

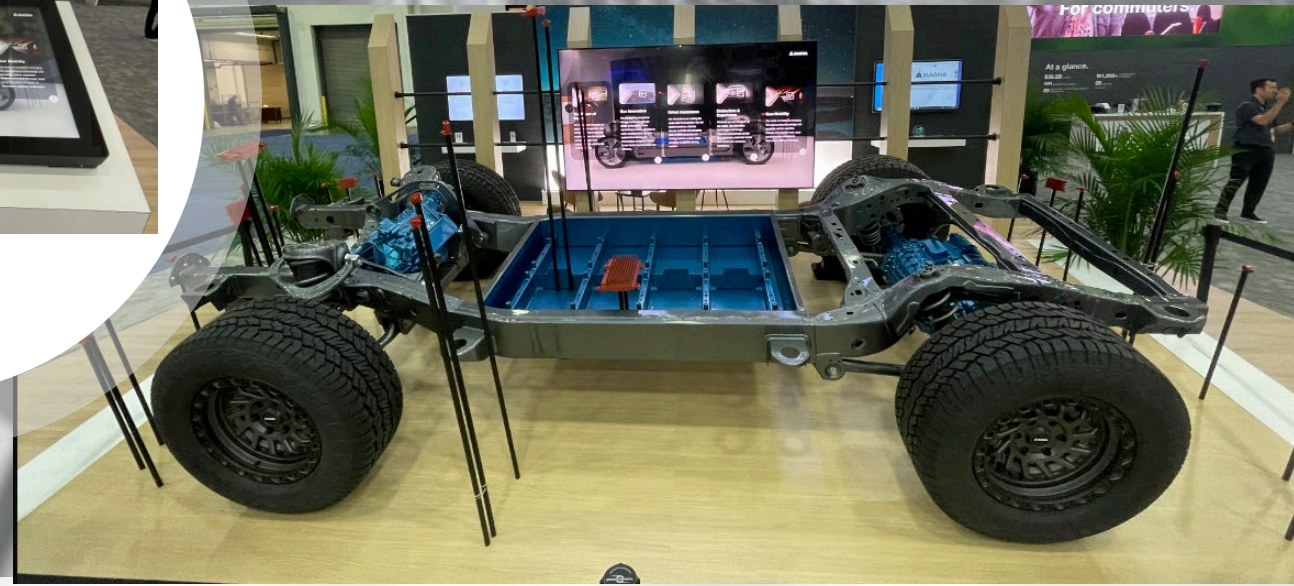
2023 CES Technology Storyboards

Power of Magna



The Power of Magna Display

Our holistic approach is your competitive advantage across the complete vehicle and beyond. Through our global networked knowledge and collaborative teamwork, relevant innovations are created. As a system partner, we are the innovation hub with state-of-the-art simultaneous engineering methods and highly automated production processes.



Product display only that encompasses all Magna competencies and differentiators

Competitive advantage/differentiators

- Deep product expertise
- Integrated systems approach
- Complete vehicle engineering and manufacturing experience

Virtual Features

Storyboards, Video and other media arranged by Technology Pillars

- Eco Innovation
- Distinction and Experience
- Assisted Driving
- New Mobility

Physical Features

- Complete ADAS System: Domain Controller, Ultrasonic sensors, Cameras, Radar, LiDAR
- Electric eBeam rear axle w/ Front mid+ eDrive
- Fully integrated, structural battery enclosure

New Mobility – Flexible, low-cost EV for autonomous, last mile, delivery solutions

Magna Delivery Device

autonomous, electric delivery vehicle

Our bot is a low cost, on-road, electric delivery vehicle. The bot is designed to be flexible in use cases and storage configurations with multiple levels of on-board and external safety technologies.



Features and Specifications

- 20 mph max speed
- 75 kgs of payload, 700 liters of cargo volume
- Can accommodate up to 4 separate orders per trip
- Self-driving with teleoperations
- All electric application
- Width: 1.1m
- Length: 1.8m
- Height: 1.35m
- Weight: <250kg
- Range: TBA

Additional Features

Safety

- L4 autonomy with Radar, LiDAR, cameras and ultrasonic sensors on board
- 1:6 Teleoperation ratio for remote monitoring
- Automatic Emergency Braking activated if communication with bot is lost

Cargo

- Flexible cargo area that can be configured for varying sizes and shapes
- Space allows for at least 4 separate orders per trip
- May be heated depending on application



Smarter



Cleaner



Magna Exclusive



Electrification



New Mobility



Design

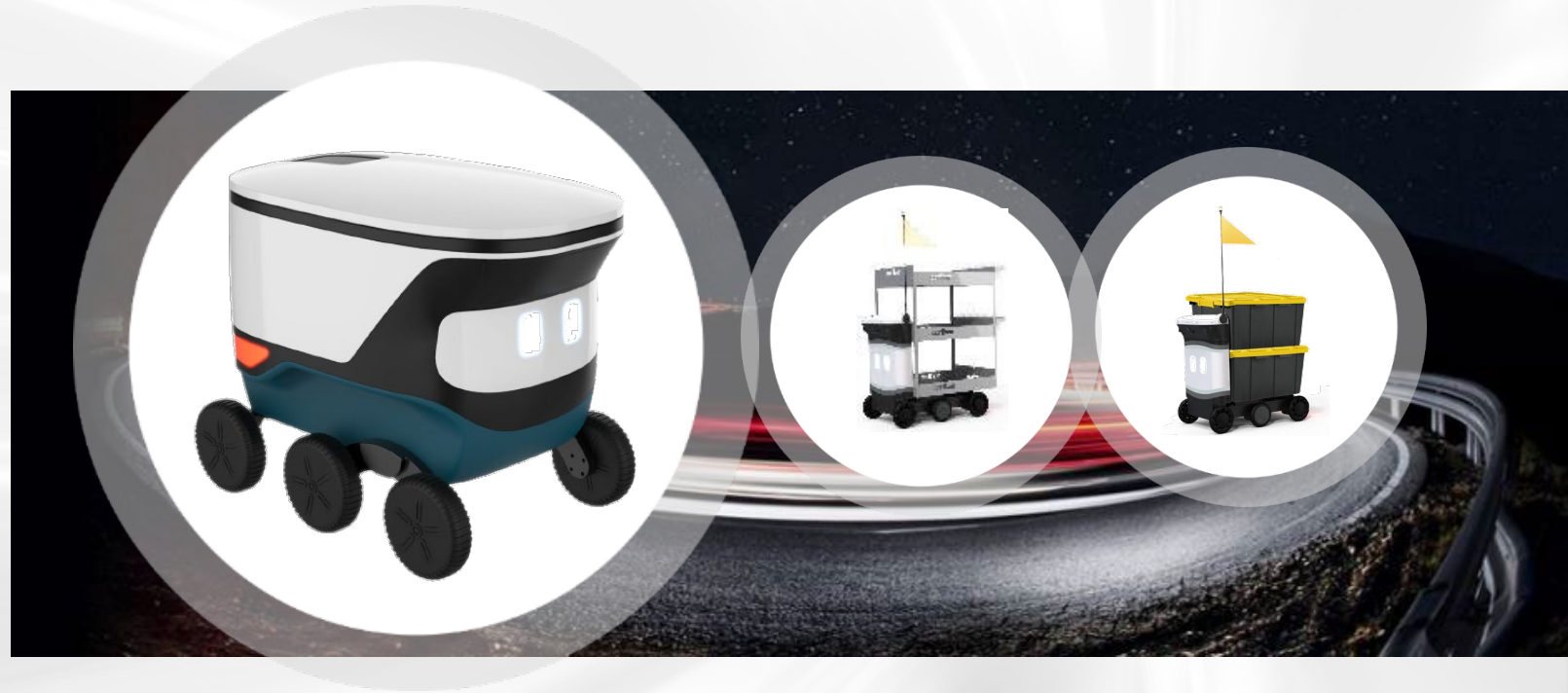


Autonomy

New Mobility – Purpose built autonomous delivery bots for indoor or outdoor applications

Cartken Indoor / Outdoor Delivery Devices

Magna is partnering with San Francisco-based autonomous robotics company, Cartken, to scale assembly of their Model C sidewalk delivery device. There are plans to expand the lineup for more robot-as-a service applications. The Cartken autonomous delivery robots are fitted with multiple cameras and respond to situations in real-time using a combination of machine learning and simultaneous localization and mapping (SLAM)-based navigation algorithms



Features and Specifications

MODEL C

- 6 mph max speed
- 14 kgs of payload, 40 liters of cargo volume
- All electric application
- Fully Autonomous using active stereo HDR Cameras
- Indoor / Outdoor capable
- Can climb 8" obstacles

- Currently in operation in several malls, hotels, universities, retail back-of-house and warehouses around the world

MODEL E

- 5 mph max speed
- 50 - 100 kgs of payload, based on configuration
- All electric application
- Modular platform for many use cases
- Controlled via tablet, easy setup and use
- Sidewalk delivery version available



Smarter



Cleaner



Autonomy



Electrification



New Mobility

Auto Adjust Seating

Magna's Real Time Pressure Sensing technology can measure occupant pressures and adjust bolsters automatically based on pre-determined preferred positions.



Smarter



New Mobility



Lighter



Co-Development
Opportunity



Patent Pending



Magna Exclusive

Competitive advantage/differentiators

- Flexible and thin 2D Multiplex sensor array
- Compatible with foam pad integration
- Machine learning algorithms can detect in real-time the variation in postures
- Precision and accuracy
- Inert to external interference
- Low profile packaging - less than 2mm thick
- Low power – operates on less than 500mW

Applications

- Auto-Adjustment of seat comfort features
- Adjustable for different driving modes
- Anti-fatigue/discomfort mitigation
- Occupant detection in autonomous vehicles
- Detect unbuckled occupant and unattended children
- Potential to use in occupant classification system

SOP

Ideation

Discovery

Concept

Development

Serial Preparation

in Production

Central Seat ECU

Magna's Central Seat ECU provides a scalable solution with the capability to incorporate features for all rows of seating and the opportunity to extend into other vehicle controls (such as doors, steering wheel, mirrors, running boards, etc.).



Smarter



Electrification

Competitive advantage/differentiators

- High performance 32 bit, 48MHz MCU (S32K142)
- 2 KB EEPROM/NVRAM for position memory
- High speed CAN/LIN (CAN-FD scalable)
- Object detection
- Modular concept (Configurable IOs) can be scaled up or down as required
 - Capable to run up to 10 motors with PWM controls and 11 hall effect sensors
 - 4 temperature sensors (thermistors), 10 digital inputs, 5 analog inputs and 4 solenoids
 - 4 high side drivers for heaters and 4 for vents

Applications

- Reconfigurable IOs to support different applications
- Capable of consolidating multiple functions to reduce the number of individual controllers

SOP

Ideation

Discovery

Concept

Development

Serial Preparation

in Production

FreeForm™

Magna FreeForm™ is an innovative new seat trim cover technique that provides OEMs with a single smooth, seamless styling surface with hidden tiedowns. It enables the freedom to achieve endless design possibilities, high seat concavity, improved seat back comfort and enhanced cleanability.



Smarter



Cleaner



Lighter



Design



Exclusive@Magna



New Mobility



Patented



First to Market

Competitive advantage/differentiators

- Remarkable design & styling flexibility
- Allows for rapid mid cycle trim changes
- Reduces production variation, improves overall quality and craftsmanship
- Can be applied to other areas of the interior (i.e. door panels, and center consoles)
- Utilizing our in-house expertise, FreeForm™ back panels contain up to 50% proprietary polyols derived from recycled polyethylene terephthalate while the seating surface foam contains up to 20% renewable materials from a bio-feedstock.

Applications

- Provides a highly concave surface without material bridging or traditional tie-downs
- Allows for various shapes and crisp styling lines that result in prominent visual effects (Seamless A or B surface designs)
- Provides a back panel with a “soft touch” while maintaining shape, improving rear seat occupant knee clearance

SOP

Ideation

Discovery

Concept

Development

Series Preparation

in Production

Advanced Driver Assistance Systems

Driver Monitoring System

Magna's mirror integrated DMS is a natural extension of our leadership position in camera and mirror technologies. Features a proven camera-based solution that actively monitors and reduces distracted driving through customizable alerts and notifications, all in one complete product system.



Smarter



Safer



Electrification



Autonomy



New Mobility



Design



Co-Development
Opportunity



Patented

Competitive advantage/differentiators

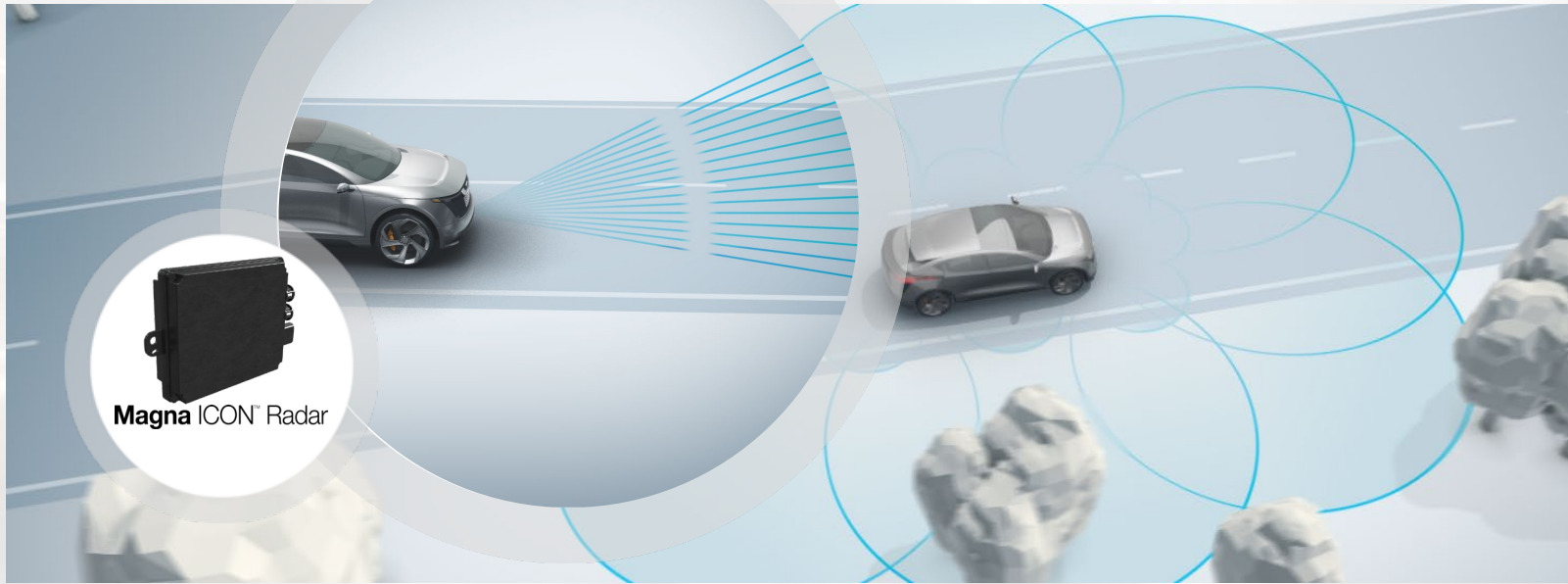
- Real time monitoring of driver head, eye and body movement to detect distracted behavior, drowsiness and fatigue
- Cost saving by integrating with existing ADAS systems
- Common core designs (camera and algorithm) fit multiple system configurations
- Seamless packaging into inside mirror and overhead console
 - By design, the interior mirror provides the best unobstructed view to the driver
 - Flexible camera mounting positions including steering column, instrument cluster, center console and A-pillar

Features

- Drowsiness detection
- Engagement level detection
- Precision gaze detection
- Head pose detection
- Face identification
- Auto calibration

ICON™ Radar Long-Range

The industry's first to market digital code modulated 4D imaging radar. Best-in-class range & resolution, safety through enhanced perception.



Smarter



Safer



Autonomy



New Mobility



First to Market
Opportunity

Competitive advantage/differentiators

- Digital encoded Phase Modulated Continuous Wave (PMCW) Radar technology
- 4D sensing enhances perception with object separation in range, velocity, azimuth & elevation
- High dynamic range – detects small objects relative to a larger object
- High vehicle detection range of >300m
- Detection of pedestrians of >150m

Features

- Full speed range ACC with VRU AEB
- Traffic Jam Assist (TJA)
- Debris on road AEB/AES
- L2+ highway driving support
- Localization & mapping
- Radar point cloud output

ICON™ Radar Mid-Range

The industry's first-to-market digital code modulated 4D imaging radar. Our Mid-Range ICON Radar offers a 360° cocoon encompassing >160m, supporting L2+ features.



Smarter



Safer



Autonomy



New Mobility



First to Market
Opportunity

Competitive advantage/differentiators

- Digital encoded Phase Modulated Continuous Wave (PMCW) Radar technology
- Superior pedestrian detection – VRU regulation
- Common sensor for all mid-range applications with expanded features
- Angular separation – discrimination of pedestrians and small objects

Features

- Enhanced rear and front cross traffic
- Extended range blind spot / Lane change assist
- Lateral collision mitigation
- Intersection (crossing) protection
- ACC Stop & Go
- Small object detection

Mechatronics

SmartAccess™ Power Door B-Pillarless

The SmartAccess™ platform reimagines traditional vehicle access experiences. Enabled by Magna's holistic vehicle systems approach, SmartAccess™ B-Pillarless provides an elegant access experience for consumers by removing the b-pillar from the vehicle structure.



Smarter



Safer



Electrification



Autonomy



New Mobility



First to Market



Design



Co-Development
Opportunity



Exclusive@Magna



Patented

Competitive advantage/differentiators

- Holistic vehicle solution with complete mechatronics system and structural reinforcements to enable a b-pillarless experience
 - Mechatronics: power hinges, door-to-door latches and strikers, door to vehicle SmartLatch™
 - Structure Reinforcements: integrated b-pillar, body side structure
- Multiple embodiments available for various vehicle segments
- Allows for brand differentiation and styling
- Available SmartLatch™ with integrated cinch enables full door function integration and styling enhancements through eHandles and HMI sensors

SOP

Ideation

Discovery

Concept

Development

Series Preparation

in Production

FlecsForm™

Advanced lighting technology that utilizes high speed direct transfer technology of mini LEDs onto rigid or flexible circuits to enable thinner, more efficient lighting solutions to enhance styling.



Smarter



Safer



Cleaner



Lighter



Electrification



First to Market



Patented



Exclusive@Magna



Design



Co-Development
Opportunity

Competitive advantage/differentiators

- Uniform lighting in an extremely thin and flexible package
- Enables complex shapes and endless design possibilities
- Provides styling freedom for brand/series signature lighting
- Robust and cost-efficient OLED alternative light source
- Thermally efficient, low power consumption and lightweight
- Communication display capabilities
- Supports intricate animation function
- Functions – Tail, Stop, Turn, Backup
- White LED for high lumen output (fog, DRL, low beam)
- RGB color (SOP ready 2025)
- RFQ Ready

SOP

Ideation

Discovery

Concept

Development

Series Preparation

in Production

eBeam – Electric Axle Drive System

Heavy Duty electric drive for frame-based vehicle usage. Structure-oriented design to support high payload and towing capability with matching power for continuous duty usage, high peak torque and robustness.



Features and Specifications

- Targeting up to 225 kW continuous power / 300 kW peak power and up to 12,000 Nm at the wheels
- Reduction ratio range: 12 – 25 (w/ 2-speed option)
- ePark-lock, locking differential, mLSD & eLSD options
- Fulfills ISO 26262 - ASiL “D”
- Integrated or remote mounted inverter design possible
- Coaxial or offset architecture w/ option for 2-speed gearbox for increased towing capability
- High speed PSM 3 phase motor: nMax = 16,500 rpm
- Steerable version and dual motor architecture optionally available

Competitive advantage/differentiators

- **Safety**
Robust design for safe towing and hauling
- **Dynamics**
Scalable power to 225 kW_{cont} / 300 kW_{peak} and 12,000 Nm peak axle torque
- **Vehicle Integration**
Adaptable to current suspension, achieves required clearances during full suspension movement

Applications

- Battery Electric Vehicle / FuelCell
- PUP / LCV
- Primary and complementary propulsion
- Coaxial e-motor for GAWR up to 3,250 kg and Offset e-motor w/banjo axle for GAWR up to 7,850 kg

SOP

Ideation

Discovery

Concept

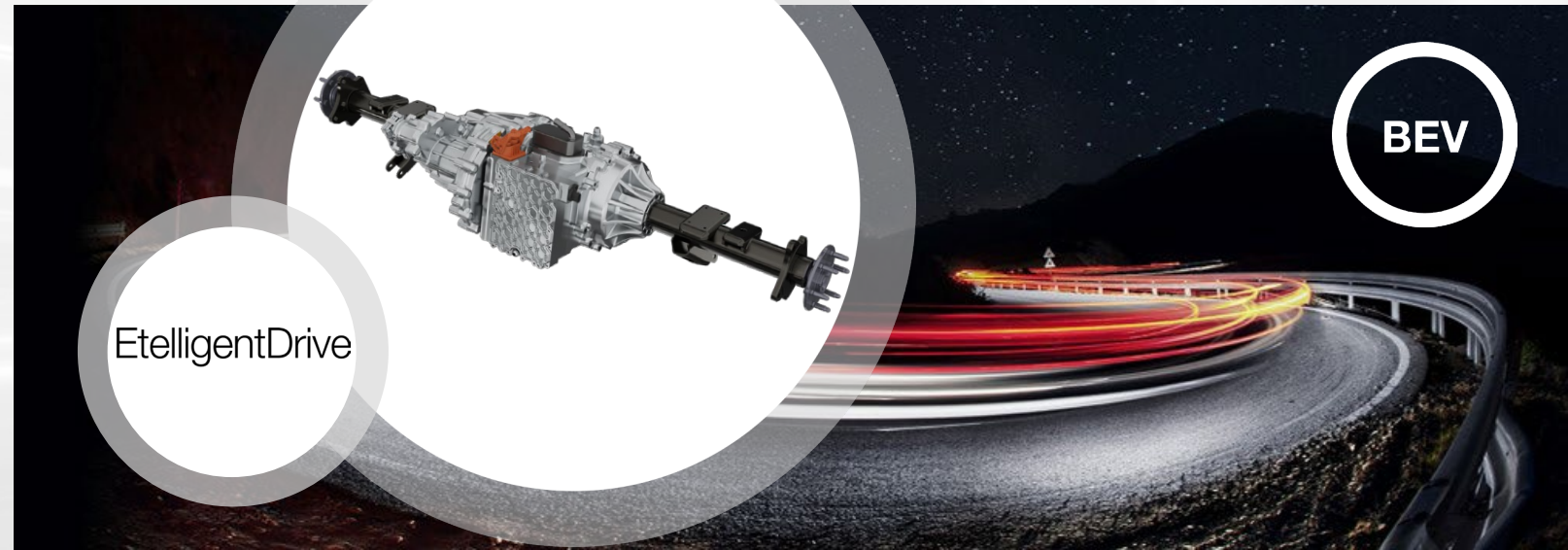
Development

Series Preparation

in Production

eBeam – Electric Axle Drive System

Heavy Duty electric drive for frame-based vehicle usage. Structure-oriented design to support high payload and towing capability with matching power for continuous duty usage, high peak torque and robustness.



Features and Specifications

- Targeting up to 150 kW continuous power / 200 kW peak power and up to 7,000 Nm at the wheels
- Reduction ratio range: 12 – 18
- ePark-lock, locking differential, mLSD & eLSD options
- Fulfills ISO 26262 - ASiL “D”
- Integrated or remote mounted inverter design possible
- Coaxial architecture with offset gearbox
- High speed PSM 3 phase motor: $n_{Max} = 16,500$ rpm
- Steerable version and dual motor architecture optionally available

Competitive advantage/differentiators

- **Safety**
Robust design for safe towing and hauling
- **Dynamics**
Scalable power to 150 kW_{cont} / 200 kW_{peak} and 7,000 Nm peak axle torque
- **Vehicle Integration**
Adaptable to current suspension, achieves required clearances during full suspension movement

Applications

- Battery Electric Vehicle / FuelCell
- PUP / SUV / LCV
- Primary and complementary propulsion
- Coaxial e-motor for GAWR up to 3,250 kg

SOP

Ideation

Discovery

Concept

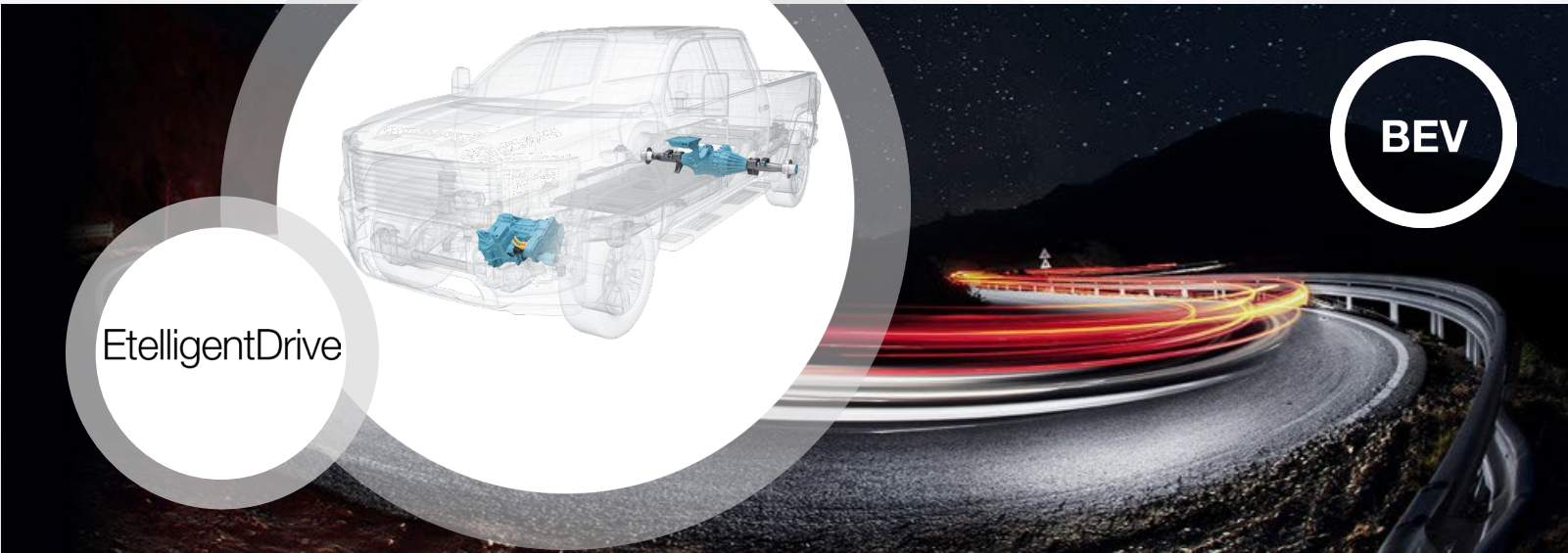
Development

Series Preparation

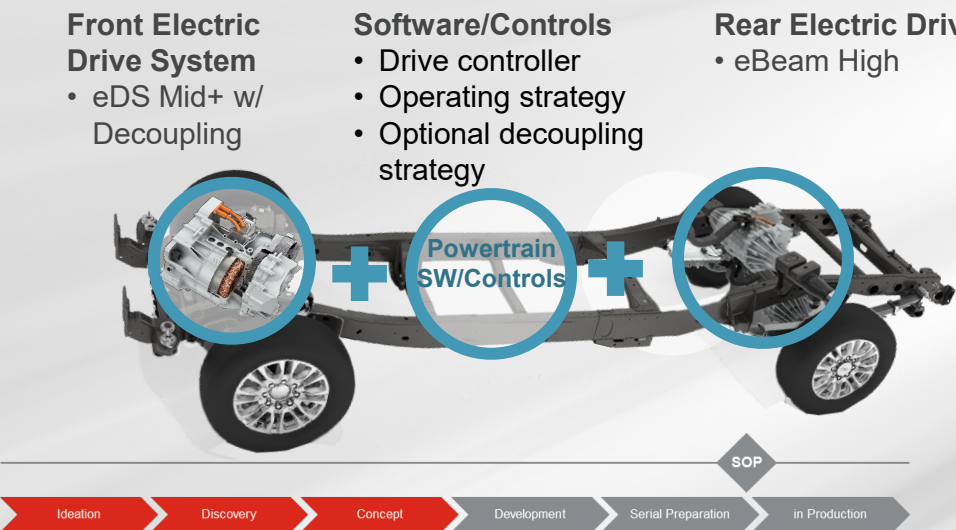
in Production

Magna EtelligentForce

Magna EtelligentForce is a battery electric 4WD powertrain system for passenger trucks and light commercial vehicles, designed to maintain the full capabilities of these vehicles with uncompromised payload and towing.



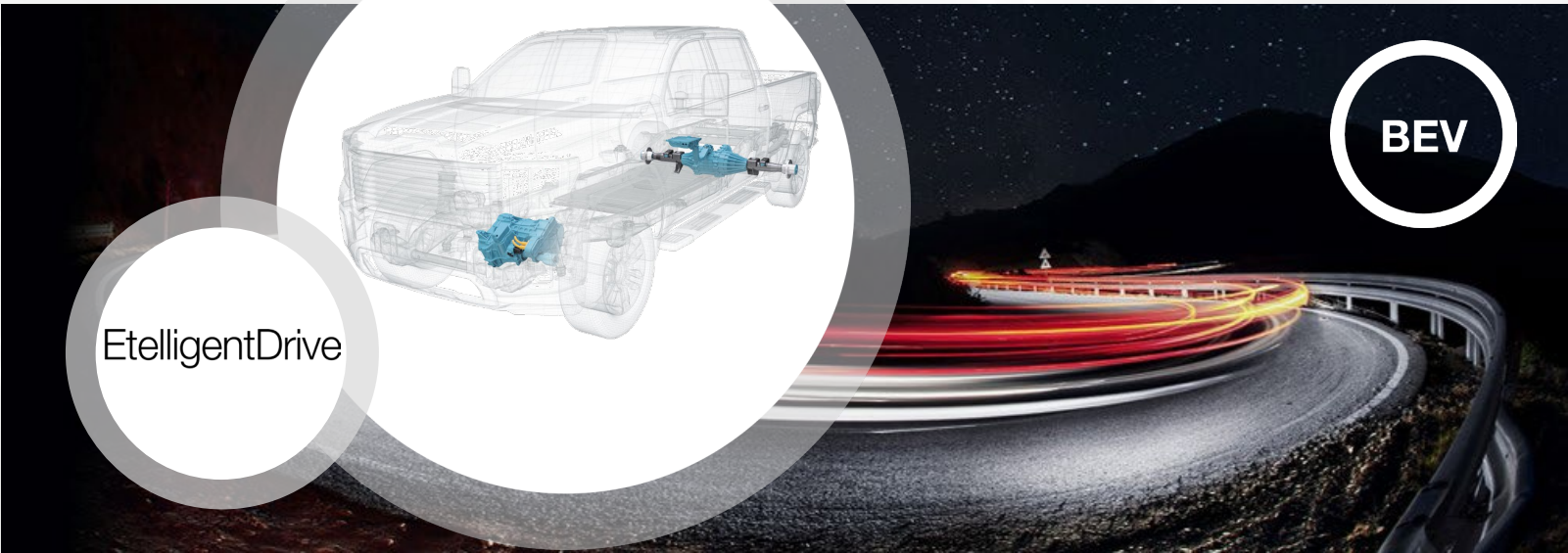
Complete powertrain solution with best-in-class functions



		Covers all Real World Driving Situations			
		BIC Efficiency	BIC Safety	BIC Dynamics	BIC Convenience
Vehicle Sub Functions	Longitudinal	X Required for BIC Functionality			
			X	X	X
	Lateral		X	X	X
			X	X	X
			X	X	X
	Options		X	X	X
			X		X

Magna EtelligentForce

Magna EtelligentForce is a battery electric 4WD powertrain system for passenger trucks and light commercial vehicles, designed to maintain the full capabilities of these vehicles with uncompromised payload and towing.



Features and Specifications

Rear Axle Electric Drive Unit

Magna eBeam

- Peak axle power: up to 250 kW ¹⁾
- Peak axle torque: 10,000 Nm²⁾
- Ratio rear axle : 12,67

Front Electric Drive Unit

Magna eDS Mid+ w/ Decoupling

- Peak axle power: up to 170 kW
- Peak axle torque: 3,770 Nm
- Ratio front axle 11,720

Magna Operating Control Software

Competitive advantage/differentiators

- **Efficiency**
Decoupling capability of front axle
- **Safety**
Robust coaxial beam axle design
- **Convenience**
Uncompromised 14,500 pounds towing capability
- **Dynamics**
Up to 430 kW peak power

Applications/benefits

- **Vehicle Integration**
Totally customizable w/o need for architectural changes

¹⁾ A-sample application limitation to 220 kW for 30 s for protection reasons

²⁾ A-sample application limitation to 7,500 Nm for protection reasons

