# Piel

by McPhy

## DESIGNER AND MANUFACTURER OF HYDROGEN AND OXYGEN GAS GENERATORS FOR LIGHT MANUFACTURING


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McPhy

Driving clean energy forward

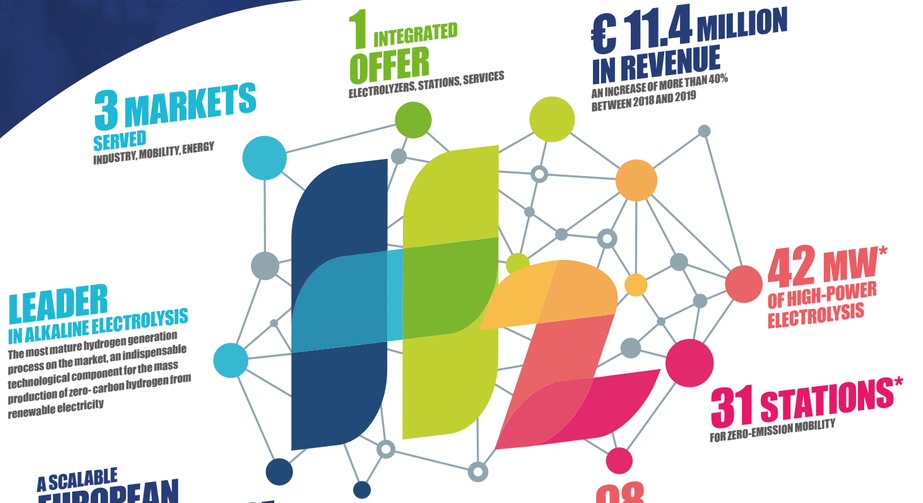
**In the framework of the energy transition, and as a leading supplier of hydrogen production and distribution equipment, McPhy contributes to the deployment of zero-carbon hydrogen throughout the world.**

Thanks to its wide range of equipment and services dedicated to the industry, mobility and energy markets, McPhy provides turnkey solutions to its clients adapted to their applications in industrial raw material supply, mobility solutions or renewable energy surplus storage and valorization.

As a designer, manufacturer and integrator of hydrogen equipment since 2008, McPhy has three development, engineering and production sites based in Europe (France, Italy, Germany).

McPhy Italia, a member of the McPhy Group, is a unique center specialized in the design, manufacturing and maintenance of a wide range of Piel and McLyzer electrolyzers.

The company's international subsidiaries ensure a global sales coverage of McPhy's innovative hydrogen solutions.




*[16 July, 2020] References that are already operational, being installed or under development. Among them: 4MW ELY and 2 HRS are condition apart of the ZEV framework contract *[18 June, 2020]*.


PRODUCTION CAPACITY: UP TO 300 MW PER YEAR

## McPhy ITALIA : IN SAN MINIATO, OUR CENTER OF EXPERTISE FOR ELECTROLYZERS

McPhy Italia, a member of the McPhy Group, is a unique center specialized in the design, manufacturing and maintenance of a wide range of electrolyzers. From machines for the precision industry of the Piel range, for which it is the exclusive designer and manufacturer, to McLyzer electrolyzers and to large multi-MW industrial platforms, our hydrogen production equipment covers a wide range of industrial applications.

As a result of over thirty years of experience in technical gases applied to metallurgy and welding for the manufacturing industry, our Piel hydrogen solutions have a proven track record and are recognized by more than 3,000 installations worldwide.

We design, manufacture and install hydrogen solutions that are adapted to your needs and requirements. Our vision is pragmatic: it's about applying our experience and expertise toward your productivity, energy efficiency and economic performance.

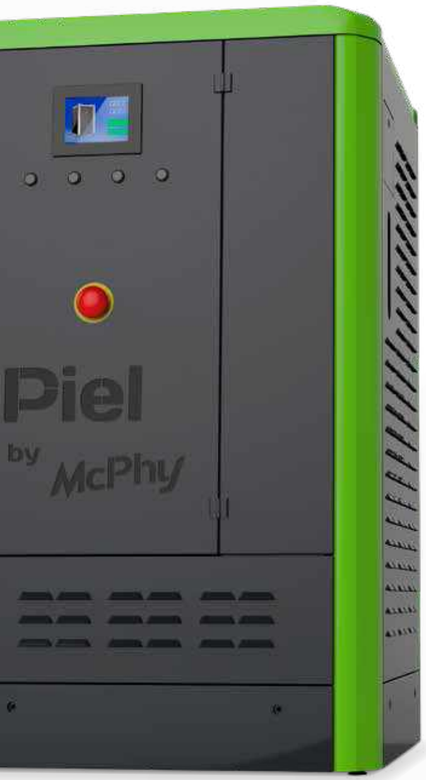
## PREMIER INDUSTRIAL INFRASTRUCTURE

- Design office, manufacturing and testing areas, customer service
- A production site of over 4,000 m², expandible up to 2 times
- Production capacity of 100 MW per year, expandible up to 3 times
- At the heart of an Italian intermodal hub, with direct connections with the rest of Europe
- 30 employees*
- ISO 9001 certified since 2015

*As of 2019.12.31

## MORE THAN A MANUFACTURER

**An experienced team, specialized technicians and widespread assistance centers: McPhy offers a complete energy consultancy package to satisfy all customer requests through cost/benefit analysis - thus guaranteeing a significant economic return.**




# Piel
## by McPhy

**MCPHY SUPPLIES INDUSTRIAL COMPANIES WITH ZERO CARBON HYDROGEN, RECONCILING PRODUCTIVITY, COMPETITIVENESS AND SOCIAL RESPONSIBILITY**

**Already used as feedstock in the industry for more than 100 years, hydrogen has since seen its development accelerated. By producing their zero-carbon hydrogen on site, using electrolysis from renewable electricity, industrial companies are entering a new low-carbon era.**

Our Piel product line comes from decade-long experience in the gold smithery sector, in precious metal treatment and in metallurgy, and covers a broad spectrum of applications from welding and brazing to the fashion industry.

Qualified and brand of choice for several industrial companies, our Piel hydrogen and oxygen generators are an ideal solution for light manufacturing. They integrate perfectly into industrial systems, whatever their size or business sector.

### A PROVEN TRACK RECORD OF 3,000 INSTALLATIONS WORLDWIDE

Our customers are choosing to produce hydrogen that is: on-site, on-demand, and according to their specifications. They say farewell to the constraints of traditional storage systems (compressed gas cylinders: hydrogen, oxygen, acetylene, propane) and achieve better and verifiable results in terms of:

- Security of supply and energy independence (freedom from logistic constraints),
- Productivity,
- Cost control,
- Reliability and continuity of service,
- Drastic reduction of their $CO_2$ footprint and air pollution,
- On-site production in the best conditions of quality and safety.



## QUALIFIED AND BRAND OF CHOICE FOR SEVERAL INDUSTRIAL COMPANIES,
# PIEL COVERS A WIDE RANGE OF APPLICATIONS

**With its hydrogen and oxygen generators, nitrogen generators, and its complete range of accessories and services, Piel covers a wide range of applications.**

### WELDING AND BRAZING
Spot welding, high precision and clean welding.

### CUTTING
High precision metal cutting. With Piel's high oxygen purity (99.5%), all metal cutting operations can be carried out manually or with single or multiple cutting etchers, with maximum precision and cutting speed even on large thicknesses.

### GLASS WORKING
*(heating, fusing and cutting operations)*
High-precision flames and reduced heat, fine-tuning the area heated on precision pieces, allowing for surprisingly precise work.

### HEAT TREATMENT
Optimal security and pure hydrogen, perfectly adapted to heat treatment furnaces.

### METALWORKING
Torches fueled by hydrogen and oxygen, a very flexible solution (flame regulation, deoxidation, etc.), freedom from the constraints of bottled gas.

### ALL INDUSTRIAL SECTORS ARE CONCERNED

- **Jewelry, gold smithery** and silverware.
- **Glass** industry.
- **Optical instruments:** induction welding used for the optical instruments can be performed by protecting the welding zone with an inert atmosphere made up of a mixture with hydrogen. This way eliminates the use of liquid deoxidizers, and the subsequent pickling.
- **Meteorology:** hydrogen produced on-site used to fill radiosonde balloons for meteorological institutes.
- **Electronics** industry.
- **Agri-food** industry.
- **Treatment of metals:** the ideal equipment for feeding furnaces for the treatment of metals in a controlled atmosphere (gold, silver, steel, etc.). The utmost hydrogen purity (up to 99.999%) and its safety in the production process makes it a preferable solution over the traditional systems.

## HOW DOES IT WORK ?

**Alkaline electrolysis, also called electrolysis, is a process used to produce hydrogen from electricity and water through an electrochemical reaction:**

**$2H_2O$ + Energy = $2H_2$ + $O_2$**
**Water + Electricity → Hydrogen + Oxygen**

**Piel generators produce hydrogen and oxygen, released separately from the electrolytic cell, through electrolysis of demineralized water. The gases are then cooled, dehumidified and made available for use at the two respective outlet valves.**

# FULL RANGE OF SMALL-SIZED HYDROGEN AND OXYGEN GAS GENERATORS

AN IDEAL SOLUTION FOR LIGHT MANUFACTURING


**From 0.4 to 10 Nm³/h at 1 to 8 bar: our proven design solutions, whose reliability has made our product a worldwide success, are perfectly in line with the requirements of light industry.**

| SERIES | Pressure (barg) | $H_2$ flow range ($Nm^3/h$) | $O_2$ flow range ($Nm^3/h$) | Electrical power range at nominal rate (kW) |
|---|---|---|---|---|
| Baby | 1 | 0.4 | 0.2 | 3 |
| P | 1 to 2.5 | 1 to 1.6 | 0.5 to 0.8 | 6 to 9 |
| M | 1 to 2.5 | 2.4 to 4.4 | 1.2 to 2.2 | 14 to 26 |
| H | 4 to 8 | 3 to 10 | 1.5 to 5 | 18 to 60 |

All of our products are CE marked, in full compliance with European Union directives [machine, low voltage, electromagnetic compatibility, pressure equipment directive].

**FULL RANGE OF OPTIONS**
- Purification • Demineralization • Monitoring and control • Cooling / Pre-cooling system
- Accessories for brazing – welding - heat treatment

## PIEL NEW GENERATION

- Engineered to cover a **wide range of applications**
- **"Plug and play" technology,** producing 24h, on-demand, according to your requirements
- **Remote monitoring** and diagnostic-ready
- **Ultra-modern design,** PLC touch screens, precise and timely process monitoring, simple and intuitive diagnostics, and fast and cost-effective maintenance
- **A new layout for easier maintenance,** decreasing downtime for our customers
- Best materials selected, for **advanced reliability**
- Updated sensors, for **optimized control**
- New control and power unit with proven **high-quality components**
- **Wide selection of options** available on demand
- **Safety further improved**
- Option to **customize the color of your generator**

## KEY FEATURES OF OUR PIEL SMALL-SIZED ELECTROLYZERS

- **Alkaline electrolysis:** the most mature and robust technology on the market.
- **Fully integrated turnkey system.**
- **Remote supervision** and maintenance.
- **COST CONTROL**
  - **Low cost of the gases:** approximately 5.5 kWh are required to produce 1 $Nm^3$ of gas - considerable savings.
  - 20% savings on brazing allows for a higher working speed (+ 15-25%) for the specific characteristics of the hydrogen and oxygen.
- **Zero-carbon energy:** the combustion of hydrogen with oxygen does not produce residual products. Total absence of smoke pollution. Operators do not need cumbersome breathing masks, and it is not necessary to install extensive purifying systems.
- **Separated gas generation** gives you the option of adjusting the flame: neutral, oxidizing, reducing, in addition to the option to use the hydrogen and oxygen separately.
- **Convenience / Autonomous units:** can be transported anywhere for the production of hydrogen and oxygen. With its four pivoting wheels, the machine is easy to move to where you need it to go.
- **Safety:** the gas is produced at actual point of use and there is no compressed gas volume. Piel equipment does not require any authorizations from Health Authorities or Fire Brigades.
- All of our products are CE marked, in full compliance with European Union directives [machine, low voltage, electromagnetic compatibility, pressure equipment directive].

## WITH THE PIEL NEW GENERATION: WELCOME TO INDUSTRY 4.0

The industry's digital shift is a strategic move towards smarter, automated manufacturing processes that are more connected, more flexible and more efficient.

Thanks to the smart sensors integrated into the new Piel line, your pool of equipment is digitally connected, and our programmable logic controllers (PLC) collect, process and share real-time data, before, in a fully automated way, (re)defining your operating process towards increased productivity.

INDUSTRY 4.0

# DIGITAL:
## OUR REMOTE SUPERVISION AND ASSISTANCE MODULE


**With our remote assistance module installed on your Piel generator(s), the sensors ensure real-time data collection and provide all the insights you need to help your operators increase their operational efficiency,**

**Thanks to its wireless connectivity, the Piel generator can - anytime, anywhere, and fully autonomously - transmit its data and self-analysis so that our teams can work quickly and remotely on a diagnosis, intervene on the programming or arrange for any on-site maintenance operations.**

**Our digital solution is environmentally friendly. It shortens your lead times and gives you more flexibility, drastically increasing the efficiency and profitability of your hydrogen system.**

McPhy

Driving
clean energy
forward

***McPhy - a pioneer of hydrogen solutions in the service of the energy revolution - has made a name for itself among the world leaders in zero-carbon hydrogen production.***

## We invite you to discover our range of small-sized hydrogen and oxygen Piel gas generators, specifically designed for light manufacturing.

*From 0.4 to 10 $Nm^3/h$ at 1 to 8 bar: we design, manufacture and install hydrogen solutions that cover a broad spectrum of applications from welding and brazing to the fashion industry or meteorology.*

***To find out more about the McPhy Group, visit our website***

**mcphy.com**

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# Piel

by McPhy

PROGETTISTA E COSTRUTTORE

## DI GENERATORI DI GAS SEPARATI IDROGENO E OSSIGENO

PER PRODUZIONE ON-DEMAND

PER L'INDUSTRIA LEGGERA


IT

McPhy

Driving clean energy forward

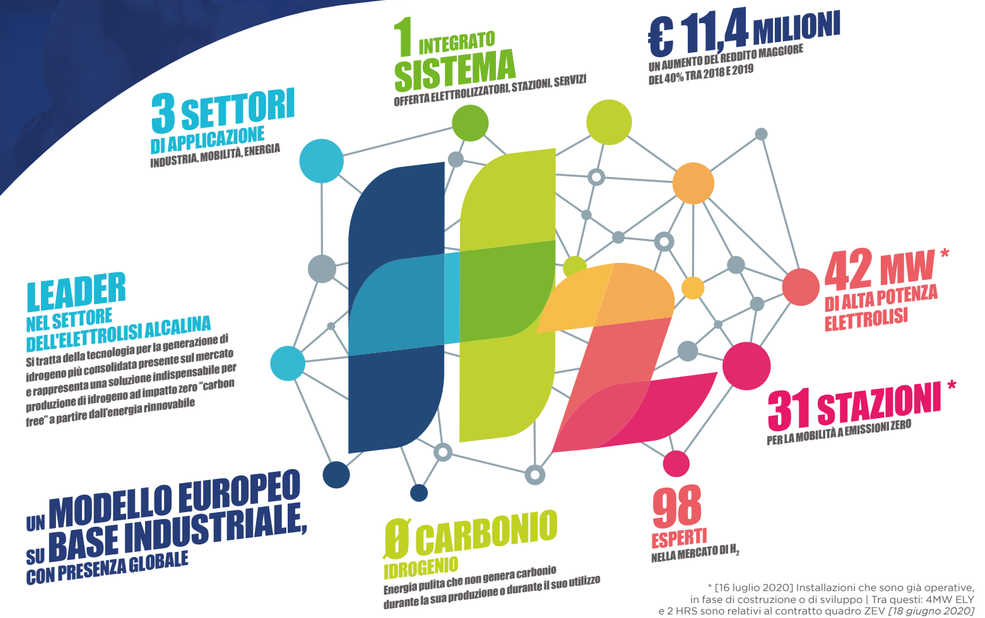
**Nel quadro della transizione energetica e in quanto fornitore leader di apparecchiature per la produzione e la distribuzione dell'idrogeno, McPhy contribuisce alla diffusione dell'idrogeno a emissioni zero in tutto il mondo.**

Grazie alla sua ampia gamma di attrezzature e servizidedicati ai settori dell'industria, della mobilità e dell'energia, McPhy fornisce ai suoi clienti soluzioni chiavi in mano adattate alle loro applicazioni nella fornitura di materie prime industriali, nelle soluzioni per la mobilità o nello stoccaggio e valorizzazione del surplus di energia rinnovabile.

Progettista, costruttore e integratore di apparecchiature a idrogeno fin dal 2008, McPhy ha tre centri di sviluppo, ingegnerizzazione e produzione in Europa (Francia, Italia, Germania).

McPhy Italia, che fa parte del Gruppo McPhy, è un centro unico specializzato nella progettazione, produzione e manutenzione di un'ampia gamma di elettrolizzatori Piel e McLyzer.

Le filiali internazionali dell'azienda assicurano un'ampia copertura commerciale per le innovative soluzioni di idrogeno di McPhy.




* [16 luglio 2020] Installazioni che sono già operative, in fase di costruzione o di sviluppo | Tra questi: 4MW ELY e 2 HRS sono relativi al contratto quadro ZEV *[18 giugno 2020]*


CAPACITÀ DI PRODUZIONE : FINO A 300 MW L'ANNO

## McPhy ITALIA: il nostro centro di competenza per elettrolizzatori di San Miniato

McPhy Italia, che fa parte del Gruppo McPhy, è un centro unico specializzato nella progettazione, produzione e manutenzione di un'ampia gamma di elettrolizzatori. Dalle macchine per l'industria di precisione della gamma Piel - di cui è l'esclusivo progettista e costruttore - agli elettrolizzatori McLyzer, passando dalle grandi piattaforme industriali multi MW, le nostre apparecchiature per la produzione di idrogeno coprono una vasta gamma di applicazioni industriali.

Risultato di oltre trent'anni di esperienza nei gas tecnici applicati alla metallurgia e alla saldatura per l'industria manifatturiera, le nostre soluzioni di idrogeno Piel e McLyzer vantano risultati comprovati e sono riconosciute da oltre 3.000 installazioni in tutto il mondo.

Progettiamo, costruiamo e installiamo soluzioni di idrogeno adattate ai tuoi bisogni e ai tuoi requisiti. La nostra visione è pragmatica: si tratta di applicare le nostre esperienze e competenze al servizio della tua produttività, della tua efficienza energetica e delle tue performance economiche.

## INFRASTRUTTURA INDUSTRIALE PRINCIPALE

- **Ufficio progetti, aree di produzione e di prova, servizio clienti**
- **Un sito produttivo di più di 4.000 m², che può raggiungere il doppio delle dimensioni**
- **Capacità di produzione di 100 MW l'anno, che può persino triplicare**
- **Nel cuore di un hub intermodale italiano, con collegamenti diretti con il resto d'Europa**
- **30 dipendenti***
- **Certificazione ISO 9001 dal 2015**

* 31 dicembre 2019

## MOLTO PIÙ DI UN COSTRUTTORE

**Un team esperto, tecnici specializzati e capillarità dei centri di assistenza: McPhy offre un pacchetto completo di consulenza energetica per soddisfare tutte le richieste dei clienti attraverso l'analisi costi/benefici, garantendo così un significativo ritorno economico.**


# Piel

by McPhy

**MCPHY**
**RIFORNISCE LE AZIENDE INDUSTRIALI DI IDROGENO DECARBONIZZATO, CONCILIANDO PRODUTTIVITÀ, COMPETITIVITÀ E RESPONSABILITÀ SOCIALE**

**Già utilizzato come materia prima nell'industria da oltre 100 anni, l'idrogeno sta conoscendo uno sviluppo accelerato. Producendo il proprio idrogeno a emissioni zero sul posto e impiegando l'elettrolisi da elettricità verde, le aziende industriali stanno entrando in una nuova era a basse emissioni di carbonio.**

La nostra linea di prodotti Piel nasce da un'esperienza decennale nel settore dell'oreficeria, del trattamento dei metalli preziosi e della metallurgia, e copre un ampio spettro di applicazioni che vanno dalla saldatura e brasatura all'industria dell'alta moda.

I nostri generatori di idrogeno e di ossigeno Piel, marchio di riferimento per molte aziende industriali, sono la soluzione ideale per la produzione leggera. Si integrano perfettamente nei sistemi industriali, qualunque sia la loro dimensione o settore di attività.

## RISULTATI COMPROVATI DA 3.000 INSTALLAZIONI IN TUTTO IL MONDO

I nostri clienti scelgono di produrre idrogeno e ossigeno sul posto, in base alle loro necessità e alle loro specifiche. Si liberano così dai vincoli dei tradizionali sistemi di stoccaggio (bombole di gas compresso: idrogeno, ossigeno, acetilene, propano) ottenendo risultati migliori e verificabili in termini di :

- Sicurezza dell'approvvigionamento e indipendenza energetica (libertà dai vincoli logistici),
- Produttività,
- Controllo sui costi,
- Affidabilità e continuità del servizio,
- Drastica riduzione dell'impronta di CO2 e dell'inquinamento atmosferico,
- Produzione in loco nelle migliori condizioni di qualità e sicurezza.



MARCHIO DI RIFERIMENTO PER MOLTE AZIENDE INDUSTRIALI

# PIEL È ADATTA AD UN'AMPIA GAMMA DI APPLICAZIONI

**Con i suoi generatori di idrogeno e ossigeno, i generatori di azoto e la gamma completa di accessori e servizi, la gamma Piel è adatta ad un'ampia serie di applicazioni.**

### SALDATURA E BRASATURA
Saldatura a punti, ad alta precisione e saldatura pulita.

### LAVORAZIONE DEL VETRO
*(riscaldamento, fusione e operazioni di taglio)*
Fiamme ad alta precisione e calore ridotto, il che consente di ridurre al minimo l'area riscaldata dei pezzi per ottenere una lavorazione sorprendentemente precisa.

### TRATTAMENTO TERMICO
Sicurezza ottimale e idrogeno puro, perfettamente adattato ai forni per il trattamento termico.

### TAGLIO
Taglio di metalli ad alta precisione. Grazie all'elevata purezza dell'ossigeno Piel (99,5%), tutte le operazioni di taglio dei metalli possono essere eseguite sia manualmente che con l'ausilio di macchinari di taglio, con la massima precisione e velocità di taglio anche su spessori elevati.

### LAVORAZIONE DEI METALLI
Torce alimentate a idrogeno e ossigeno, una soluzione molto flessibile (regolazione della fiamma, disossidazione, ecc.), libertà dai vincoli del gas in bombole.

## TUTTI I SETTORI INDUSTRIALI POSSONO UTILIZZARE I NOSTRI PRODOTTI

- **Gioielleria, oreficeria** e argenteria.
- Industria del **vetro.**
- **Strumenti ottici :** la saldatura a induzione utilizzata per gli strumenti ottici può essere eseguita proteggendo la zona di saldatura con atmosfera inerte costituita da una miscela con idrogeno. In questo modo si evita l'uso di disossidanti liquidi e il successivo decapaggio.
- **Meteorologia :** l'idrogeno prodotto sul posto viene utilizzato per riempire i palloni-sonda per gli istituti meteorologici.
- Industria **elettronica.**
- Industria **agroalimentare.**
- **Trattamento dei metalli :** l'apparecchiatura ideale per alimentare i forni per il trattamento dei metalli in atmosfera controllata (oro, argento, acciaio, ecc.). L'elevatissima purezza dell'idrogeno (fino al 99,999%) e la sua sicurezza nel processo di produzione lo rendono una soluzione preferibile ai sistemi tradizionali.

## COME FUNZIONA ?

**L'elettrolisi alcalina, chiamata anche elettrolisi, è un processo utilizzato per produrre idrogeno dall'elettricità e dall'acqua attraverso una reazione elettrochimica :**

**2H2O + Energia = 2H2 + O2**
**Acqua + Elettricità → Idrogeno + Ossigeno**

**I generatori Piel producono idrogeno e ossigeno, rilasciati separatamente dalle celle elettrolitiche, attraverso l'elettrolisi di acqua demineralizzata. I gas vengono quindi raffreddati, deumidificati e resi disponibili per l'uso alle due rispettive valvole di uscita.**

# GAMMA COMPLETA DI GENERATORI DI GAS SEPARATI IDROGENO E OSSIGENO DI PICCOLE DIMENSIONI

UNA SOLUZIONE IDEALE PER PRODUZIONE LEGGERA


**Da 0,4 a 10 Nm³/h, da 1 a 8 bar: le nostre comprovate soluzioni di progettazione, la cui affidabilità ha reso il nostro prodotto un successo mondiale, sono perfettamente in linea con i requisiti dell'industria leggera.**

| SERIE | Pressione (barg) | Intervallo di portata $H_2$ ($Nm^3/h$) | Intervallo di portata $O_2$ ($Nm^3/h$) | Gamma di potenza elettrica alle condizioni nominali (kW) |
|---|---|---|---|---|
| Baby | 1 | 0,4 | 0,2 | 3 |
| P | 1 – 2,5 | 1 – 1,6 | 0,5 – 0,8 | 6 – 9 |
| M | 1 – 2,5 | 2,4 – 4,4 | 1,2 – 2,2 | 14 – 26 |
| H | 4 – 8 | 3 – 10 | 1,5 – 5 | 18 – 60 |

Tutti i nostri prodotti hanno il marchio CE, nel pieno rispetto delle direttive dell'Unione europea [direttive macchine, bassa tensione, compatibilità elettromagnetica, attrezzature a pressione].

| UNA GAMMA COMPLETA DI OPZIONI | • Purificazione • Demineralizzazione • Monitoraggio e controllo<br>• Sistema di raffreddamento/pre-raffreddamento<br>• Accessori per brasatura - saldatura - trattamento termico |
|---|---|

## NUOVA GENERAZIONE PIEL

- Progettata per coprire una **vasta gamma di applicazioni**
- **Tecnologia "Plug and play"**, produzione 24H, su richiesta, in base alle tue esigenze
- **Monitoraggio remoto** e pronto per la diagnostica
- **Design ultra moderno,** PLC con touch screen, monitoraggio preciso e puntuale dei processi, una diagnostica semplice e intuitiva e una manutenzione rapida e conveniente
- **Una nuova struttura per facilitare la manutenzione,** e ridurre i tempi di fermo per i nostri clienti
- Scelta dei migliori materiali, per **un'affidabilità avanzata**
- Sensori aggiornati, per un for **controllo ottimizzato**
- Nuovo controllo e unità di potenza con comprovati **componenti di alta qualità**
- **Ampia scelta di opzioni** disponibili su richiesta
- **Sicurezza ancora migliorata**
- Opzione di **personalizzazione del colore del tuo generatore**

## PUNTI CHIAVE DEGLI ELETTROLIZZATORI PIEL DI PICCOLE DIMENSIONI

- **Elettrolisi alcalina :** la tecnologia più collaudata e affidabile sul mercato.
- **Sistema chiavi in mano completamente integrato.**
- Supervisione e manutenzione **a distanza**.
- **CONTROLLO SUI COSTI**
  - **Basso costo dei gas :** servono circa 5,5 kWh per produrre 1 $Nm^3$ di gas - notevole risparmio.
  - Il 20% di risparmio sulla brasatura consente una maggiore velocità di lavoro (+ 15-25%) per le specifiche caratteristiche dell'idrogeno e dell'ossigeno.
- **Energia a zero emissioni di carbonio :** la combustione dell'idrogeno con l'ossigeno non genera prodotti residui. Totale assenza di inquinamento da fumi. Gli operatori non hanno bisogno di ingombranti respiratori e non è necessario installare sistemi di purificazione di grandi dimensioni.
- La generazione **separata del gas** offre la possibilità di regolare la fiamma: neutra, ossidante, riducente, oltre all'opzione di poter utilizzare l'idrogeno e l'ossigeno separatamente.
- **Comodità d'uso/Unità autonome :** possono essere trasportate ovunque per la produzione di idrogeno e ossigeno. Con le sue quattro ruote pivottanti, la macchina è facile da spostare là dove serve.
- **Sicurezza :** il gas viene prodotto nell'effettivo punto di utilizzo e non c'è volume di gas compresso. Le apparecchiature Piel non richiedono nessuna autorizzazione da parte delle autorità sanitarie o dei vigili del fuoco.
- Tutti i nostri prodotti hanno il marchio CE, nel pieno rispetto delle direttive dell'Unione europea [direttive macchine, bassa tensione, compatibilità elettromagnetica, attrezzature a pressione].

## BENVENUTI NELL'ERA DELL'INDUSTRIA 4.0 CON LA NUOVA GENERAZIONE PIEL

INDUSTRIA 4.0

La digitalizzazione dell'industria è un cambiamento strategico verso processi produttivi più intelligenti e automatizzati, più connessi, flessibili ed efficienti.

Grazie ai sensori intelligenti integrati nella nuova linea Piel, le tue apparecchiature sono connesse digitalmente e i nostri Programmable logic controllers (PLC) raccolgono, elaborano e condividono i dati in tempo reale, in maniera completamente automatizzata, (ri)definendo uno schema operativo che consente una maggiore produttività.

## DIGITALE

### IL NOSTRO MODULO DI SUPERVISIONE E ASSISTENZA REMOTA


**Il modulo di assistenza remota può essere installato sul/i generatore/i Piel. I sensori assicurano la raccolta dei dati in tempo reale e forniscono tutte le informazioni utili per aiutare gli operatori ad incrementare l'efficienza operativa.**

**Grazie alla connettività wireless, il generatore Piel può - in qualsiasi momento, ovunque e in piena autonomia - trasmettere i suoi dati e l'autoanalisi, cosicché i nostri team possano lavorare rapidamente e in remoto su una diagnostica, intervenire sulla programmazione o organizzare eventuali interventi di manutenzione sul posto.**

**La nostra soluzione digitale è ecologica, riduce i tempi di consegna e offre più flessibilità, aumentando nettamente l'efficienza e la redditività del sistema di idrogeno.**

McPhy

Driving
clean energy
forward

***McPhy - pioniere delle soluzioni di idrogeno al servizio della rivoluzione energetica - si è affermata tra i leader mondiali nella produzione di idrogeno a emissioni zero***

## Ti invitiamo a scoprire la nostra gamma di generatori di gas idrogeno e ossigeno Piel di piccole dimensioni, appositamente progettati per la produzione leggera.

*Da 0,4 a 10 $Nm^3/h$, da 1 a 8 bar : progettiamo, costruiamo e installiamo soluzioni di idrogeno che coprono un ampio spettro di applicazioni che vanno dalla saldatura e brasatura all'industria della moda o alla meteorologia*

***Per saperne di più sul Gruppo McPhy, visita il nostro sito***

**mcphy.com**

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# UNLIMITED HYDROGEN

DESIGNER AND MANUFACTURER
OF EQUIPMENT
FOR THE PRODUCTION
& DISTRIBUTION
OF ZERO-CARBON HYDROGEN

BY McPhy

EN

DESIGNER AND MANUFACTURER

# OF EQUIPMENT FOR THE PRODUCTION & DISTRIBUTION OF ZERO-CARBON HYDROGEN

**A pioneer of hydrogen solutions in the service of the energy revolution, in ten years McPhy has positioned itself among the world leaders in zero-carbon hydrogen.**

Our projects, the trust placed in us by key economic players, and our ongoing policy of innovation coupled with a solid industrial infrastructure allow us to design, manufacture and integrate effective and competitive hydrogen production and distribution equipment, in order to decarbonize the industry, mobility and energy sectors.

**Laurent CARME**
*Chief Executive Officer of McPhy*

## EDITO

2019 was a pivotal year for hydrogen in the fight against climate change.

The industry's global growth has reached a peak, confirmed by the incorporation of zero-carbon hydrogen in an increasing number of government roadmaps, the development of international coalitions and the realization of the first large-scale projects.

It was also a **year of major change for McPhy,** with the business successfully passing key technological and commercial milestones for preparing the future.

Our strategy centers on helping our customers in the industry, mobility and energy sectors to **successfully transition to business models based on zero-carbon hydrogen, reconciling economic performance and corporate social responsibility.**

The reinforcement of our teams and their fields of expertise, our commitment to ongoing innovation and the increasing industrialization of our manufacturing processes enabled us to **consolidate our position as a key technological and industrial partner for the hydrogen market** and to be chosen to equip **projects heralding the arrival of wide-scale change in the industry.**

These include the scaling up towards multi-MW industrial hydrogen equipment - with McPhy having been selected to equip the largest zero-carbon hydrogen plant in Europe (20 MW), and the inauguration of the first zero-carbon hydrogen refueling station for public transportation in the Hauts de France Region (for 6 buses).

> **We are confident that the combination of rigor, agility, innovation and massification found in our markets will enable us to accelerate the roll out of competitive, high-performance zero-carbon hydrogen ecosystems with unlimited opportunities.**

Our ambition for the future is clear: **to continue our large-scale transition and increase the attractiveness and competitiveness of zero-carbon hydrogen** by continually improving our equipment's performance, with the highest standards of quality and safety, all within a strategy of hydrogen cost reduction.

**We're ready for the "Unlimited Hydrogen" era. Are you?**



McPhy
Driving clean energy forward

**3 MARKETS SERVED**
INDUSTRY, MOBILITY, ENERGY

**1 INTEGRATED OFFER**
ELECTROLYZERS, STATIONS, SERVICES

**€ 11.4 MILLION IN REVENUE**
AN INCREASE OF MORE THAN 40% BETWEEN 2018 AND 2019

**LEADER IN ALKALINE ELECTROLYSIS**
The most mature hydrogen generation process on the market, an indispensable technological component for the mass production of zero- carbon hydrogen from renewable electricity

**37 MW* OF HIGH-POWER ELECTROLYSIS**

**24 STATIONS*** FOR ZERO-EMISSION MOBILITY

**5 SITES IN EUROPE**

**Ø CARBON HYDROGEN**
Clean energy that doesn't generate any carbon at all - during its production or during its use

**98 EXPERT STAFF** IN THE $H_2$ VALUE CHAIN

*References that are already operational, being installed or under development | Figures as of 31-01-2020

# CLEAN INDUSTRY REVOLUTION

**MCPHY SUPPLIES INDUSTRIALISTS WITH DECARBONIZED HYDROGEN,** RECONCILING PRODUCTIVITY, COMPETITIVENESS AND SOCIAL RESPONSIBILITY

WIDELY USED FOR ITS FLEXIBILITY, MULTISECTORAL APPLICATIONS AND ITS ENERGY EFFICIENCY, HYDROGEN IS A COMPETITIVE AND ATTRACTIVE STRATEGIC TECHNOLOGY FOR INDUSTRIAL COMPANIES.

BY REPLACING EXISTING CARBONIZED ENERGIES WITH CLEAN HYDROGEN, PRODUCED BY ELECTROLYSIS FROM RENEWABLE SOURCES, INDUSTRIALISTS ARE ENTERING A NEW LOW-CARBON ERA.

## Low carbon, responsible, innovative and profitable: WELCOME TO THE INDUSTRY OF THE FUTURE

Already used in industry for more than 100 years, hydrogen has seen its development accelerated. On a world scale, industrial chemical and refining applications consume 60 million tons of hydrogen per year.

Almost all of this volume is produced using fossil fuels, based on a production process which is generally accepted to emit ten kilos of $CO_2$ per kilo of hydrogen produced.

By producing their zero-carbon hydrogen on site, using electrolysis from green electricity, manufacturers ensure their:

- Security of supply and energy independence (freedom from logistic constraints),
- Control over their costs,
- Reliability and continuity of service,
- Drastic reduction of their $CO_2$ footprint and air pollution,
- On-site production in the best conditions of quality and safety,
- Creation of new business models.

## "POWER TO INDUSTRY": ALL SECTORS ARE CONCERNED

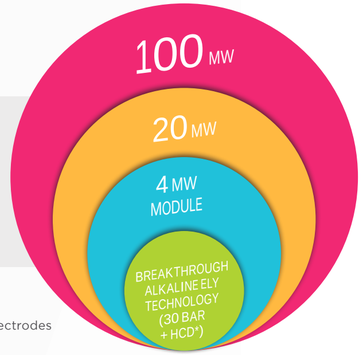
**Petrol and gas refineries**
*fuel desulfurization, e-fuels*

**Chemical processing**
*e-methanol, synthesis of ammonia for fertilizers*

**BUT ALSO:** Steel mills, coal-fired plants, thermal power stations (cooling system for alternators), metallurgy, glass production, electronic components, etc.

**FOCUS ON CCU:** With "Carbon-Capture Utilization", polluting industrial emissions are captured before being released into the atmosphere and then added to hydrogen, allowing synthetic molecules to be created and channelled into new uses: e-methanol, biodiesel, e-fuel, etc.

Qualified and selected by numerous industrialists and/or gas companies, our electrolyzers integrate perfectly into industrial systems, whatever their size or business sector.




*HCD : High Current Density electrodes

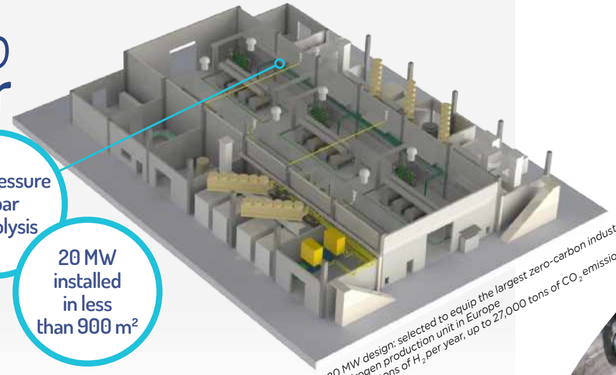


# AUGMENTED McLyzer

Advanced high current density electrodes

High-pressure 30 bar electrolysis

20 MW installed in less than 900 m²



20 MW design: selected to equip the largest zero-carbon industrial hydrogen production unit in Europe. 3,000 tons of $H_2$ per year, up to 27,000 tons of $CO_2$ emissions abated.

**McLyzer:** electrolyzers up to **800 Nm³/h** in series

**Augmented McLyzer: 20 to 100 MW** (scalable: GW) platforms for large-scale industrial applications

**30 bar:** high pressure production

**Very fast response dynamics,** perfectly adapted to the fluctuations of the renewables

High energy efficiency

A mature, industrialized process

**Robustness**

**Simple installation** and commissioning

**Compactness**

Remote supervising and piloting

Economic competitiveness

## AUGMENTED MCLYZER: NEW GENERATION ALKALINE ELECTROLYSIS FOR 20 TO +100 MW ARCHITECTURES

A true **breakthrough technology,** our "Augmented McLyzer" electrolyzers combine the **reliability and the maturity of alkaline technology with great flexibility.** They integrate new generation **electrodes with high current density** (doubled compared to standard electrodes) that significantly increase the performance of our equipments, all within a compact design. Based on a 4MW module design, our systems are created to scale up with your operating rhythm.

**"Bigger scale, lower costs":** the scaling up and industrialization of electrolyzers will make it possible to bring about a drastic reduction in the purchasing costs and the democratization of hydrogen.

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Driving clean energy forward

4 MW electrolysis solution for the Hebei province, China

## FOCUS ON PIEL

**[From 0,4 to 12 Nm³/h | 1 to 8 bar] Perfectly in line with discontinuous applications and the requirements of light industry, the new generation PIEL by McPhy offers a solution that is perfectly adapted to the jewellery sectors – goldsmithing, meteorology, and the glass industry, or welding operations – brazing, and thermal processing.**

# CLEAN MOBILITY REVOLUTION

MCPHY
CLEAN HYDROGEN PRODUCTION AND DISTRIBUTION SOLUTIONS FOR ZERO-EMISSION MOBILITY

HYDROGEN ESTABLISHES ITSELF AS A ZERO-EMISSION ALTERNATIVE FUEL THAT CAN SIGNIFICANTLY REDUCE AIR POLLUTION IN THE TRANSPORT SECTOR BY ELIMINATING THE EMISSION OF POLLUTANTS AND $CO_2$.

## ENSURE HIGH-QUALITY SERVICE, ALL WHILE CONTRIBUTING TO IMPROVE AIR QUALITY AND PUBLIC HEALTH

With their great autonomy and fast refueling, hydrogen vehicles are attracting a growing number of communities, manufacturers or managers of automobile fleets and plants or logistic platform operators.

They find the perfect union of operating convenience, continuity of service and participation in the fight against air pollution.

All types of mobility are concerned:

- Land: utility vehicles, passenger cars, buses, big rig trucks, lift trucks,
- Railway: trains,
- Or maritime: river shuttles, boats.

## TOWARDS "ZERO EMISSIONS" HEAVY TRANSPORTATION

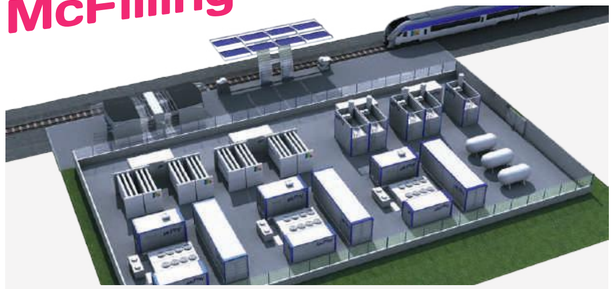
Hydrogen is **the only scalable technology, capable of meeting the massive needs of heavy-duty transportation**, which amount to hundreds or even thousands of kilograms of hydrogen each day:

- A zero-carbon hydrogen, produced on site by alkaline electrolysis, cost-competitive with carbonated hydrogen (SMR),
- A clean alternative fuel, whose price at the pump is competitive with diesel,
- "Bigger scale, lower costs": the scaling up and industrialization of hydrogen stations will make it possible to bring about a drastic reduction in the purchasing costs and the democratization of hydrogen mobility.

Hydrogen Station McFilling 20-350 Sorigny.



# AUGMENTED McFilling


*Augmented McFilling hydrogen station: 2 tons per day configuration / 12 trains scenario, including 6 MW of electrolysis (3 x Augmented McLyzer 800-30 high current density)*

EXAMPLE OF POSSIBLE SCENARIOS

**12** TRAINS

**50** TRUCKS

**100** BUSES

**McFilling:** a wide range of small, medium and large capacity stations

350 and/or 700 bar

**Augmented McFilling:** as of 2 tons per day, a modular solution with no limits in terms of capacity

Interfaces with an **electrolyzer** for true clean mobility chain

**Zero-emission** mobility: zero particles, zero $CO_2$, zero noise

Compact and modular

## AUGMENTED MCFILLING: A NEW GENERATION OF HYDROGEN STATION FOR HEAVY-DUTY TRANSPORT

A true concentration of **technological and digital innovation,** Augmented McFilling by McPhy is a **unique and proprietary design philosophy** that supports the heavy-duty transport sector's transition towards the large-scale use of low carbon hydrogen. Combining the best of alkaline electrolysis and hydrogen station technologies, Augmented McFilling is an intelligent system capable of being **dynamically reconfigured** to offer you multiple modes of operation that will **optimize our customer's TCO** (Total Cost of Ownership) in real time.

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© Photo Credit: Arnaud Février ENGIE
Hauts de France: first zero-carbon hydrogen station for buses in France (200 kg of hydrogen/day, 0.5 MW of electrolysis).

## FOCUS ON SUPERVISION SOFTWARE

**Embedded supervisory software makes our Augmented McFilling station dynamically reconfigurable. The station autonomously defines its optimal operating scheme and (re)routes the flows, from production to distribution to the vehicle, via compression and storage steps to deliver hydrogen at the lowest cost while ensuring service continuity and maximum availability.**

# CLEAN ENERGY REVOLUTION

**MCPHY**
AGILE HYDROGEN SOLUTIONS TO SUCCEED IN THE ENERGY REVOLUTION

BY TRANSFORMING SURPLUS RENEWABLE ELECTRICITY INTO ZERO-CARBON HYDROGEN, MCPHY FACILITATES THE LARGE-SCALE INTEGRATION OF CLEAN ENERGY INTO THE ENERGY MIX.

## INCREASING THE SHARE OF RENEWABLES IN THE ENERGY MIX

Solar, wind, hydraulic: energy transition depends on renewable energies.
They can answer the growing needs for energy, all while:


## HYDROGEN, AN AGILE ENERGY

In the face of the massive deployment of renewable energies, by nature intermittent and difficult to predict, hydrogen seems to be a flexible and competitive solution.

- Flexibility and balance for the network: compensate for the intermittence of renewable energies,
- Matching supply and demand thanks to hydrogen storage,
- Reliable energy reserve for insular or off-grid locations and a backup solution and/or autonomous energy (buildings, telecom antennas, data centers, ...).



*Jupiter 1000 | Power to Gas: first industrial demonstrator at the megawatt scale in France (0, 5 MW alkaline electrolysis + 0, 5 MW PEM electrolysis).*

## MCPHY ELECTROLYZERS: A DEMONSTRATED DYNAMIC RESPONSE

The McLyzer range is positioned as the ideal tool to stabilize the electric grids confronted by a growing influx of renewable electricity and participates in the primary and secondary reserves.

Its dynamic response to power fluctuations and its durability have long been demonstrated through data collected since 2014 on the "$H_2$Ber" Power to Gas project in Berlin.

Designed by McPhy to limit their operating impact on the environment, these hydrogen generators combine a zero-loss purification unit with a closed-loop system to reduce the consumption of water to the strict minimum during its transformation into hydrogen.

**Instantaneous adaptability** to power fluctuations in electricity from renewable energies

**System services** participation (primary and secondary reserves)

**High energy efficiency**

Economic competitiveness

Reliability and robustness of a mature technology

Easy to use and maintain

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*EnergieDienst : 1 MW of electrolysis in Germany*

## FOCUS ON POWER TO GAS

**A true "bridge" between the electric and gas grids, Power to Gas brings flexibility and can increase the clean energy share, all while managing investments:**

- Using existing grid infrastructures
- Coupling with other industrial or mobility applications

**This solution has been widely adopted by large companies around the world.**

# AUGMENTED HYDROGEN SOLUTIONS

TO STRENGTHEN THE ATTRACTIVENESS AND PROFITABILITY OF CLEAN HYDROGEN, MCPHY RELIES ON ITS CAPACITY FOR INNOVATION, BACKED BY A PREMIER INDUSTRIAL INFRASTRUCTURE.

AN INTEGRATED APPROACH TO RESPOND TO YOUR LARGE-SCALE APPLICATION NEEDS

BREAKTHROUGH TECHNOLOGIES

## RESEARCH & INNOVATION

In one decade, McPhy has acquired a solid expertise in hydrogen technologies for the reduction of carbon footprints in the industry, mobility and energy sectors. Combined with a policy of ongoing research and innovation, this allows it to work on continually improving its equipment - to achieve the highest standards of performance, quality and safety.

MODULARIZED & SCALABLE SYSTEMS

## DESIGN & ENGINEERING

McPhy applies its strengths in technological and scientific leadership to designing scalable architectures for the production and distribution of zero-carbon hydrogen, ready for the massification of the sector. All this based on a standardization approach which meets both the needs and the techno-economic demands of markets.



MANUFACTURING CAPACITIES x100

## MANUFACTURING & COMMISSIONING

McPhy's market reach and that of its services is worldwide, coupled with a solid industrial infrastructure, designed to scale-up in line with the markets. McPhy has five centers of excellence in Europe:

- France: one engineering site, an innovation platform, test bench and industrial manufacturing site dedicated to our hydrogen stations (ISO 9001), and a business unit in Paris,
- Germany: engineering for multi-MW electrolysis systems,
- Italy: a large industrial site certified ISO 9001 and dedicated to the assembly of PIEL electrolyzers and the production of our large capacity stacks (multi MW).

For the installation and commissioning stages, McPhy has created a Services team, supported by a first class international partnership network.

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Driving clean energy forward

VALUE CREATION € $ CN¥

## CUSTOMER SATISFACTION

Our strategy centers on helping our customers in the industry, mobility and energy sectors to successfully transition to business models based on zero-carbon hydrogen. We design hydrogen systems based on real-world conditions and which are scalable for the future, reconciling the demands for both economic performance and social responsibility.

| | SMALL | LARGE | AUGMENTED |
|---|---|---|---|
| ELECTROLYZERS | **Piel** 0.4 to 12 Nm³/h (1 to 8 bar)<br>**McLyzer** 20 to 80 Nm³/h (30 bar) | **McLyzer** 100 to 800 Nm³/h (30 bar) | **Augmented McLyzer** Multi-MW, GW designs |
| STATIONS | **Starter Kit** McFilling 20 kg (350 bar) | **McFilling 500** 350 bar: 100 to 800 kg per day; 700 bar: 100 to 600 kg per day; Dual Pressure 350/700 bar: 100 to 600 kg per day | **Augmented McFilling** Multi-tons designs |
| SERVICES | Supervision and remote control, preventive maintenance, training of your teams, etc. | | |

McPhy

Driving
clean energy
forward

## FACED WITH ENVIRONMENTAL, ECONOMIC AND SOCIETAL CHALLENGES, A NEW ENERGY MODEL IS EMERGING, ROOTED IN THE TERRITORIES, AND BASED ON NON-CARBON EMITTING ENERGIES.

*Used as a feedstock in industrial processes, converted into clean fuel for zero-emission vehicles, or used to facilitate storage and flexibility for electricity and gas networks:* ***zero-carbon hydrogen - produced by electrolysis using renewable electricity - plays a central role, and contributes to the decarbonization of all sections of the economy and the emergence of a societal model that is more carbon neutral.***

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