

NORMANDY

Energy sector

Focus hydrogen & MRE

February 2020

WWW.ADNORMANDIE.FR

NORMANDY:

a leading region for the HYDROGEN SECTOR



RÉGION
NORMANDIE



NORMANDIE
AGENCE DE DÉVELOPPEMENT

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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**



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Roadmap



METHOD

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



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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)

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

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



◆ NORMANDY UNIVERSITY (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)

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)

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



▶ INSA Rouen (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)

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



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HYDROGEN



Projects covering the whole value chain

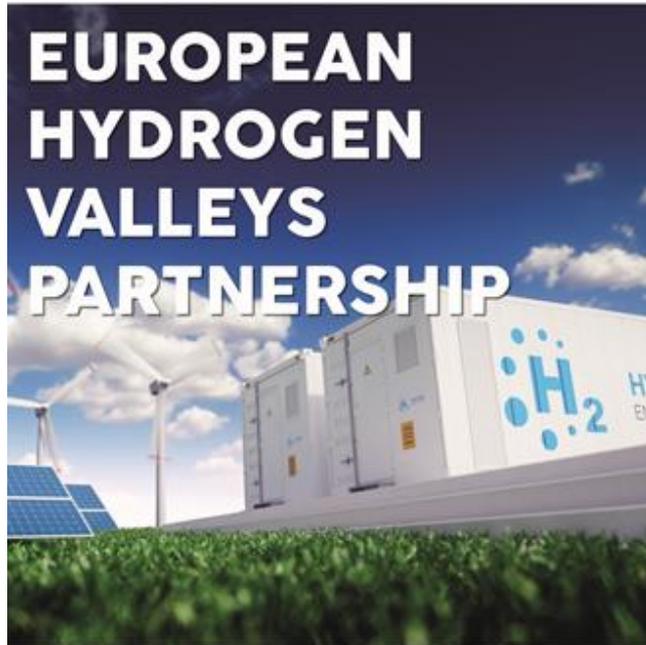
	Production	Usage	Recycling	Research	Management and social acceptability
ONGOING		Mob. <ul style="list-style-type: none"> • EAS-HyMob • BHYKE Habitat <ul style="list-style-type: none"> • Logeo Logistics <ul style="list-style-type: none"> • ROAD Storage <ul style="list-style-type: none"> • Chausey Isl.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

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ENERGY

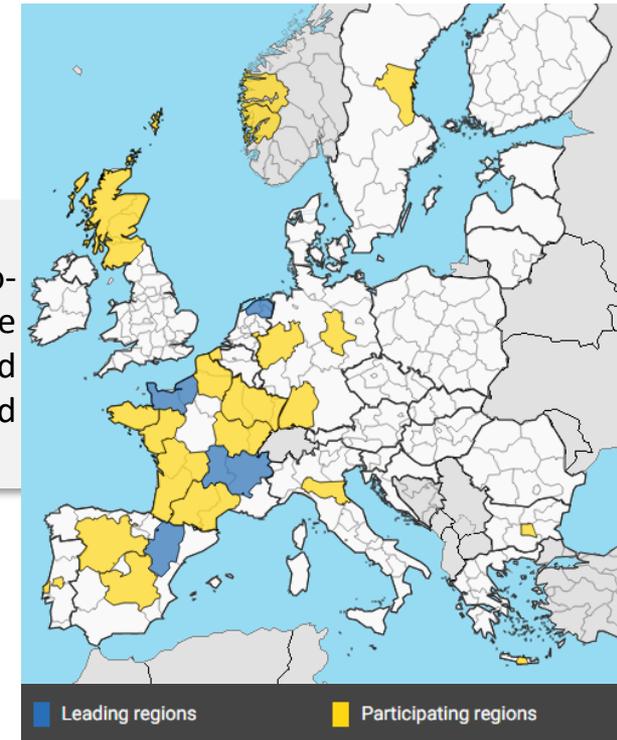


Leader of European Hydrogen Valleys Partnership



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

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European program for hydrogen mobility in Normandy



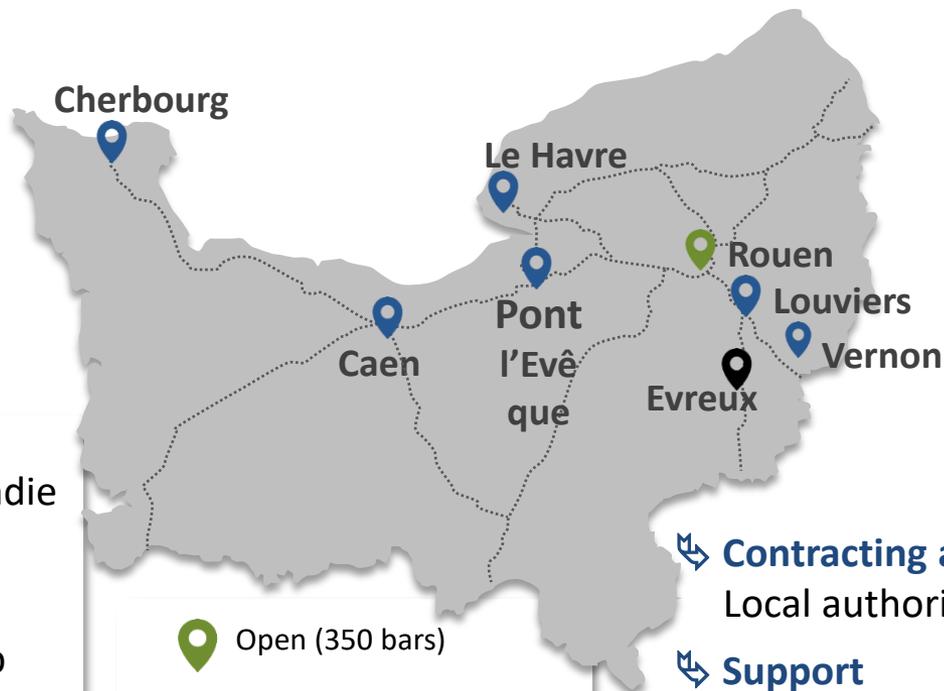
↪ **Period** 2016-2019

↪ **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



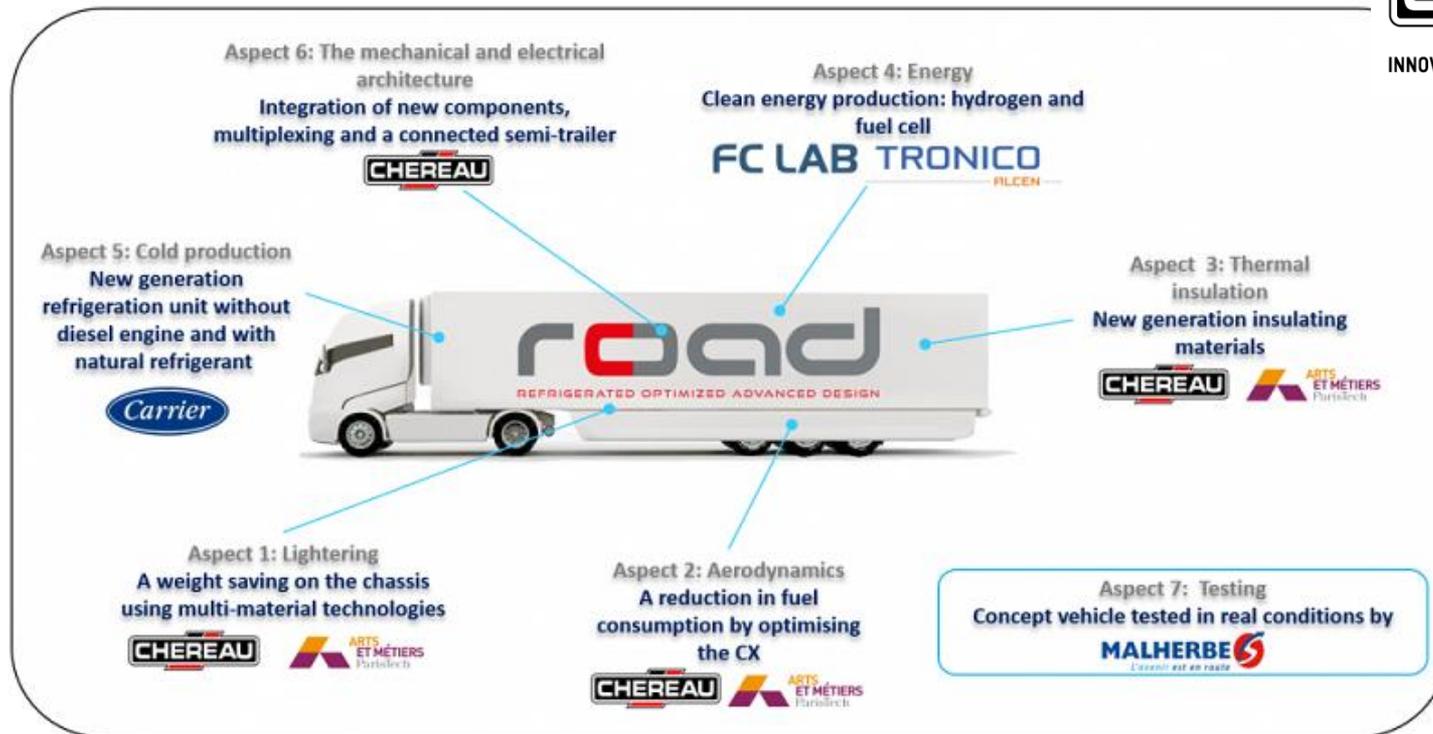
The first hydrogen refrigerated semi-trailer

Designed, produced and tested in Normandy

ROAD semi-trailer description



INNOVATION DRIVES YOU FORWARD



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

Sous l'action de l'électricité... $2H_2O \rightarrow 2H_2 + O_2$

...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)



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**MARINE RENEWABLE ENERGY
offshore & Tidal**



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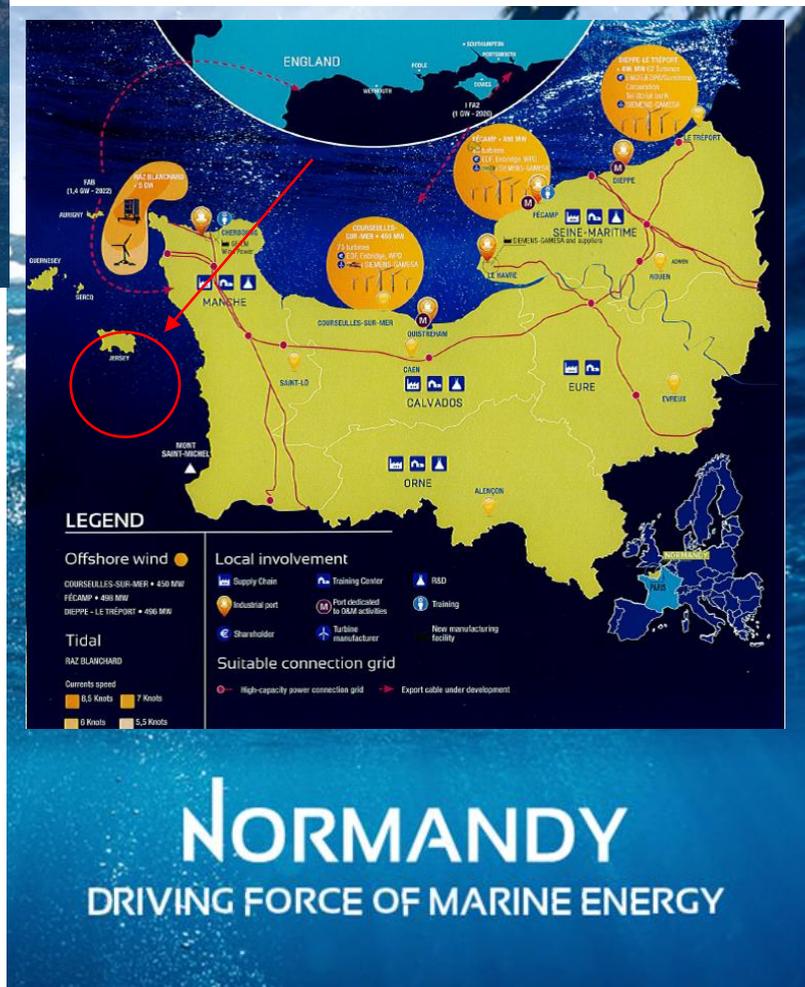
MARINE RENEWABLE ENERGY – OFFSHORE WIND FARMS – TIDAL ENERGY



Example of regional companies

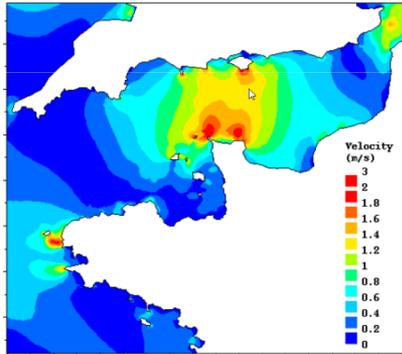


- ▶ **650km of coastline**
- ▶ **3 offshore wind farms:**
 - ▶ Courseulles-sur-mer: power 450 MW – 75 wind turbines
 - ▶ Fécamp: power 498 MW – 83 wind turbines
 - ▶ Le Tréport: power 496 MW – 62 wind turbines
- ▶ **Tidal energy projects**
- ▶ **1 hydroelectric farm** (biggest potential in the world) - 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 »



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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/)

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)

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



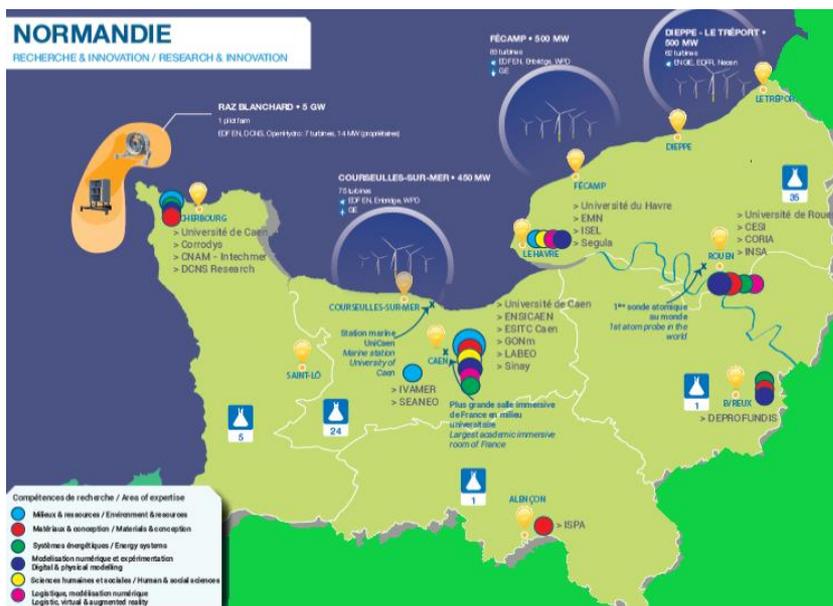
ESITC Caen (<http://www.esitc-caen.fr/content/recherche>)

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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