

Special Feature

Isuzu's Value Creation as Demonstrated by the Evolution of the N-Series Model

History of the N-Series

1975



Third-generation N-Series

Improved comfort, operability, safety, and power performance. The new diesel engine adopted a "quick-on system" for instant starting, improving the slow start of conventional engines at the time.

1993



Fifth-generation N-Series

The fifth-generation N-Series sought to break away from the compact vehicle crowd with a high cab configuration and also featured a new series of environment-friendly engines. With advanced safety technology, it marked the beginning of building vehicles that are kind to the earth and to people.

1959



First-generation N-Series

Based on the concept of "the most efficient cargo transport" for Japan's cramped landmass and narrow roads, the inaugural N-Series was the first cab-over truck in its class, giving it excellent maneuverability. It received top marks for its high loading efficiency.

1968



Second-generation N-Series

The N-Series' first full-model change. With a more diverse range of vehicles for each model type, the second-generation N-Series met the needs of the advancements in transportation specialization and streamlining with a full-model lineup. Blue was added to the range of cab color offerings.

1984



Fourth-generation N-Series

The fourth-generation N-Series was a new delivery vehicle built for a new era of goods distribution in the 1980s and was the latest enhancement in a series of optimal vehicles designed to meet a wide range of needs. All models also featured direct injection engines for improved noise reduction.

2006



Sixth-generation N-Series

The sixth-generation N-Series was developed in response to the evolving circumstances surrounding light-duty trucks, such as vehicle safety requirements and the increasing importance of operation management. It embodied an evolution to new dimensions in environment-friendliness, economy, safety, and comfort.

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2023

Seventh-generation N-Series

Enhanced comfort, advanced safety, and updated driving support technologies. With a diverse lineup that includes battery-electric vehicles (BEVs), the seventh-generation N-Series offers solutions to the growing challenges of trucking, such as carbon neutrality and providing a better working environment for drivers.

In March 2023, the all-new N-Series made its long-awaited debut. The full-model change of the N-Series, the force behind the creation of the Isuzu brand of transportation, carries revolutionary significance. In this special feature, we present the challenges and innovations of the development of the all-new N-Series, as well as the Isuzu values and strengths that stand behind it.

Challenge and Innovation



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01 | The Value That the New N-Series Delivers

Changing Transportation Needs and the "Freedom of Choice"

"Choose your future." That is the product concept behind the fully redesigned N-Series. Freedom of choice means not only that we offer vehicle models and parts suited to each customer's kind of usage but also that, with a variety of lineups including diesel vehicles, electric vehicles (EVs), and models compatible with Japan's new ordinary class driver's license, customers are free to select the perfect model to meet all of their needs. This concept of "choose your future," by which we mean supporting the future of the logistics industry, is the basic spirit imbued in the all-new N-Series.

Behind it all is the desire to meet the societal needs that have undergone such change since the previous N-Series generation's release in 2006. In addition to the worldwide demand for connected, autonomous, shared & service, and electric (CASE) technologies and services and efforts to promote carbon neutrality, the shortage of workers in the logistics industry has emerged as an urgent issue in Japan. While cargo volumes have increased due to the growth of e-commerce, the logistics industry's very existence is threatened by the "2024 issue"* and the aging of drivers. Given these circumstances, as a supplier of commercial vehicles, Isuzu is tasked with providing vehicles that are easy to use regardless of age, physical size, or strength.

* The decline in transportation capacity and labor shortage due to an amendment to the Japanese Labor Standards Act limiting truck drivers' annual overtime to 960 hours starting in April 2024.

Enhanced Hospitality and a Wide Lineup to Choose From

We defined the main themes for the development of the new N-Series based on the needs of the customers we interact with on a daily basis and the following social needs: carbon neutrality, driver labor environment, safety, and connectivity.

In terms of carbon neutrality, in consideration of customer convenience and the energy and infrastructure circumstances in individual countries, we added BEVs to the lineup in addition to conventional diesel and hybrid models. This is the first step toward realizing a carbon-neutral society while adapting to the regional circumstances of individual countries.

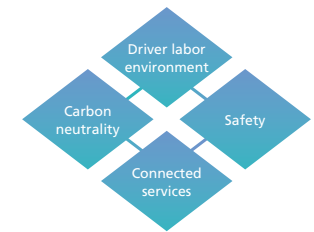
At the same time, given the shortage of drivers, workstyle reforms, and demand for improvement in labor environments, we aimed to provide enhanced hospitality by pursuing ease of use and ease of driving, with the growing diversity among drivers in mind. By fundamentally rethinking the positioning of the steering wheel and pedals, as well as vehicle interior space, the new N-Series offers seats that help improve driving posture and greater storage space for enhanced comfort and amenity.

To make a vehicle that is easy for everyone to use, safety is a must. For example, in response to the prevalence of left-turn accidents at intersections when driving in urban areas, we have incorporated new safety technologies that predict various situations, such as pre-crash braking when making left turns.

Connected services such as MIMAMORI and PREISM, which support safety and security during vehicle operation, have also evolved in line with the full-model change. Along with supplying EVs, we have introduced a comprehensive solutions program called EVision that utilizes the GATEX commercial vehicle information platform, which we launched in October 2022. The utilization of GATEX data enables the provision of services that facilitate more effective EV operation, such as drawing up vehicle operation plans that take recharging needs into consideration and measuring CO₂ reduction effects by ascertaining vehicle operation status.

For more information on safety technology, please refer to "Development and Application of Advanced Safety Technologies" on [page 50](#).

Priority social issues



Being the Best Partner for All Customers

Corporate customers have traditionally been a source of strong demand for the N-Series. In addition to offering a wider range of options with a lineup that includes EVs, one of the key challenges for this full-model change is providing enhanced hospitality, in other words raising the bar for comfort, including riding comfort and cab storage capacity. With these enhancements, we are now able to make a robust appeal to a diverse individual customer base, working to operate private small-lot transportation that values such features. Since improving the labor environment for drivers is a challenge for the logistics industry, we have made changes to specifications so as to meet the needs of customers who value ease of use and comfort, whether corporate or individual, and regardless of age, physical size, or strength.

In addition, the ELF mio,* a model available only in Japan, that is compatible with Japan's ordinary class driver's licenses from 2017 onward, is critically positioned to open new market areas. As a solution to the problems facing the logistics industry, including Japan's aging population and chronic labor shortage, we anticipate a substantial need for the ELF mio,* which can also appeal to young people who only hold ordinary driver's licenses.

Given the changing needs of the logistics industry and drivers, we aim to be the best partner that can meet the diverse needs of our customers by presenting a wide range of options with the new N-Series.

*The N-Series is known as the ELF series in Japan.

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Message "Reliability x Creativity" of the N-Series

Our determination expressed in the new management philosophy system the ISUZU ID is also reflected in the full-model change of the N-Series. One of the key concepts, "Reliability x Creativity," is essentially a balance between what customers have been asking for up until now and what will be demanded in the new era. The challenge that we have undertaken with the full-model change of the N-Series is to increase product variations from the customer's point of view and at the same time reduce social costs from an environmental, social, and governance (ESG) perspective. Since commercial vehicles have different requirements depending on the customer's purpose and location, we have prepared more than 2,000 types of N-Series vehicle models. In addition, more variations, such as EVs and fuel-cell vehicles, are required to achieve carbon neutrality. However, attempting to achieve those goals necessarily requires a larger variety of different parts as well as greater man-hours, which in turn entails heavier social cost. I-MACS is a premier method to solve these conflicting issues. By combining a small number of parts, we have been able to realize a lineup that meets the diverse needs of customers around the world while keeping social costs down. Isuzu will continue to provide customers around the world with the "freedom of choice."



Takashi Oodaira
Managing Executive Officer and
EVP of Engineering Division

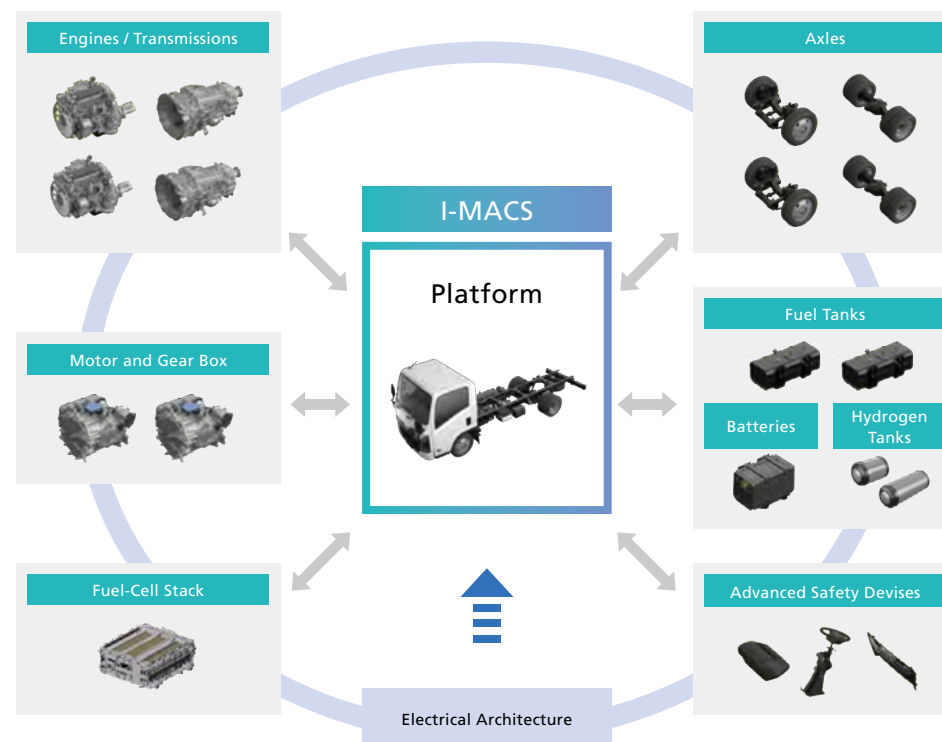
Modular Design Concept I-MACS Provides Flexible Response to a Wide Range of Needs and Power Sources

For the new N-Series, we have developed a new platform that meets both the needs of society, which are becoming more sophisticated and diverse, and the individual needs of our customers into the future. At the heart of this is I-MACS (Isuzu Modular Architecture and Component Standard: Isuzu's rules for optimizing the use and combination of components in vehicle development).

Traditionally, when creating components, parts, and devices for a particular vehicle model, it was necessary to create parts unique to that model, and consequently, as the number of models increased, the range of variations in development also increased, resulting in a snowballing amount of different components, parts, and devices.

With I-MACS, however, we have achieved the commonization and systematization of the coupling sections of parts that connect vehicle models with components such as engines and transmissions. This makes it possible to freely combine components and devices as if they were building blocks to meet various needs.

This new development method has made it possible to flexibly install various power sources, including electric motors, as well as advanced technologies, resulting in a wide lineup of approximately 2,500 N-Series models and approximately 1,500 F-Series models. Furthermore, even if we should need to develop new parts or specifications in the future, we will be able to respond more efficiently and flexibly by combining them with existing vehicle models.



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» Building I-MACS

Even during previous full-model changes to the N-Series, we had the notion of using a common platform to respond to the needs of each market and customer. Needs change with the times, however, and with the wave of technological innovation known as CASE, the number of parts requiring specialized development has increased, resulting in over 2,000 vehicle variations. That is where I-MACS comes in. By systematizing the arrangement of and linkage between parts and switching out or relocating certain parts, I-MACS makes it possible to adapt to changes that may occur in the future while remaining compatible with legacy vehicle models.

In putting together I-MACS, we first envisioned the parts required for existing vehicle models and the parts that will be required in the future, determined the cabs and frames that make up platforms, and identified more than 1,000 configuration patterns. We then repeatedly went through the process of using virtual evaluation to verify whether all patterns worked and fixing any defects. This was the toughest part, and we spent an enormous amount of time on it, but I am proud that we succeeded in creating a solid foundation for I-MACS.

We have just started selling the new N-Series in Japan, but the true test of the value of I-MACS is still to come. We are just at the starting point of a long journey. As we expand overseas and conduct sales in developed and emerging countries, our ability to achieve the expected results will be put to the test. We will continue to exert steady efforts to maximize the potential of I-MACS.



Tomoyuki Oshikawa
L/D & M/D Product Planning & Engineering Dept.
Chief Engineer

» Streamlining Production with I-MACS

Isuzu has long offered a wide range of commercial trucks including the N-Series, to meet the needs of the market and customers, and one of the Company's strengths is that it has established a system for efficiently producing them. Specifically, the main assembly lines are where parts are attached to the frames that are fed through on the conveyor and the finished vehicle is completed, and by using sub-assembly lines to supply those parts in nearly complete form, we have managed to level out the work performed on the main assembly lines.

With the latest full-model change to the N-Series, we will be producing both new and prior models simultaneously. Instead of setting up new main production lines for the new-generation models, however, we are using the same main assembly lines for both the new and prior generations, and in so doing we aim to reduce man-hours and save on investments. What makes this possible is that I-MACS is designed to be compatible with legacy vehicle models as well. Continuing in line with the I-MACS concept, I hope to continue to design main assembly lines capable of flexibly and efficiently producing any type of vehicle.



Takeyuki Odagiri
Vehicle Manufacturing Engineering Dept.
Group Leader



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Dialogue

Taking on the challenges of incorporating EVs

Yuuta Takamatsu
CN Product Planning &
Engineering Dept.
General Manager



Yasuhiro Wakamura
GR Japan Product
Marketing Dept.
General Manager



Wakamura In March 2023, we announced a full-model change for the N-Series, and since then we have held presentations for customers in seven cities nationwide. I personally participated in all of them, and the feedback from our customers has been outstanding. Everyone remarked on how eagerly they were awaiting the first full-model change in 17 years. Orders are also doing well, and I really feel that this will be a success.

Takamatsu Direct feedback from customers is really powerful. With this full-model change, one of the major development goals was to improve the comfort and amenity of the cab (the passenger space), and we put a lot of effort into making it feel spacious when sitting in the driver's seat. When I participated in the presentation, however, I was even more impressed that customers directly gave us exactly the kind of feedback we were hoping for.

Wakamura It is a blessing to be a developer. One of the highlights of the N-Series full-model change is the addition of the N-Series EV light-duty electric truck to the lineup. What kind of difficulties did you face in developing Isuzu's first EV?

Takamatsu As you know, Mr. Wakamura, for the introduction of the N-Series EV, we conducted three years of demonstration tests with the help of our customers. For passenger cars, as a mode of daily transportation, there is little difference in performance when replacing a conventional internal combustion engine vehicle with an EV. However, since commercial vehicles are used as tools of business, issues such as cruising range, in which EVs fall short of internal combustion engine vehicles, and the availability of charging facilities have a major impact on those tools' ability to serve their function. The switchover to EVs must not cause any disruption of customers' operations, so we

had to exercise extra diligence in the verification process.

Wakamura I was also involved in the launch of the demonstration tests. Many of the customers who assisted in the tests proactive in initiatives such as achieving carbon neutrality, are amenable to the use of EVs, and make heavy use of their vehicles. A typical example is major convenience store chains, who mainly use their truck fleets for short-distance deliveries, meaning short cruising range is not usually a problem. In addition, while drivers may change shifts three times a day, the vehicles themselves are often in operation nearly all day long.

Takamatsu With internal combustion engines, it only takes a few minutes to refuel, but it takes several hours to charge an EV. If vehicles are used during the day and not at night, then there is no problem since batteries can be charged during the night. However, due to the way the convenience store industry uses their trucks, it is difficult to ensure sufficient time for charging and that makes quick charging facilities essential. In addition, depending on the kind of contract customers have with electric companies, how much and when they charge the batteries can make a substantial difference in running costs.

Wakamura That's why, rather than creating a special route for the demonstration tests, we asked that the test vehicles be used in the same operations as conventional diesel vehicles. We are also very fortunate to enjoy that kind of customer cooperation before a new vehicle model goes into mass production, and that is not limited to just the adoption of EVs. Since the vehicles are run under harsh conditions, defects are revealed at an early stage, so improvements can be reflected in the mass-produced versions.

Takamatsu With these demonstration tests, we were able to accumulate detailed data on how the vehicles are used. The test vehicles were outfitted with equipment and communication

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units to collect operational data so that information could be viewed in real time, even remotely. I had full access to information on when the vehicles were started up, where they were driven, when they were shut down, and when they began charging, which was extremely helpful in the development of the N-Series EV. I think this kind of data will be a valuable asset for future development.

Wakamura So, what did the data reveal about the differences between internal combustion engine vehicles and EVs?

Takamatsu One thing is that when using the heater in winter, a diesel vehicle can use the heat emitted by the engine, but an EV cannot generate heat from its motor, so it uses up battery power. What that means is that there will be a considerable difference in cruising range from winter to summer. The trial data showed us that directly heating the driver consumes less battery power than heating the air inside the vehicle, so we decided to introduce seat heaters. We also incorporated

mechanisms to reduce battery consumption even in the winter, such as high thermal efficiency heat pump air conditioning.

Wakamura So, the data showed that our initial predictions were correct and that simply replacing internal combustion vehicles with EVs would cause a variety of problems.

Takamatsu Yes, but at the same time, we also found workarounds. However, more than improving the vehicles themselves, it is extremely important how customers use their vehicles and how they set up charging equipment. Therefore, we worked with our external partners to devise a set of support services to encourage the adoption of EVs by our customers. The result is EVision.

Wakamura Whether or not there are advantages to adopting EVs depends largely on how they are used, and that can be difficult for the customers themselves to determine. For customers who are considering adopting EVs, EVision may be a vote in their favor.

Takamatsu EVision is not yet a finished product, though, and we are still adding new features. As N-Series EVs become more popular in the future, new issues may emerge, and I would like to establish a Companywide customer support system, including the further evolution of EVision.

Wakamura On the sales side, in addition to setting up the Solution Sales Development Department, which is a team responsible for EVision, we decided to install EV managers at every dealership. Commercial vehicle development does not end when the product is released. It's important to keep thinking about them and keep working on them even after release.

Takamatsu EVs in particular are in a period of transition, and the performance and technology will no doubt continue to evolve. We have also commenced new developments with an eye toward the future, so let's continue working together to create vehicles that please our customers.



What is EVision?

To coincide with the market launch of the N-Series EV, Isuzu's first mass-produced battery electric vehicle (BEV), Isuzu began offering EVision, a total solutions program for the commercial introduction of commercial EVs.

Through EVision, we provide solutions to various issues that customers may face when introducing commercial BEVs, such as charging facilities, electricity rates, and effective reduction of environmental impacts, according to each phase of their introduction, from consideration to introduction and post-introduction.

