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**COST-EFFECTIVE DIESEL  
ENGINE CONVERSION  
TOWARDS HYDROGEN**

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PROBLEM N°1

# POLLUTION

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9%

MORTALITY IN  
FRANCE

92%

OF THE WORLD'S  
POPULATION  
BREATHES TOO  
POLLUTED AIR

Source : étude « santé publique France » - OMS



PROBLEM N°2  
**PETROL**

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**98%** PETROLEUM REFINED IN FRANCE IS IMPORTED

**2025** ESTIMATED DATE OF OIL SHORTAGE

Sources : SDES, Bilan énergétique de la France  
Rapport 2019 de l'AIE

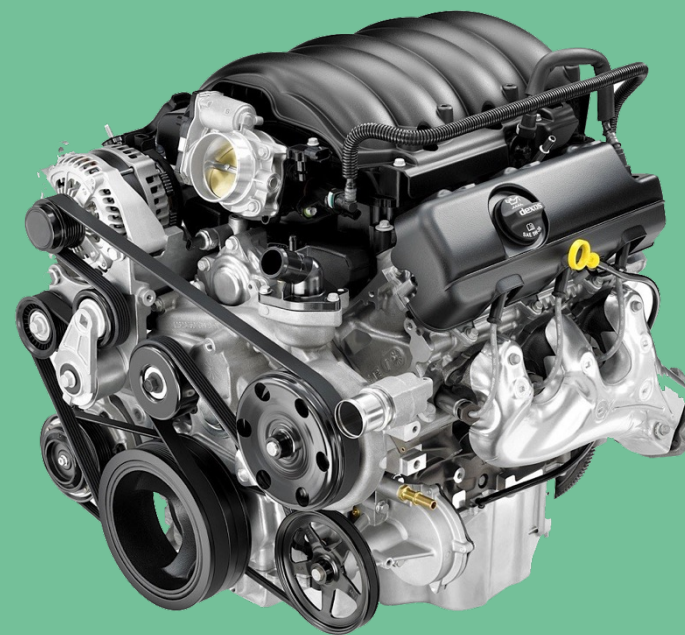


# OUR SOLUTION

LOW-COST CONVERSION  
OF DIESEL ENGINES TO  
HYDROGEN



DIESEL



HYDROGENE

## ● PROCESS



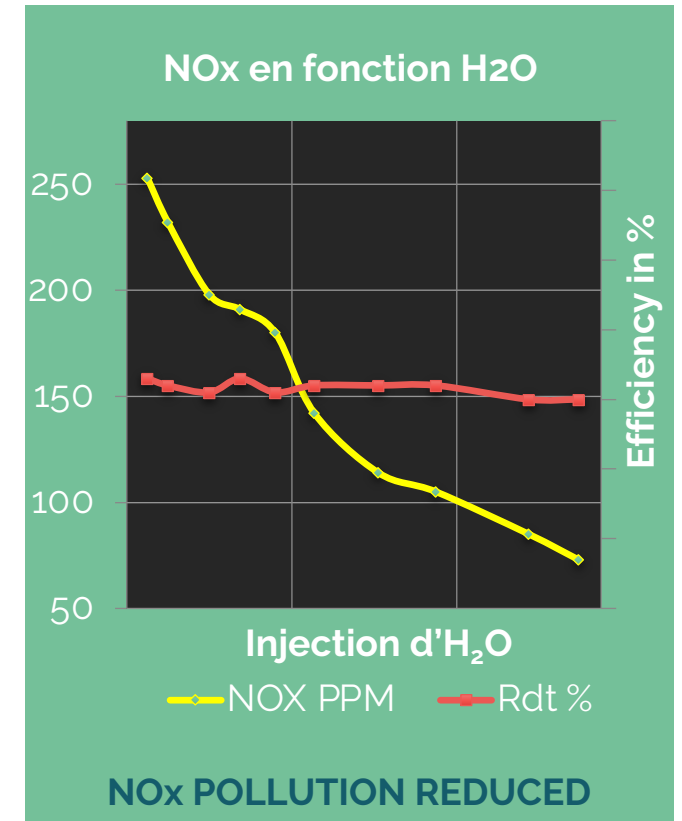
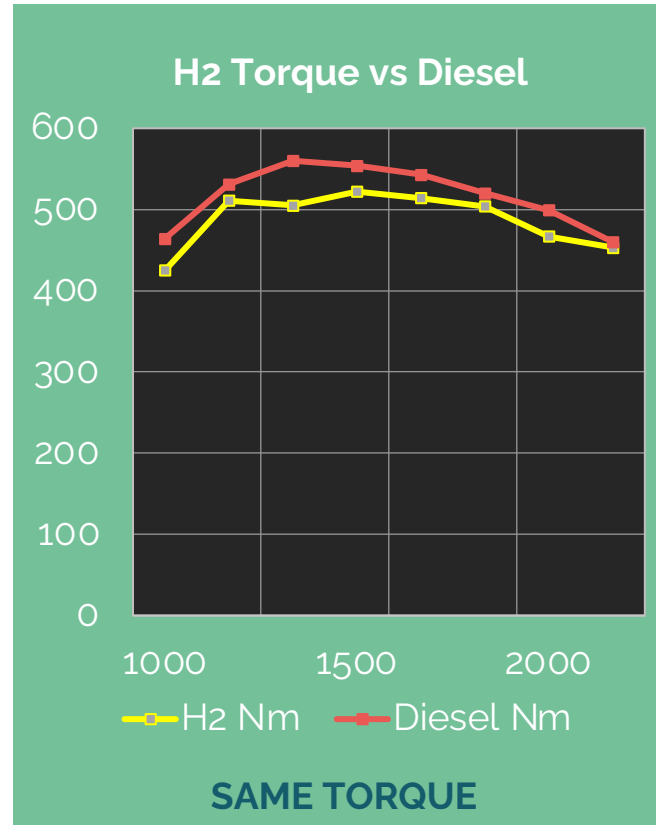
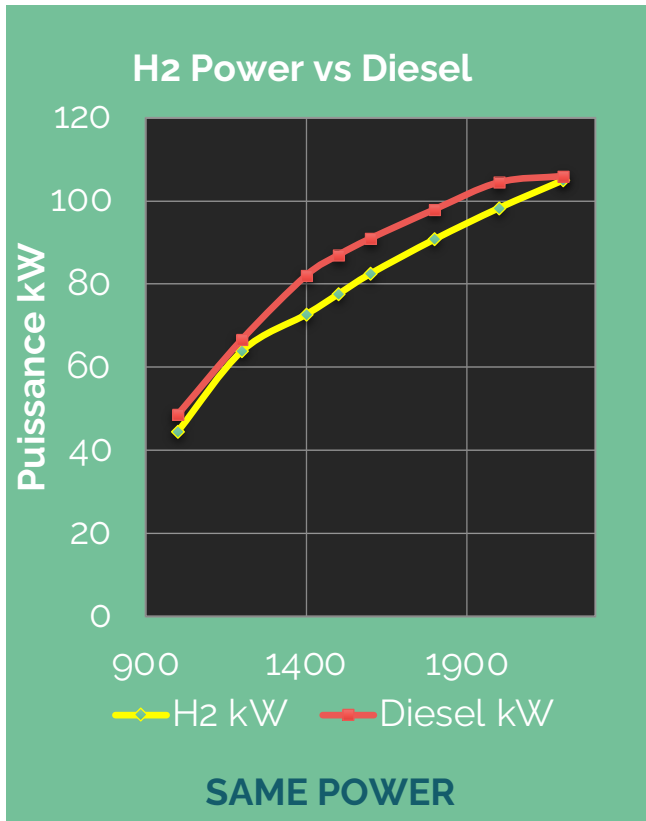
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Combination of patented concepts with several direct injections of hydrogen and water to achieve power without pollution.

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# RESULTS

AFTER 30 HEURES ON TEST BENCH



(\*) Caterpillar industrial engine 4.4l.

# INTELLECTUAL PROPERTY

US010858990B2

(12) **United States Patent**  
Bouvy

(10) Patent No.: **US 10,858,990 B2**  
(45) Date of Patent: **Dec. 8, 2020**

(54) **INTERNAL COMBUSTION STEAM ENGINE**

(71) Applicant: **DMA TECH S.À R.L., Hobscheid (LU)**

(72) Inventor: **Jacques Bouvy, Battincourt (BE)**

(73) Assignee: **DMA TECH S.À R.L., Hobscheid (LU)**

(58) **Field of Classification Search**  
CPC: F02B 47/00; F02B 47/00; F02D 37/00; F02M 57/04; F02M 57/04 (Continued)

(56) **References Cited**  
U.S. PATENT DOCUMENTS  
3,696,795 A \* 10/1972 Smith

(\*) Nc

(21) Aq

(22) PC

(86) PC

(19) (11) **EP 3 523 532 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(87) PC (45) Date of publication and mention of the grant of the patent: **25.11.2020 Bulletin 2020/48**

(65) (21) Application number: **17766880.9**

(30) (22) Date of filing: **06.10.2017**

(51) Int. Cl. (87) International publication number: **WO 2018/065594 (12.04.2018 Gazette 2018/15)**

(54) **INTERNAL COMBUSTION STEAM ENGINE**  
BRENNKRAFTDAMPFMASCHINE  
MOTEUR À COMBUSTION INTERNE À VAPEUR

(72) Inventor: **BOUVY, Jacques**  
6792 Battincourt (BE)

(74) Representative: **Office Freylinger**  
P.O. Box 48  
8001 Strassen (LU)

(56) References cited:  
EP-A1- 3 081 790 WO-A1-99/42718  
WO-A2-2014/132125 DE-A1-102012 107 714  
JP-A- H08 296 441 JP-A- 2001 082 259  
US-A- 4 805 571

(84) Designated Contracting States:  
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **07.10.2016 LU 93252**  
**17.01.2017 LU 100622**

(43) Date of publication of application:  
**14.08.2019 Bulletin 2019/33**

(73) Proprietor: **DMA Tech S.À R.L.**  
8372 Hobscheid (LU)

ЕВРАЗИЙСКАЯ ПАТЕНТНАЯ ОРГАНИЗАЦИЯ  
ЕВРАЗИЙСКОЕ ПАТЕНТНОЕ ВЕДОМСТВО

ЕВРАЗИЙСКИЙ ПАТЕНТ  
№ 039210

特許証  
(CERTIFICATE OF PATENT)  
特許第 7 0 3 0 8 2 2 号  
(PATENT NUMBER)

内燃蒸気エンジン

ルクセンブルク、8372リュ、45  
国籍・地域 ルクセンブルク  
ディーエムエー テック  
エール、エル、

ボーヴィ、ジャック

特許 2019-540693  
平成 29 年 10 月 6 日 October 6, 2017  
令和 4 年 2 月 25 日 February 25, 2020

INTELLECTUAL PROPERTY INDIA  
PATENTS | DESIGNS | TRADE MARKS | GEOGRAPHICAL INDICATIONS

भारत सरकार  
GOVERNMENT OF INDIA  
पेटेंट कार्यालय  
THE PATENT OFFICE  
पेटेंट प्रमाणपत्र  
PATENT CERTIFICATE  
(Rule 114 of The Patents Rules)

कमल : 011155042  
SL No :

पेटेंट नं. / Patent No. : 417516  
अवेदन नं. / Application No. : 201917013254  
पेटेंट करने की तारीख / Date of Filing : 06/10/2017  
पेटेंटी / Patentee : DMA TECH S.À R.L.

आमंत्रित किए जाते हैं कि पेटेंटी को, उपरोक्त आवेदन में वर्णनकृत INTERNAL COMBUSTION STEAM ENGINE नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबन्धों के अनुसार आम तौर पर अक्टूबर 2017 के छठे दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदान किया जाय है।  
It is hereby certified that a patent has been granted to the patentee for an invention entitled INTERNAL COMBUSTION STEAM ENGINE as disclosed in the above mentioned application for the term of 20 years from the 6<sup>th</sup> day of October 2017 in accordance with the provisions of the Patents Act, 1970.

अनुदान की तारीख  
Date of Grant : 10/01/2023

श्री. राजेश  
Controller of Patent

नोट - यह पेटेंट के अंतर्गत में किए गए, यदि इसे बनाए रखा जाना है, अक्टूबर 2016 के छठे दिन को बीस वर्ष पहले तक के छठे दिन के अंतर्गत में।  
Note - The term for renewal of this patent, if it is to be maintained will fall / has fallen due on 6<sup>th</sup> day of October 2016 and on the same day in every year thereafter.

OFFICE FREYLINGER **DONNÉES DE DÉPÔT**

*Votre référence:*  
Veuillez indiquer votre référence

*Notre référence:*  
P-DMATEC-002/LU2

*Titre:*  
**Hydrogen-fueled four-stroke internal combustion engine**

*Dépôt pour:* Brevet  
*Pays:* Luxembourg

*Date de dépôt:*  
8 avril 2022

*Numéro de dépôt:*  
501 822

*Demandeur(s):*  
DMA TECH S.à r.l.

*Inventeur(s):*  
Jacques BOUVY

*Abrégé/Revendication:*

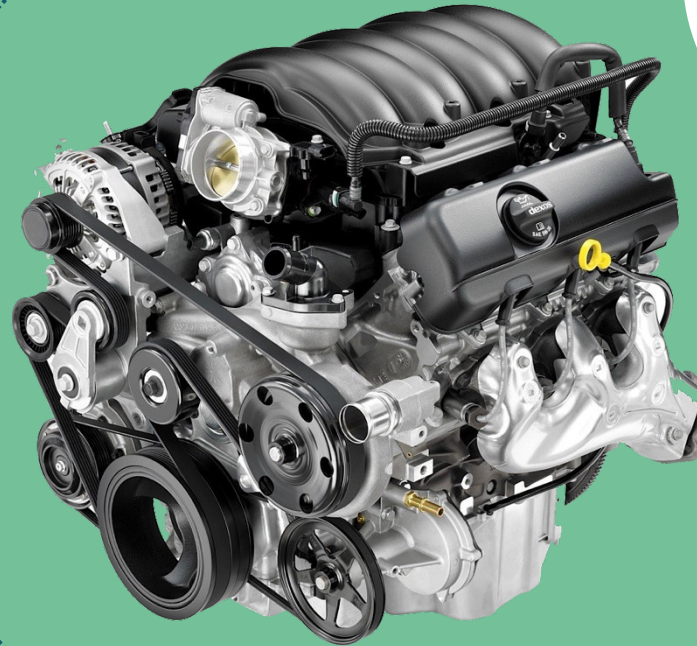
A sparked reciprocating four-stroke internal combustion hydrogen-fueled engine comprising an engine casing (10), a crankshaft (20) rotatable about a crankshaft axis, a cylinder (30) arranged inside said engine casing (10), a piston (35) arranged inside said cylinder to movably reciprocate along a reciprocating axis between a top dead center (TDC) position distal from said crankshaft (20) and a bottom dead center (BDC) position proximal to said crankshaft (20) and operatively connected to the crankshaft such that the reciprocating piston (35) imparts a rotational movement to the crankshaft, a combustion chamber (37) defined within said cylinder (30) between the engine casing (10) and a head of the piston (35) opposite said crankshaft (20), an intake valve (40.1), an exhaust valve (45.1), a hydrogen injector (60) configured to directly inject hydrogen into said combustion chamber (37), a water injector (70) configured to directly inject water into said combustion chamber (37); a spark or glow plug (50), and an engine control unit configured to control timing and quantity of hydrogen injection and of water injection, wherein said engine control unit is configured to inject into the combustion chamber a first quantity of hydrogen at a first timing from 20 ° before TDC during compression stroke to 20 ° after TDC, to inject into the combustion chamber a second quantity of water at a second timing from 110 ° to 90 ° before TDC during compression stroke and to inject into the combustion

# BEST BALANCE



## POWER

No loss of power compared to a diesel engine



## COST

Great savings compared to other retrofit solutions



## POLLUTION

A non-polluting, environmentally friendly engine



# TWO RETROFITS IN PROGRESS



## NEVERS

IVECO Truck Engine

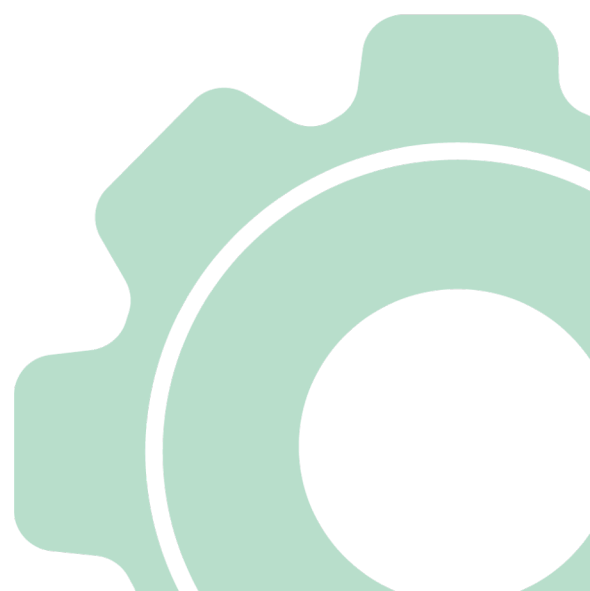
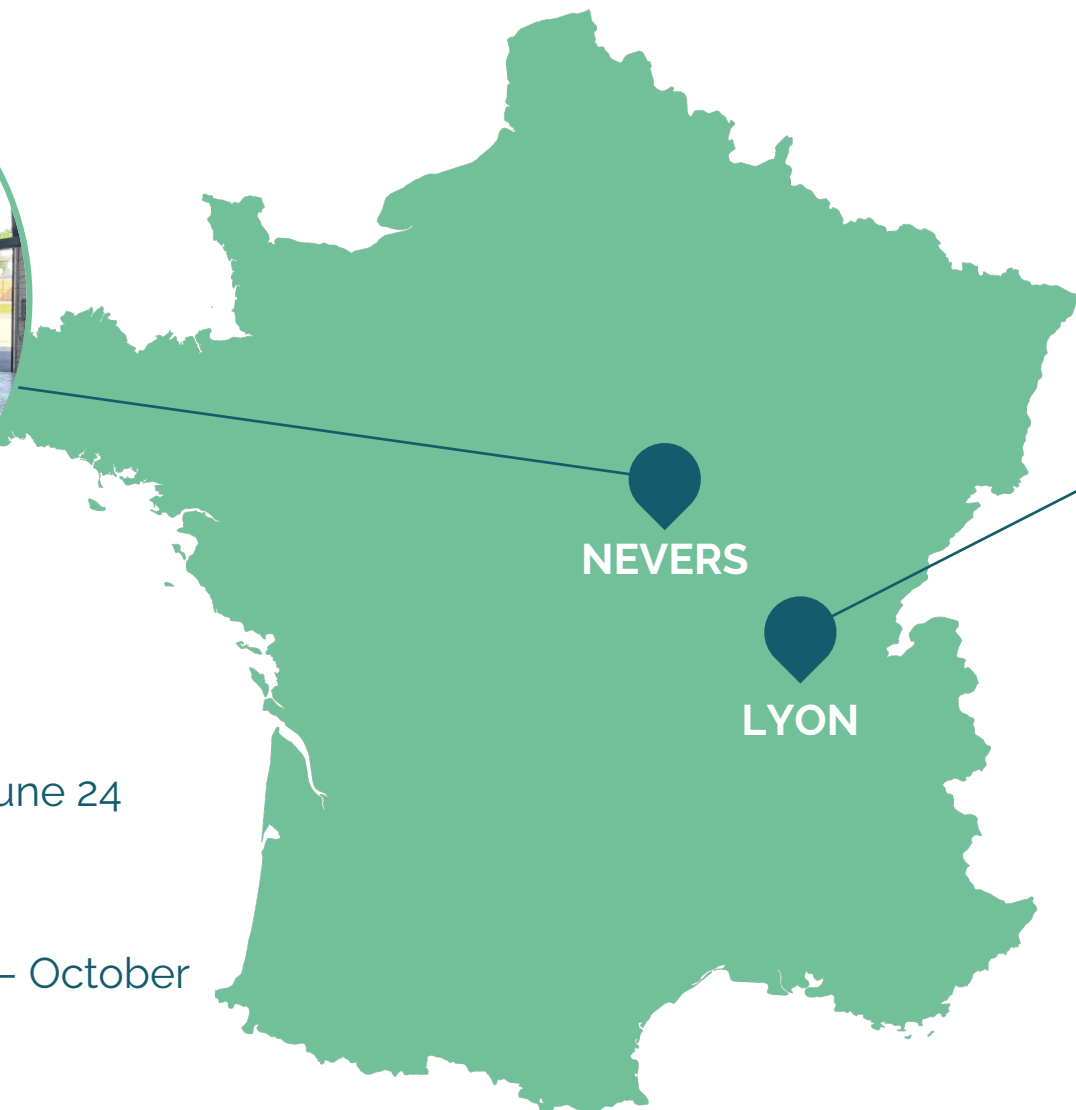
Project duration: March 23 – June 24

## LYON

Caterpillar 4.4L engine

Project duration: February 23 – October

23



# OUR MARKET

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Our process can be applied to all types of heavy machinery.

**Trucks and construction machinery are our core target.**

Indeed, these are the sectors most demanding of depollution solutions.

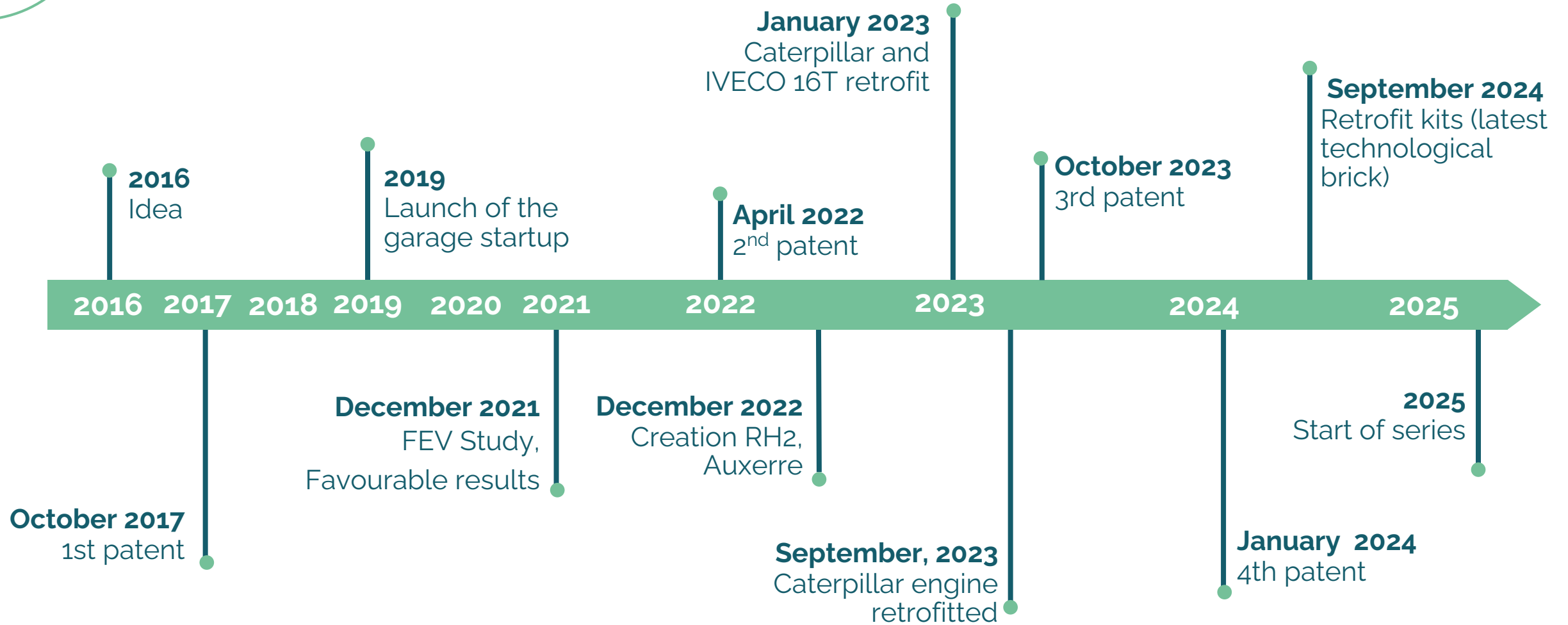
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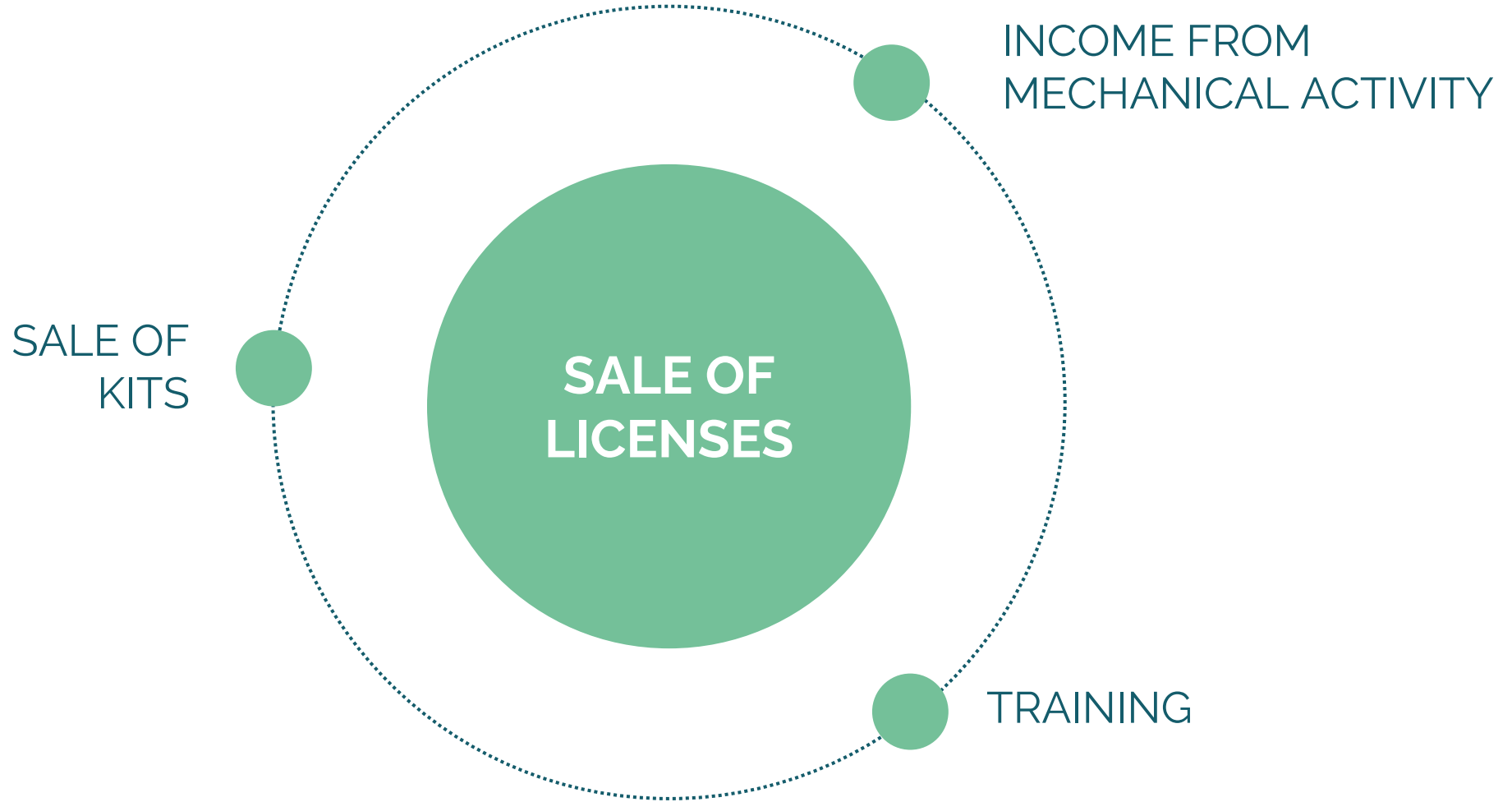
**3,4M**  
**>3.5T trucks +5**  
**years old**  
**in 2021**  
(source : Eurostat)



# ROADMAP



# MONETIZATION



## NEXT OBJECTIVES



- 1 HOMOLOGATE TRUCK 16T (IVECO)
- 2 RETROFITTING A CIVIL WORK MACHINE (CATERPILLAR EXCAVATOR)
- 3 RETROFITTING A HEAVY TRUCK (44T)
- 4 INDUSTRIALIZING RETROFIT KITS

**NEED = 2,1M€**

1,6M€ IN EQUITY @ VALUE 4,8M€

# NOTRE ÉQUIPE



## David MOURRE | CEO

(ESC Metz; INSA LYON)

Experience: Development engineer for 20 years+ (Siemens – ABB – Eneria)

Realization of innovative projects since 2010 (Eolienne-15M, Bio gas and Syngaz-35M)



## Jacques Bouvy | CTO

(Computer Engineer and Business School)

Experience: Consultant (KPMG), CIO, Secretary General (BDO)

3 business creations + resale, Business angels club



## Michel Lantin | CFO

Component research, mechanical advice (Sales Engineer)

Experience: Commercial Company Administrator

Ex-motorcycle rider on circuits

# THEY COLLABORATE WITH US AND SUPPORT US





**THANK YOU**

