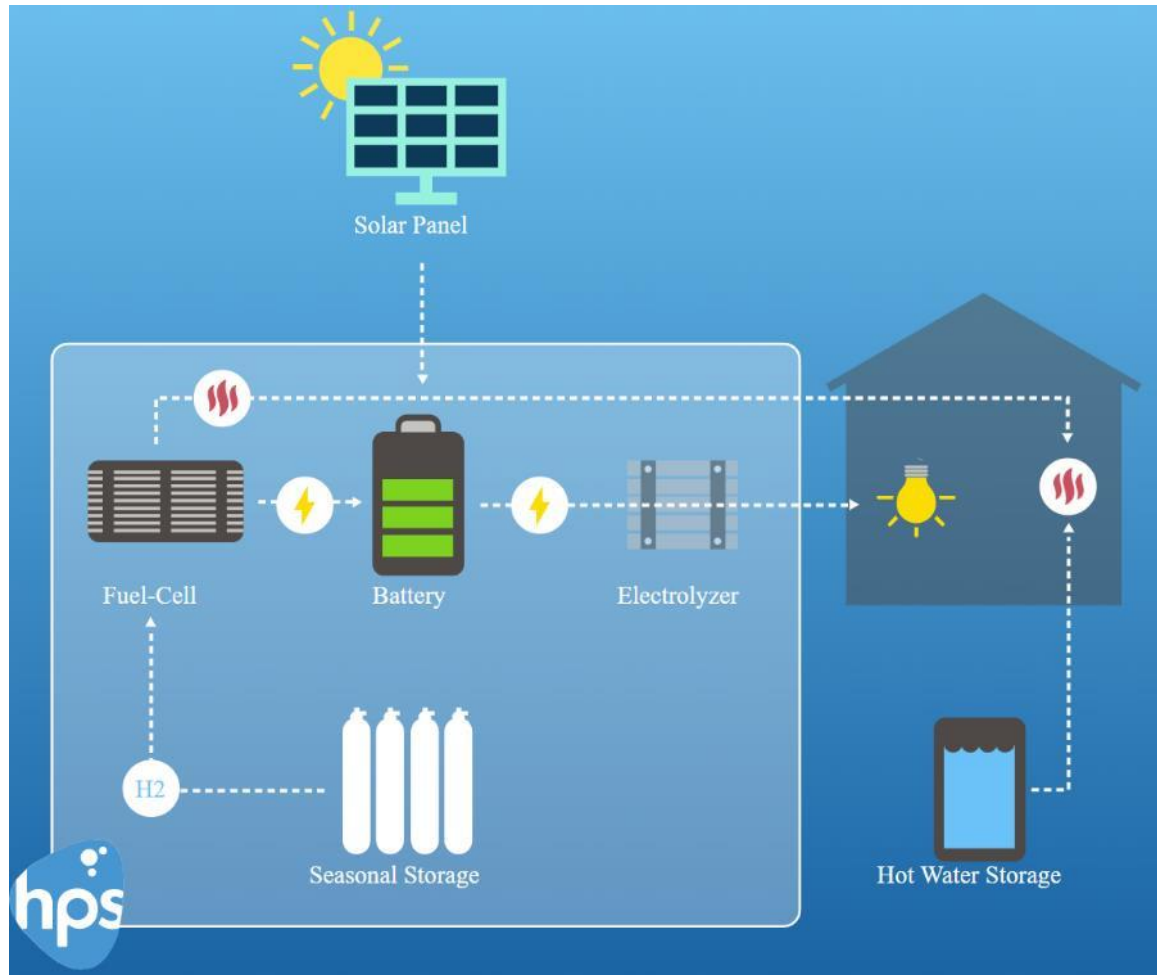
# Planair SA DNA

Bringing together practice, innovation and vision for 100% renewable energy systems



# Hybrid application : building level

*HPS Picéa has developped a turnkey unit for automous houses*



<https://www.homepowersolutions.de/en/product>

1 kW electrolyser  
1,5 kW fuel cell  
25 kWh battery  
300 to 800 kWh H<sub>2</sub>

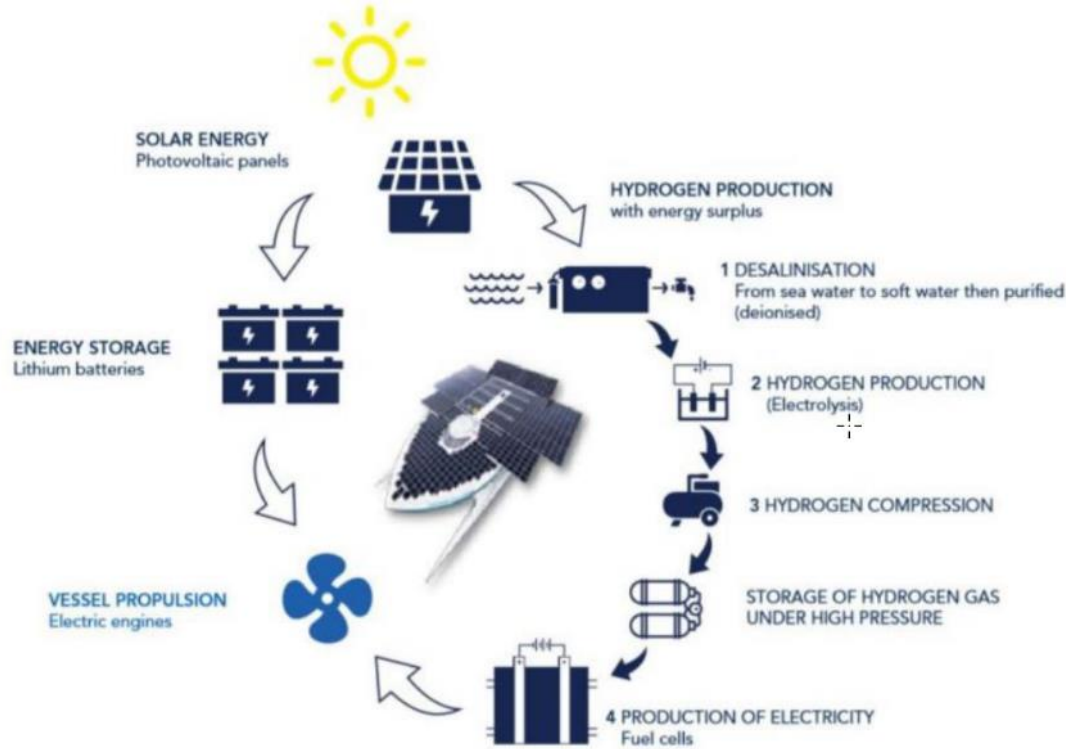
# Hybrid application : building level

## *Autonomous collective building*



# PV and Hydrogen : Islands

*2 years experience on Race for Water ship*



Since  
April  
2017

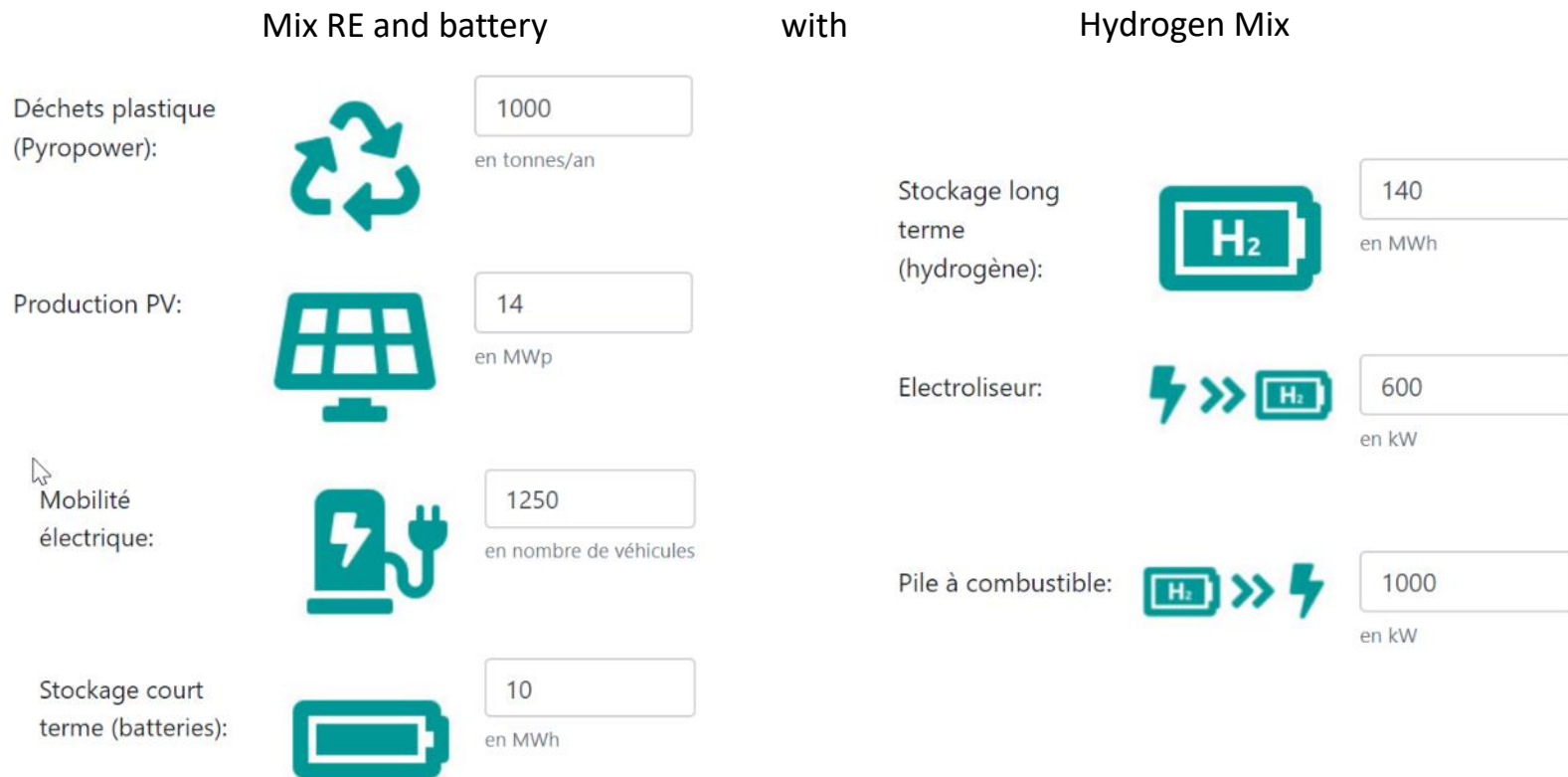




# PV and hydrogen : Islands

## 100% renewable scenarios for Easter Island (Rapa Nui)

15mn energy mix optimization

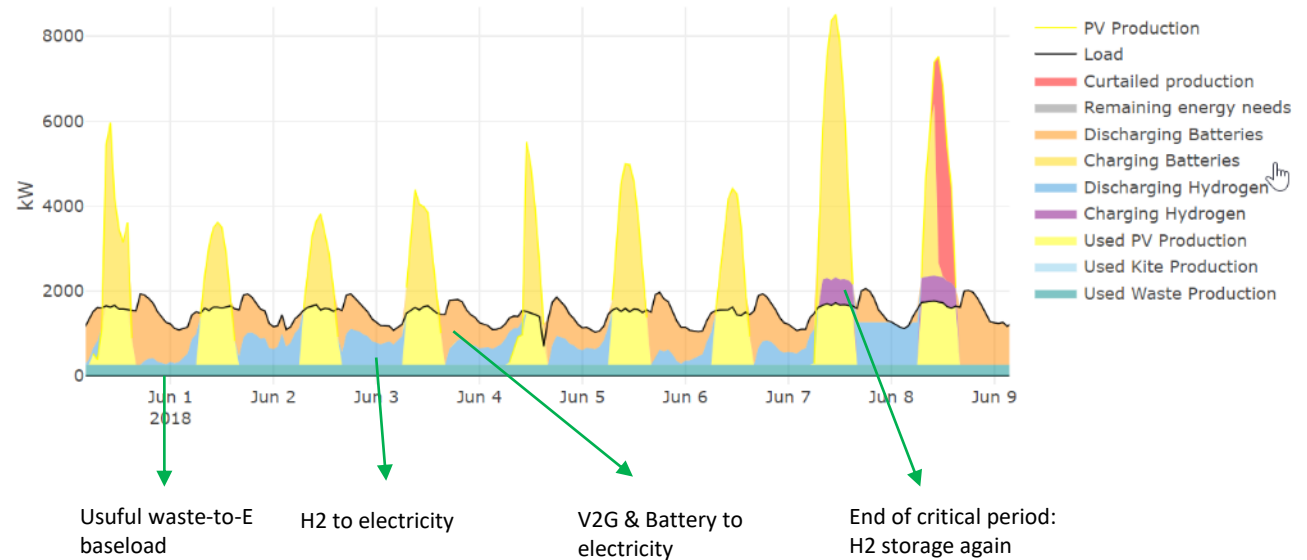


Investment of 29 M\$, pay back time around 7-9 years

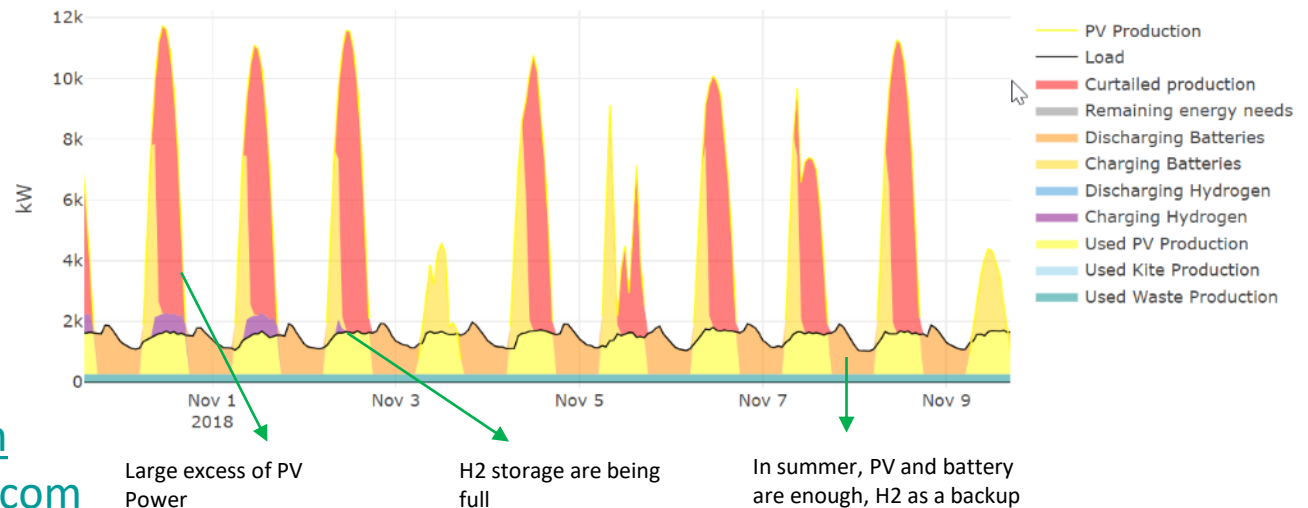
# PV and hydrogen : Island

## Optimized energy balance in Easter Island

Winter



Summer



Our online links

[www.blueislas.com](http://www.blueislas.com)

[www.gridnewdeal.com](http://www.gridnewdeal.com)

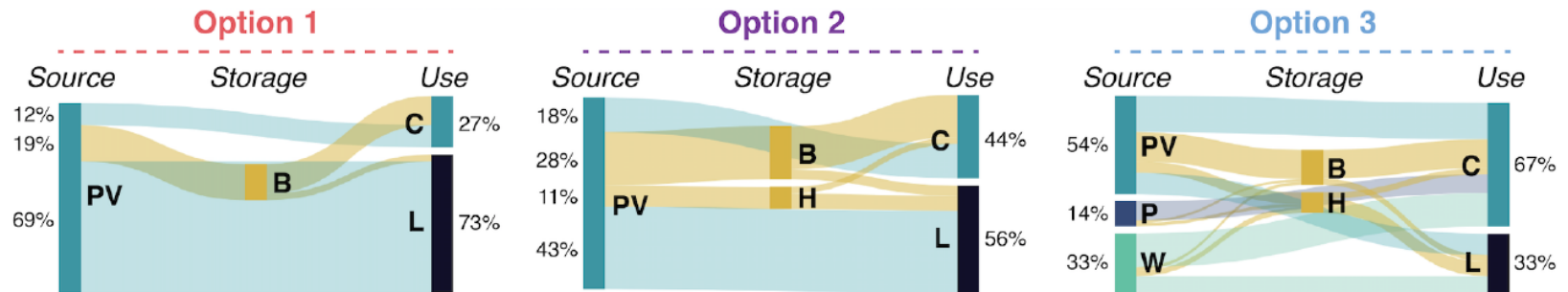
# PV and hydrogen : Island

## Optimized energy balance in Easter Island

Front. Energy Res. | doi: 10.3389/fenrg.2020.00147

### Benefits of a diversified energy mix for remote areas: the case of Easter Island

Marine Cauz 1;2, Lionel Bloch 1, Christian Rod 2, Lionel Perret 2, Christophe Ballif 1;3 and Nicolas Wyrsh 1



**Figure 2.** Summary of annual energy fluxes between energy sources, storage systems and uses. Energy sources include photovoltaic (PV), wind turbines (W) and Pyrolysis (P); storage systems include lithium-ion batteries (B) and hydrogen-based storage (H); and uses include consumption (C) and losses (L).

Our online links

[www.blueislas.com](http://www.blueislas.com)

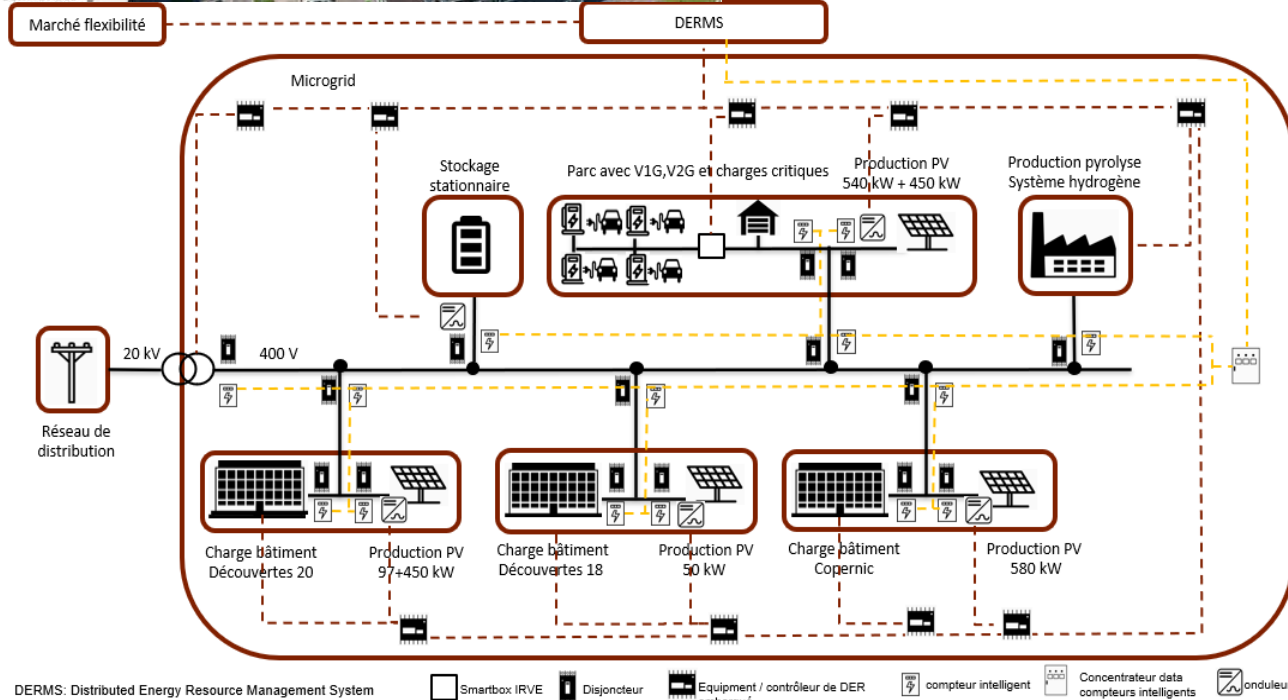
[www.gridnewdeal.com](http://www.gridnewdeal.com)



# Hybrid PV application : District

## *Demonstration of a microgrid PV/V2G/Pyrolysis*

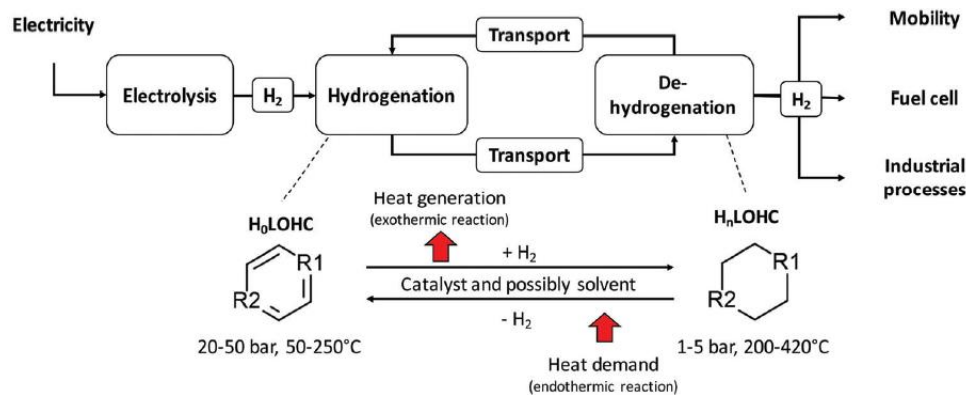
SunnYparc project by Planair includes 375 EV (50 V2G), 2 MWp PV, batteries and 300 kW pyrolysis production to test an islanded microgrid in an industrial environment



# Storage with LOHC: case for Switzerland

## *Can Hydrogen be the new hydro dams ?*

LOHC	Reason for consideration
<i>N</i> -Ethylcarbazole (NEC)	Well-studied nitrogenous LOHC
Dibenzyltoluene (DBT)	Already existing application as a LOHC; safe and convenient handling
1,2-Dihydro-1,2-azaborine (AB)	Unique characteristics through integration of boron and nitrogen
Formic acid (FA)	Safe and convenient handling
Methanol (MET)	Very high storage density
Naphthalene (NAP)	Well-studied cycloalkane; high storage density
Toluene (TOL)	Well-studied cycloalkane; planned application as a LOHC



LOHC storage and transport concept (H<sub>0</sub>LOHC: unloaded LOHC, H<sub>n</sub>LOHC: loaded LOHC).

*Energy Environ. Sci.*,  
2019, 12, 290



- Liquid organic hydrogen carriers (LOHCs) are a potential storage vector, but efficiency of the chain remains a challenge, project to convert an old Swiss refinery

## Can Hydrogen be the new hydro dams ?



# Conclusion

## *Competitive hybrid PV systems*

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- Surplus of renewable energy are needed
  - Massive Solar and Wind deployment can bring a large part of the solution
  - Produce as much as you can, focussing on annual yield
  - Create policies for cheap electricity in Winter
- Storage need cheap (even free) green electricity
- Long term storage need cheap molecules



# More information ?

**Lionel Perret**  
**Renewable Energy Director**  
[lionel.perret@planair.ch](mailto:lionel.perret@planair.ch)

Linked In : [Lionel Perret](#)

**PLANAIR SA**  
[www.planair.ch](http://www.planair.ch)

