





Good afternoon, everyone. I'm Hirose from Mazda.
Thank you for coming to the workshop.

Earlier, the three CEO talked about the concept of multi-pathways as a path for making responsible transitions toward a truly sustainable society and environment, and based on that they reaffirmed their recognition on the role of internal combustion engines during the age of electrification, and their shared determination to continue to provide exciting vehicles for customers based on this recognition.

What I will talk about in my part today are the following two points,

- 1) The multi-solution strategy that Mazda has been pursuing is the very MPW itself.
- 2) How to use the electrified engine, the assets of the multi-solutions strategy, to contribute to the next generation.



In 2007, Mazda announced its long-term vision for technology development and has consistently prepared its multi-solution technology assets in a building-block approach.

The situation of the world's power source mix differs greatly from country to country and region to region, and on a global scale, the conversion to renewable power is progressing slowly. In the midst of the energy transition, the true way to promote CN is to offer products that work with power sources which can achieve substantial CO2 reductions in the right places at the right time, in parallel with the spread of battery EVs, and to encourage customers to choose these products.

ビルディングブロックによるマルチソリューション戦略 MULTI-SOLUTION STRATEGY WITH BUILDING BLOCKS

BEV専用群
Dedicated BEVs
プラットフォーム
EV Platform



ラージ群
Large group
縦置き型
プラットフォーム
Longitudinal layout platform



スモール群
Small group
横置き型
プラットフォーム
Transverse layout platform



MULTIPATHWAY WORKSHOP

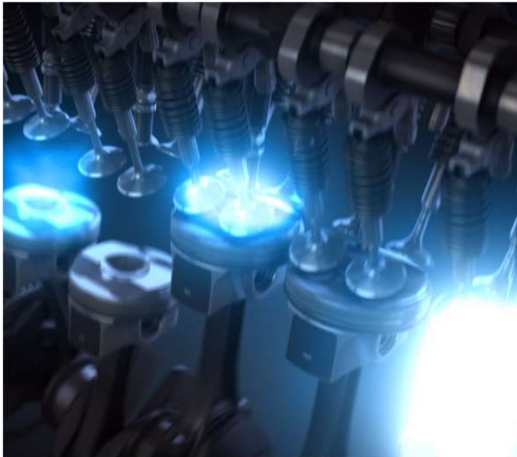
As a result of steadily building up the building blocks, we now have the technological assets of battery EV and the combination of internal combustion engine and electrification. And now we are at a turning point in our efforts to include carbon neutral fuels, and it is time to redefine the role of the internal combustion engines for that purpose.

I am talking about considering the compatibility with carbon neutral fuels as an added axis in the contribution to carbon neutral fuels

Today, I would like to talk about the second point and how Mazda's unique RE technology can be utilized as a new engine for the age of electrification.

電動化時代のエンジンの役割

THE ROLE OF ENGINES IN THE AGE OF ELECTRIFICATION



1. エミッション規制

Emission regulations

2. カーボンニュートラル燃料

Carbon-neutral fuels

3. パッケージ革新

Package innovation

MULTIPATHWAY WORKSHOP

First, with regard to what roles should engines play in this environment.

In the transition to electric vehicles, we continue to evolve engine efficiency in terms of energy savings, and also:

- Compliance with increasingly stringent emission regulations
- Expanding the application of carbon-neutral fuels
- Contribution to the innovation of vehicle packaging

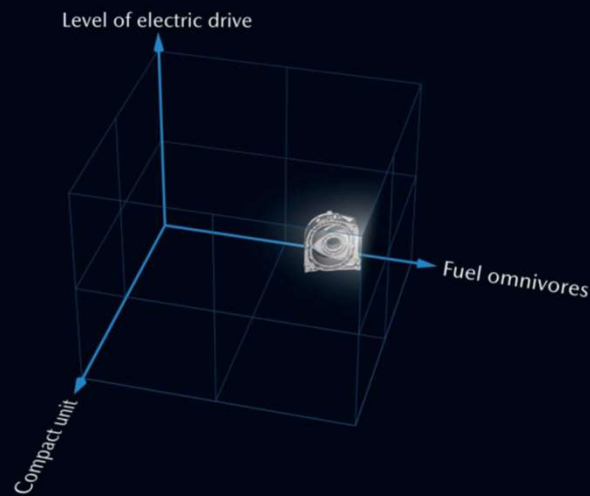
We believe these three things should be in place.

The second point is carbon neutral fuel, which is a fuel that emits virtually zero CO₂ emissions from production to use. We deliver a more compact engine that runs on this fuel, which will lead to styling innovations and consequent efficiency improvements. And its emissions are curbed by utilizing the electricity the itself has.

Through realization of these points, we will deliver products that customers will be happy to select, with the sense of contribution that they are participating in the efforts for carbon neutrality. In this way, we should be able to advance CN with both electric and engine-powered vehicles.

電動化時代のロータリーエンジンの位置づけ

POSITIONING OF ROTARY ENGINE IN THE AGE OF ELECTRIFICATION



MULTIPATHWAY WORKSHOP

So, how do we position the rotary engine, Mazda's proprietary technology, here?

If we plot the three roles mentioned earlier, electrification, compatibility with carbon-neutral fuels, and packaging innovation, on the three axes, I believe the rotary engine is to serve this positioning.

A compact unit with compatibility with a variety of CN fuels, this advantage will be realized through the idea of combining the engine with an electrically powered unit.

We believe that this is a challenge to create a new future for the engine.

The RE is Mazda's unique internal combustion engine, and because of its structural characteristics, it has repeatedly faced difficulties in meeting strict environmental regulations.

However, I believe that now is the time to take advantage of this uniqueness and turn it into an advantage.

That is what I am going to talk about now.

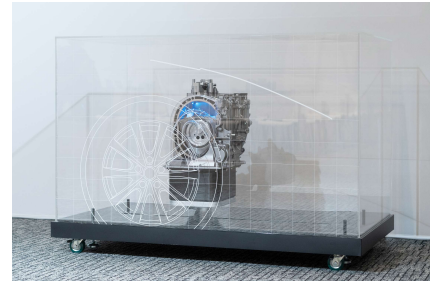
新時代の電動化ユニット

THE ELECTRIFICATION UNITS IN THE NEW ERA

ROTARY-EV SYSTEM CONCEPT (ONE ROTOR)

発電用のシングルローターと新たな電気駆動ユニットの組み合わせを検証する横置き型コンセプトユニット。MX-30のRotary-EVよりもコンパクトにしてレイアウト上の自由度を高め、実用性とエモーショナルなデザインを両立している。

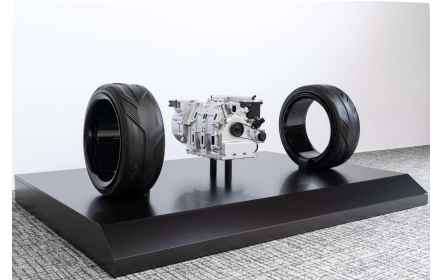
A transversely mounted concept unit combining one rotary engine for power generation and a new electric drive unit, to be chosen as more compact option that offers greater layout flexibility than the MX-30's Rotary-EV, providing both practicality and emotional design.



ROTARY-EV SYSTEM CONCEPT (TWO ROTORS)

発電用の2ローターを縦置きで搭載することでより多くの電力供給を可能にし、低重心のプロポーションを実現したコンセプトユニット。排気量アップによるエミッションや振動の改善も狙っており、スポーツカーへの採用なども視野に入れている。

This concept unit is equipped with two longitudinally mounted rotary engines for power generation, enabling a larger power supply and realizing low center-of-gravity proportions. The unit also aims to improve vibration and emissions by increasing the displacement. It is also being considered for use in sports cars.



MULTIPATHWAY WORKSHOP

These two mockups are concept units that embody that.

This one is a 1RE, mounted in transverse layout, but it is innovatively compact in width and height including the drive unit. For example, it can be mounted in the narrow motor room of a BEV.

And the 2RE is designed to be mounted longitudinally, delivering an innovative silhouette with a low center of gravity and an internal combustion engine.

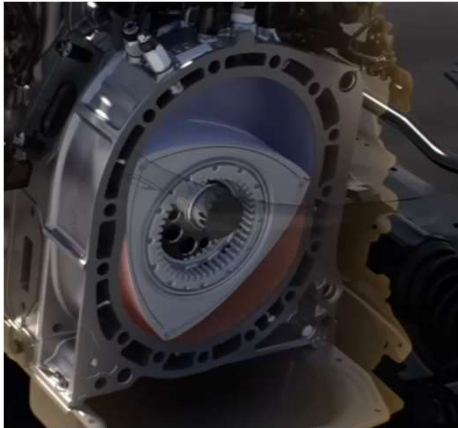
ロータリーエンジンの構造的特徴

STRUCTURAL FEATURES OF ROTARY ENGINE



CN燃料

CARBON NEUTRAL FUELS



1. シンプルな部品構成

Simple structure

2. ユニークな燃焼

Unique combustion

3. フレキシブルな潤滑機構

Flexible lubrication mechanism

MULTIPATHWAY WORKSHOP

Here I will discuss the structural characteristics of RE.
There are three major points.

First, simple component structure, with no valve mechanism, the body is compact, and the layout of auxiliary equipment is highly flexible.

Second, unique combustion, as shown in the video, the combustion flame creates a one-directional flow and burns with strong stirring. This is a handicap in terms of thermal efficiency, since combustion is slow and also allows heat to escape.

Third, the engine has a separate oil injection mechanism for lubrication of the housing.

The second and third characteristics turn into an advantage of the engines feature as was mentioned earlier, especially in the support of carbon-neutral fuels.

Unique combustion with strong flow can burn even hard-to-burn fuels. For easily flammable fuels, this turns into the advantage of being less likely to cause abnormal combustion.

In order to cope with non-lubricating fuels, the durability of valves must be considered in reciprocating engines, but the RE has no valves to begin with.

The flexible lubrication system is another advantageous factor, as it can be easily adapted to the lubrication conditions required.

ロータリーエンジンの構造的特徴 × CN燃料

STRUCTURAL FEATURES OF ROTARY ENGINE

CARBON NEUTRAL FUELS

CN 燃料種 CN fuel types			ガソリン Gasoline	ディーゼル Diesel	ロータリー Rotary
液体燃料 Liquid fuels	バイオ由来 Bio-derived	バイオエタノール Bioethanol	✓		✓
		バイオ軽油 (FAME) Bio-diesel oil		✓	✓
		HVO (廃食油利用)		✓	✓
		藻類バイオ燃料 Algae Biofuels	✓	✓	✓
	工業由来 Industrial	e-fuel	✓	✓	✓
気体燃料 Gaseous fuels	バイオ由来 Bio-derived	メタン Methane	✓		✓
	工業由来 Industrial	水素 Hydrogen	✓	✓	✓

MULTIPATHWAY WORKSHOP

There is such a variety of CN fuels available today.

Each has individual compatibility with GE, DE, but RE has the potential to accommodate any fuels. Compared to reciprocating engines, it can be adapted to a wider range of CN fuels, offering a good affinity with CN fuels.



電動化時代の新たな価値の提供に向けて

TOWARD PROVIDING NEW VALUE IN THE AGE OF ELECTRIFICATION

エミッション適合性の開発

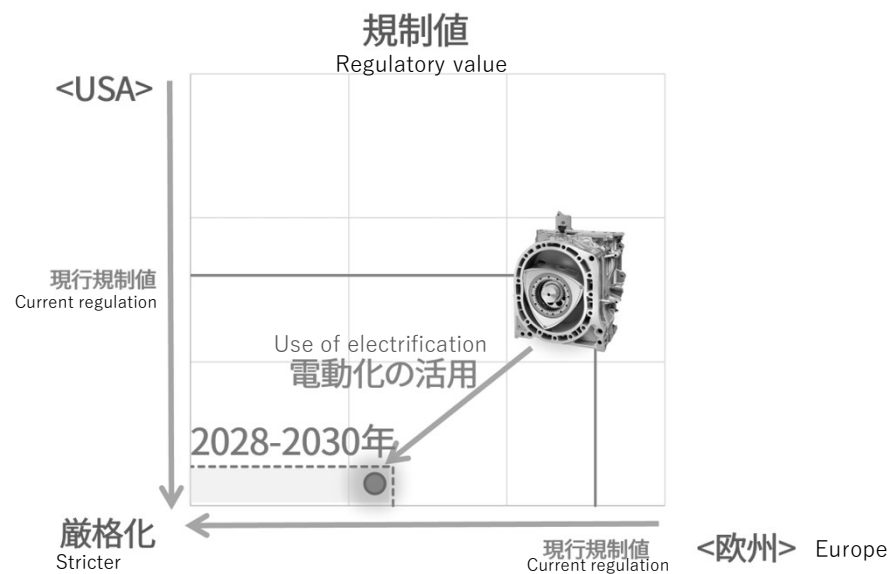
DEVELOPMENT FOR EMISSION COMPLIANCE

MULTIPATHWAY WORKSHOP

The biggest challenge in achieving this in reality is to establish emission compliance and how to address it.

エミッション適合性の確立

ACHIEVEMENT OF EMISSION COMPLIANCE

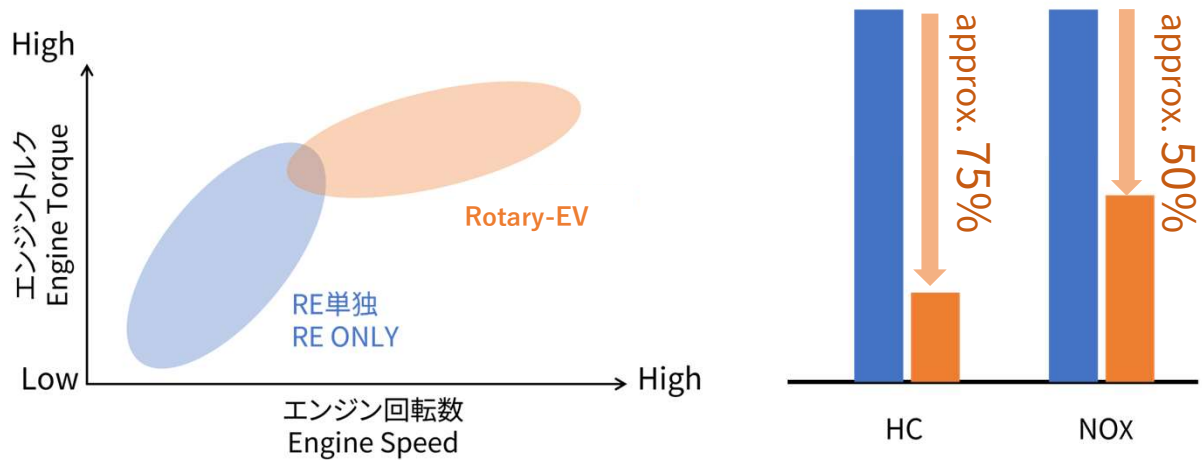


MULTIPATHWAY WORKSHOP

Emissions are becoming stricter and stricter with each passing year, and are approaching levels no different from the atmosphere.

電動化の使い切り～強みを引き出すハイブリッド構成

USING UP ELECTRIFICATION - HYBRID CONFIGURATION THAT DRAWS OUT THE STRENGTH



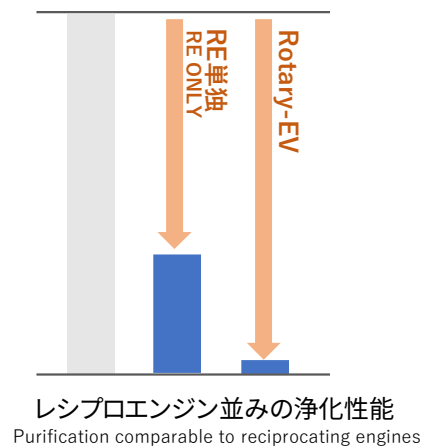
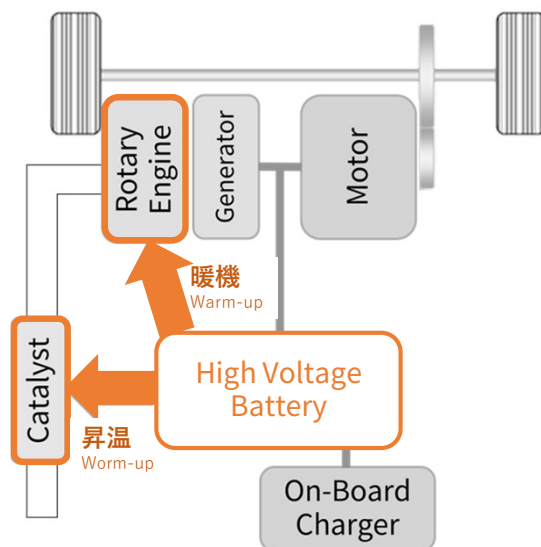
MULTIPATHWAY WORKSHOP

The engine is being electrified, and considering the response to this premise, the range of solutions that combine the engine with motors and electric power will expand.

Comparing to the case that the car runs by the engine alone, improvements are possible with RE when the engine selectively generates electricity in the conditions that it operates well and the car runs on that power.

電動化の使い切り～電力によるエミッション改善

USING UP ELECTRIFICATION - EMISSION REDUCTION BY ELECTRIC POWER



MULTIPATHWAY WORKSHOP

Also, emissions immediately after engine startup, which are the most severe, can be improved by using electric power to warm up the engine and keep the catalyst ready for purification, thereby promoting cleaner exhaust emissions.

We believe that the concept of combining an engine with an electric unit can eliminate the weak points.

カーボンニュートラルへの積極参加を促進

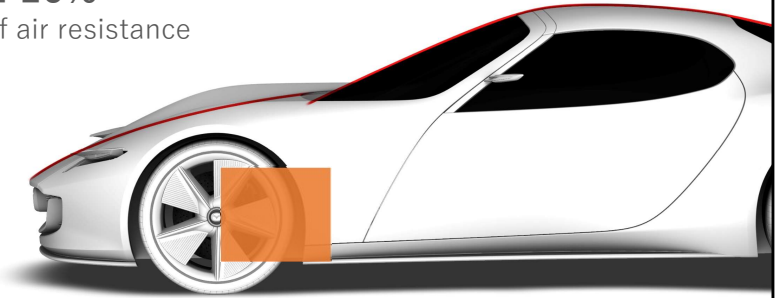
PROMOTE ACTIVE PARTICIPATION IN EFFORTS TOWARD CARBON NEUTRALITY

1. スタイリングへの貢献

Contribution to styling

2. 空力改善による効率改善 : 10%

Improved efficiency by reduction of air resistance



MULTIPATHWAY WORKSHOP

The unique and compact, electrified rotary internal combustion engine allows a wide range of applications for CN fuels,

- The number of rotors can be increased in accordance with the amount of power generated without any significant change in size, easily meeting performance requirements.
- The small stature, even when combined with an electric unit, greatly increases mounting flexibility.
- This feature can also be used to achieve innovative designs with extremely low bonnet hoods.
- As a result, the overall projected area can be minimized and the electricity consumption can be improved.

Thus, an engine that runs on CN fuel, which emits virtually zero CO₂ emissions, can be realized in a more compact form, and will serve to revolutionize vehicle styling and improve efficiency as a result.

We believe that product options will expand beyond the silhouettes of conventional internal combustion engine vehicles, and that the application of CN fuel will enable customers to contribute to global environmental protection with a sense of participation.



ロータリーエンジンを社会に広く貢献できる技術に

MAKING ROTARY ENGINE A TECHNOLOGY
THAT CONTRIBUTES BROADLY TO SOCIETY

In the past, REs have faced strict environmental regulations and have repeatedly withdrawn from the market, but they are revived by leveraging new requirements, most recently, electrification.

We believe that overcoming emission issues is the highest hurdle for internal combustion engines, but with the new axes of electrification and CN fuel compatibility, we hope to revive the RE as an environmentally friendly engine that can play a role in a journey of multi-pathways.

