

# **NORMANDY**

## Energy sector

### Focus hydrogen & MRE

February 2020

[WWW.ADNORMANDIE.FR](http://WWW.ADNORMANDIE.FR)

**NORMANDY:**

**a leading region for the HYDROGEN SECTOR**



# NORMANDY

## HYDROGEN

### Roadmap



#### ORIGINS

- National commitments
- **Marine energy projects**
- Strong **industrial and logistics sectors** having a large contribution on GHG emissions
- Competences : **chemistry, energy, automotive, aeronautics**



# NORMANDY

## HYDROGEN

### Roadmap



#### METHOD

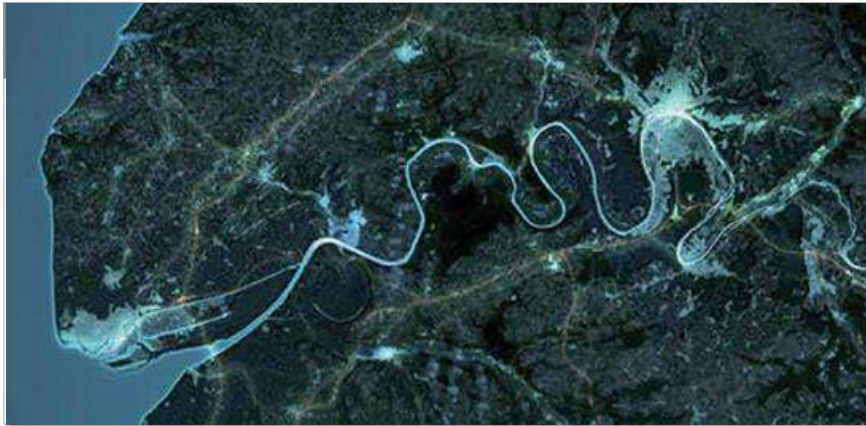
- **6 months** regional dialogue
- **100 stakeholder's** involved
- **12** working sessions
- **3** plenary meetings
- Roadmap voted in **oct. 2018**
- **46** actions planned



# NORMANDY

## HYDROGEN

### Roadmap



#### MAIN CHALLENGES

1. Structure the ecosystem
2. Strengthen the place of hydrogen in the energy transition
  - ↔ **Industry**
  - ↔ **Mobility**
  - ↔ **Logistics**

#### TOOLS

- Expanded steering committee
- Technical Committee
- Working sessions
- Annual **plenary meeting**
- Annual **regional call for proposals**
- **15 M€** budget

# NORMANDY HYDROGEN Ecosystem



# NORMANDY

## INNOVATION, RESEARCH & DEVELOPMENT & TRAINING

- ✓ A workforce ecosystem adapted to the industry
- ✓ Specific training programs
- ✓ High level scientific and technical skills
- ✓ State-of-the-art equipment for R&D
- ✓ Business and innovation Networks



### ◆ ENSICAEN ENGINEERING SCHOOL ([www.ensicaen.fr](http://www.ensicaen.fr))

750 students, more than 8000 engineers employed and 150 PhD students.

Electronics & applied physics, Materials & Mechanics, Computer Science.



### ◆ NORMANDY UNIVERSITY ([www.normandie-univ.fr](http://www.normandie-univ.fr))

Multidisciplinary Universities in Caen, Rouen and Le Havre - Master's degrees: Physics, Engineering Sciences, Development of Scientific Instruments, Optics, Detection; Physics, Mechanics, Engineering Sciences, Energy, Fluids and Environment; Mechanics, Engineering Sciences, Mechatronics, Components, Reliability.



### ▶ ITII

(Institute of engineering industry engineer) 250 students in September 2018 on the Campus of space in VERNON / training of engineers 'mechanics and production.



### ▶ ESIGELEC

The ESIGELEC research laboratory, IRSEEM, leads several research projects on the theme of autonomous vehicles.



### ▶ CORIA ([www.coria.fr](http://www.coria.fr))

The research fields of CORIA cover fundamental studies and applied to reactive or non-reactive flows: diphasic flows, turbulent mixing phenomena, combustion, plasmas, etc. Physical mechanisms and processes leading to the reduction of pollutant emissions in reactive systems are priority research axes.



### ▶ CESI Rouen ([www.eicesi.fr](http://www.eicesi.fr))

The CESI campus in Rouen includes a Research and Innovation Platform in Industrial Performance. Master in renewable energies



### ▶ INSA Rouen ([www.insa-rouen.fr](http://www.insa-rouen.fr))

Engineering school with 7 specializations, 7 Masters, 6 doctoral programs : chemistry and Processes, Control of industrial risks, Energy and Propulsion, Mechanics, Architecture of information systems, Mathematical Engineering, Civil engineering



## CLUSTER

### ◆ NORMANDIE ENERGIES ([www.normandie-energies.com](http://www.normandie-energies.com))

Association of energy professionals, Normandie Energies set up a hydrogen cluster aiming to gather complementary skills and expertise for hydrogen projects development.



# NORMANDY

## HYDROGEN



### Projects covering the whole value chain

	Production	Usage	Recycling	Research	Management and social acceptability
ONGOING		<b>Mob.</b> <ul style="list-style-type: none"> <li>• EAS-HyMob</li> <li>• BHYKE</li> </ul> <b>Habitat</b> <ul style="list-style-type: none"> <li>• Logeo</li> </ul> <b>Logistics</b> <ul style="list-style-type: none"> <li>• ROAD</li> </ul> <b>Storage</b> <ul style="list-style-type: none"> <li>• Chausey Isl.</li> </ul>	Morphosis	<ul style="list-style-type: none"> <li>• RAPHYD</li> <li>• Ergosup</li> <li>• GENCOMM</li> </ul>	<ul style="list-style-type: none"> <li>• DEPLHY</li> <li>• H2 Academie</li> <li>• TETHYS</li> <li>• Artémis</li> </ul>
UPCOMING	<ul style="list-style-type: none"> <li>• H2V</li> <li>• Tertu SA</li> <li>• ETIA</li> </ul>	<b>Mob.</b> <ul style="list-style-type: none"> <li>• NEAC</li> <li>• Bus/ coach</li> </ul> <b>Fishing</b> <ul style="list-style-type: none"> <li>• H2 Trawler</li> </ul> <b>Logistics</b> <ul style="list-style-type: none"> <li>• H2 trucks &amp; barges</li> </ul>			

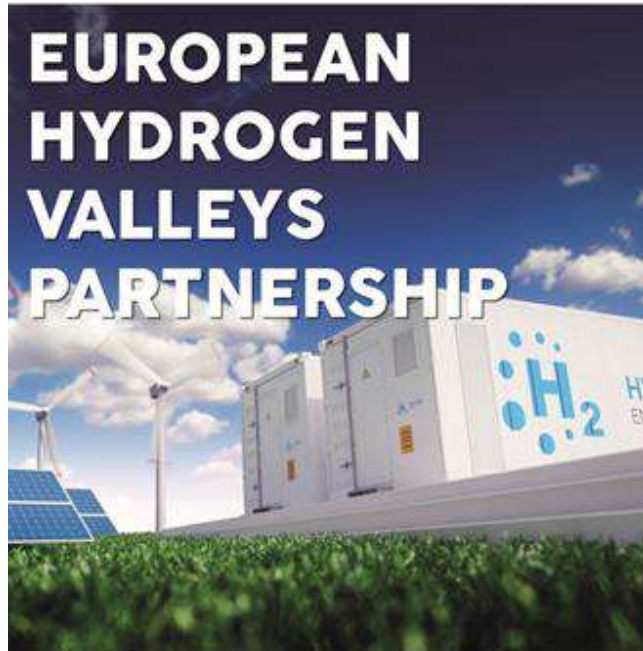


# NORMANDY

## ENERGY

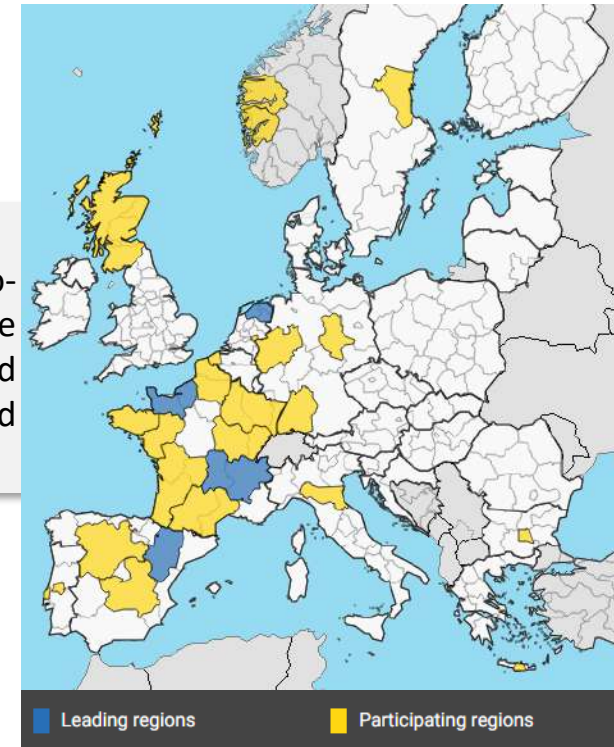


### Leader of European Hydrogen Valleys Partnership



#### Objectives

↪ Develop partnership and co-investment projects to support the development of the fuel cells and hydrogen value chain in Europe and the deployment of these technologies



- ↪ industrial modernisation Smart specialisation platform
- ↪ 40 members
- ↪ Official launch : 22/05/2019
- ↪ Technical launch : 25/06/2019
- ↪ Mapping : summer 2019
- ↪ Working group : from october 2019

# NORMANDY

## HYDROGEN



### European program for hydrogen mobility in Normandy



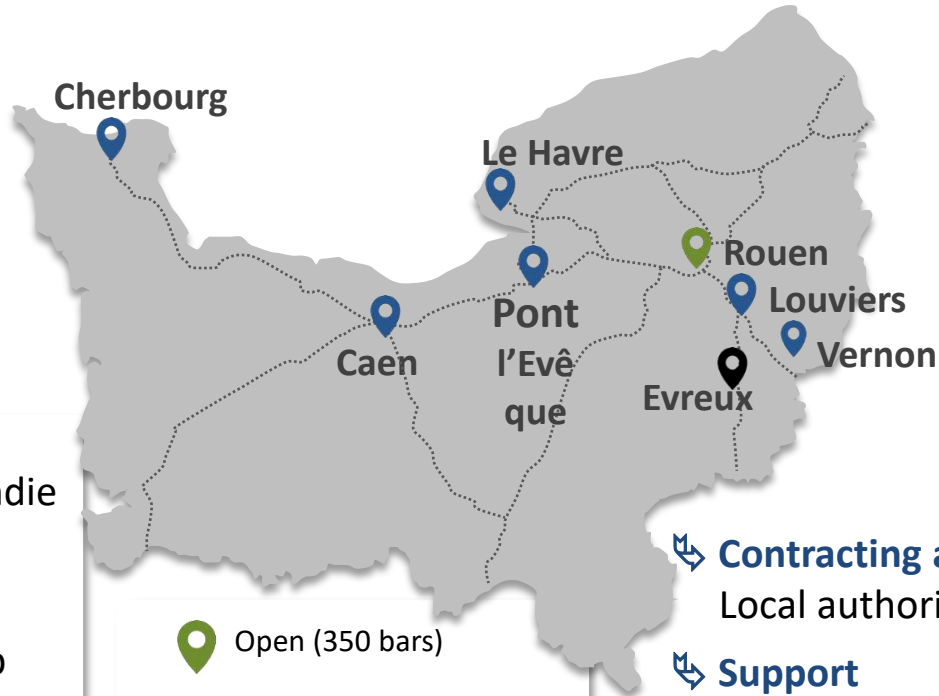
↪ **Period** 2016-2019

↪ **Budget** 8 M€

↪ **Partnership** Symbio  
Région Normandie  
Serfim

#### ↪ **Objectives**

- Deploy a network of start-up stations with captive fleets
- Develop a connected device for station access and billing



📍 Open (350 bars)

📍 Opening in 2019 (350 bars)

📍 Opening in 2019 (700 bars)

↪ **Contracting authority**  
Local authority and group

↪ **Support**

- Assistant project manager
- Regional grant
- Raising awareness

↪ **Compatibility with Hyundai Nexö and Toyota Mirai**

- Slow filling ramp protocol
- Dispensing gun with infrared communication



Co-financed by the European Union  
Connecting Europe Facility

# NORMANDY HYDROGEN



## European program for hydrogen mobility in Normandy



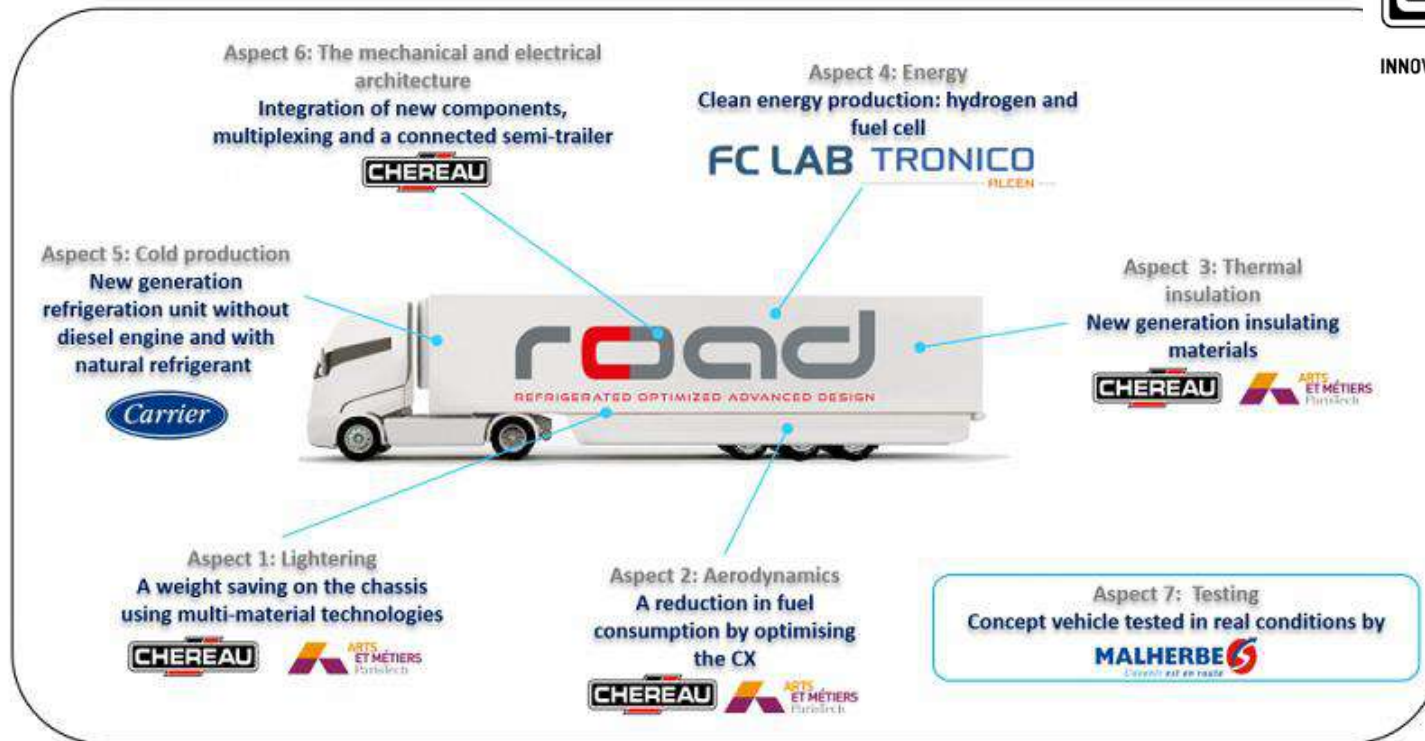
# The first hydrogen refrigerated semi-trailer

## Designed, produced and tested in Normandy

### ROAD semi-trailer description



INNOVATION DRIVES YOU FORWARD



# NORMANDY

## ENERGY



### EXAMPLE OF HYDROGEN DEPLOYMENT IN THE SEINE VALLEY IN NORMANDY

#### H2V in Normandy, a green hydrogen production plant (2022)

4 industrial buildings could be used for **the industrial production of hydrogen by electrolysis of water.**

- One Part of this hydrogen will be used within the chemical platform
- The other part will be injected into GRTgaz's network

#### Key figures

- 27 hectares on the Industrial Port Zone in the Seine Valley
- **250 M€** investment
- **180 jobs** at the beginning



**28 000 tonnes**  
d'hydrogène produit par an  
(soit 3% de la production française d'hydrogène)

Un investissement compris entre  
**230 et 251 millions d'euros**

La réaction chimique de l'électrolyse de l'eau



...deux molécules d'eau se décomposent en deux molécules d'hydrogène et une molécule d'oxygène

**70 emplois directs**  
**100 emplois indirects**

Mise en service entre **2022**  
et **2023**

#### DEPLHY (Deployment of Hydrogen in the Seine Valley), a project to study the development potential in an **industrial environment** along the Seine Valley for 24 months.

- Analyzing the possibilities of deployment considering available or upcoming local resources
  - Biomass for gasification processes, steam reforming
  - Decarbonated (nuclear and renewable) electricity production for electrolysis.
- Establishing a global and prospective vision of the technico-economic potential of the hydrogen deployment in the Seine Valley



#### Hydrogen science park

- Project of an "HY Academy" to train the future profiles on the hydrogen trades with industrial companies & Develop continuing education and lifelong learning on Hydrogen (post graduate)
- Create a technical platform to train new employees (shared with industrials)

**NORMANDY**

**MARINE RENEWABLE ENERGY  
offshore & Tidal**



RÉGION  
NORMANDIE



**NORMANDIE**  
AGENCE DE DÉVELOPPEMENT



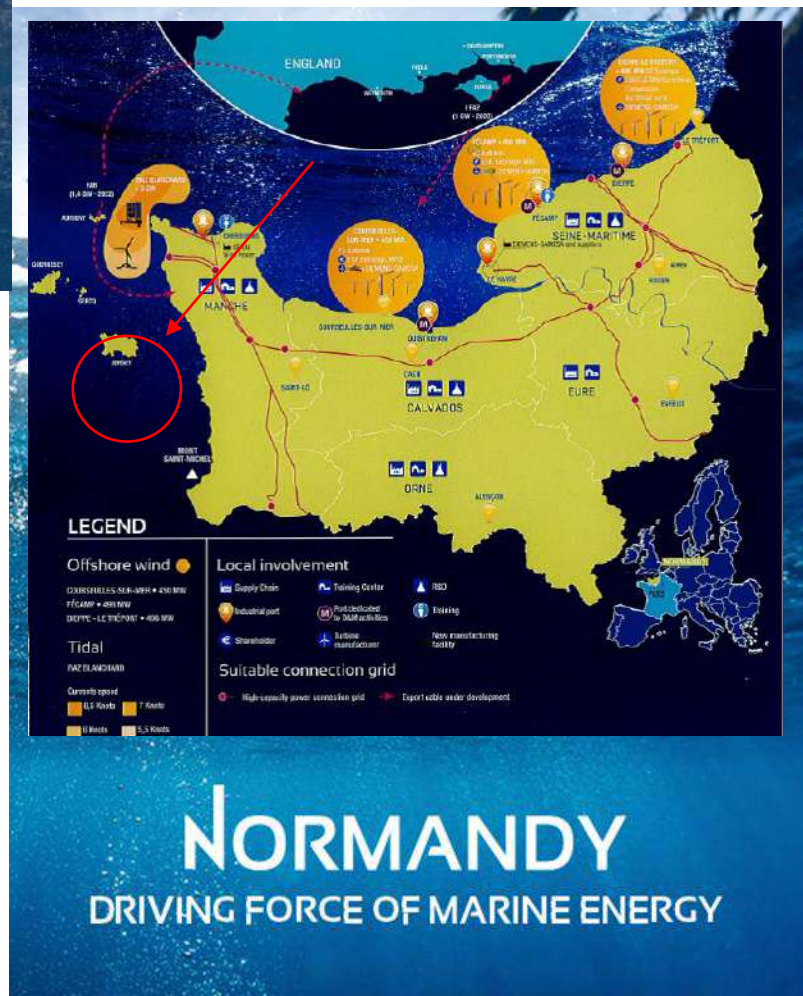
## MARINE RENEWABLE ENERGY – OFFSHORE WIND FARMS – TIDAL ENERGY



Example of regional companies

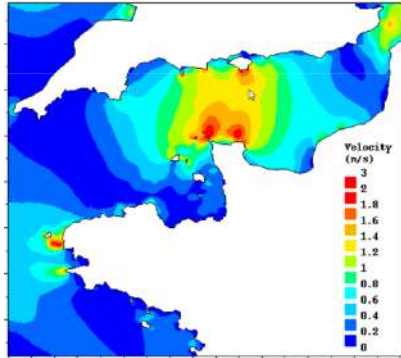


- ▶ **650km of coastline**
- ▶ **3 offshore wind farms:**
  - ▶ Courseulles-sur-mer: power 450 MW – 75 wind turbines
  - ▶ Fécamp: power 498 MW – 83 wind turbines
  - ▶ Le Tréport: power 496 MW – 62 wind turbines
- ▶ **Tidal energy projects**
- ▶ **1 hydroelectric farm** (biggest potential in the world) - Raz Blanchard
- ▶ **A powerful power grid** (capacity of 2.5 GW of hydroelectric generation)
- ▶ **A key infrastructure:** 2 industrial ports and 3 maintenance ports
- ▶ The Axe Seine, a major axis in terms of logistics
- ▶ **190 local companies** are involved in the MRE value chain
- ▶ 650 companies registered on the CCI Business MRE network
- ▶ More than **30 research structures** with recognized expertise (analysis of resources and environmental impacts of MRE activities, materials, corrosion and biofouling, energy and storage, high-performance numerical simulation, logistics and maintenance).
- ▶ 133 training centers
- ▶ **2 dedicated clusters:** « Normandie Energie » & « Normandie Maritime »



**NORMANDY**  
DRIVING FORCE OF MARINE ENERGY

## Raz Blanchard: the highest tidal site in Europe



## MRE PROJECTS IN NORMANDY

### Tidal: the Alderney Race, n°1 global tidal site available for commercial operations



Tidal energy requires locations with strong currents. Normandy has a particularly favourable asset with the Blanchard Alderney Race (a 5 GW potential), which is located between the Hague tip and the Channel Island of Alderney. It is located right next to the coast, to a port dedicated to the MRE industry and to a high capacity power grid.



## NORMANDIE HYDROLIENNES A regional commitment for your project

21 November 2018

SIMEC Atlantis Energy has agreed terms for the collaboration with the French region of Normandy under a joint venture called **Normandie Hydroliennes** that will work to deliver a phased large-scale tidal power project in the Raz Blanchard strait.





# NORMANDY/ MARINE RENEWABLE ENERGY INNOVATION, RESEARCH & DEVELOPMENT

36 organisations (research centres, labs, technical centres) are involved in MRE-related research and innovation activities. They are active along 5 strategic pillars:

- Setting-up of offshore wind farms and environmental impacts;
- Energy storage: modelling and mock-up (including hydrogen);
- Maintenance and logistics;
- MRE materials, corrosion and bio corrosion;
- Humanities and social sciences.



**CNRT MATERIAUX** ([www.cnrt.ensicaen.fr/](http://www.cnrt.ensicaen.fr/))

Federating 5 laboratories involved in material sciences: CIMAP, CRISMAT, LCMT, LCS and LOMC, CNRT supports high level collaborative research partnerships with industrials in the field of material sciences. LOMC is dedicated for MRE.



**LUSAC** (<http://lusac.unicaen.fr/>)

Laboratory created in 1994 specialized in the field of energy and materials. Specialized in marine environment survey / Marine energy conversion & numerical and physical modelling



**BOREA**

(<https://borea.mnhn.fr/en>)

Research unit for Biology of Aquatic Organisms and Ecosystems. Specialized in marine environment & survey.



**GREAH** (<https://greah.univ-lehavre.fr/>)

Research group specialized in electrical engineering. It has focused its activities on renewable energies and power storage.



**CORIA** ([www.coria.fr](http://www.coria.fr))

Research in physical mechanisms and processes to reduce polluting emissions in reaction systems.



**ESITC Caen** (<http://www.esitc-caen.fr/content/recherche>)

Applied R&D center for civil engineering , foundations materials and deposits and environment impacts



**Institut Carnot ESP** (<http://www.carnot-esp.fr/>)

The Carnot Institute ESP (Energy and Propulsion Systems) supports its partners in their R&D work by offering an integrated expertise of its laboratories.



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