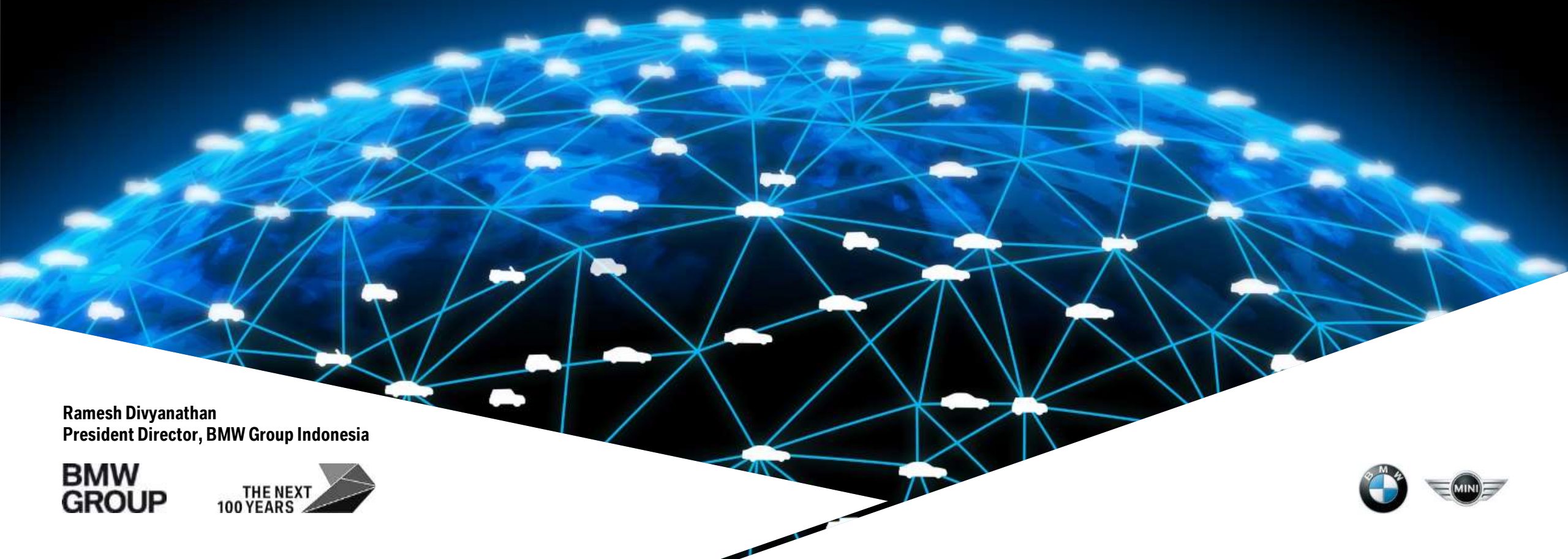
APPLICABLE AUTOMOTIVE TECHNOLOGY IN THE FUTURE.

GAIKINDO INTERNATIONAL AUTOMOTIVE CONFERENCE 2019.
"FUTURE TECHNOLOGY IN MOTION"
24 JULY 2019



Ramesh Divyanathan
President Director, BMW Group Indonesia

BMW GROUP

THE NEXT 100 YEARS

FUNDAMENTAL CHANGE IN VEHICLE REGULATION: A PARADIGM SHIFT FOR THE AUTOMOTIVE INDUSTRY.

Passive safety in the 1970s

Exhaust emissions since the 1980s

Airbags in the 1990s

In the past, new policies:

- Addressed industry only
- Did not need consumer consent
- Affected all manufacturers equally
- Did not require demand stimulation
- Were defined at national level

Today's Climate Policy:

- Mandates new products
- Requires demand side policies
- Depends on new infrastructure
- Reshapes competitive landscape

1) Decarbonization and Electrification

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Connected Mobility depends on:

- Adaptation of existing rules
- Mitigation of risks
- Clarification of responsibilities
- A competitive landscape

2) Connectivity and Vehicle Automation

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LOCAL SUPPORT IS BECOMING AN ESSENTIAL SUCCESS FACTOR

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1) Decarbonization and Electrification

2) Connectivity and Vehicle Automation

GLOBAL TRENDS DRIVING THE FUTURE OF SUSTAINABLE MOBILITY.

Environment
Climate change and the subsequent effects

Urbanization
By 2030, over 60% of the world's population will live in cities

Politics and Regulations
CO2 and fleet regulations, import restrictions

Global Trends

Economics
Dwindling resources, rising fossil fuel prices

Culture
Sustainable mobility as part of a modern urban lifestyle; taking social responsibility

Digitalization
Self-driving cars, connectivity and new business models

PICTURE INTO THE FUTURE.

Traditional OEM

Smart Car & Digital Services

Car as a Service

Mobility as a Service

MOBILITY TRANSFORMATION (ACES).

AUTONOMOUS

CONNECTED

ELECTRIFIED

SHARED & SERVICES

BMW X5.
ADAS (ADVANCED DRIVER ASSISTANCE SYSTEMS) FEATURES.

- NOT IN ECE
- OPTIONS ARE ALREADY AVAILABLE IN INDONESIA

AUTONOMOUS DRIVING OPENS NEW OPPORTUNITIES FOR CUSTOMERS AND COMMUNITY .

\+ More **Safety**
More **Comfort**
More **Flexibility**
More **Time**

– **Less** Emissions
Less Accidents
Less Traffic

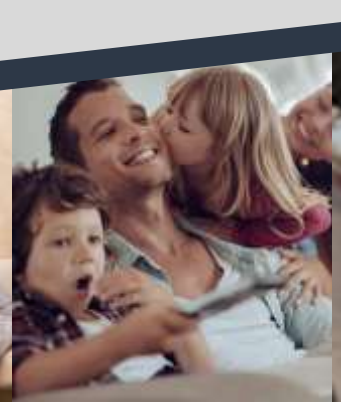
New **Mobility Concepts**

Car as **Extended Living Space**










AUTOMATED DRIVING LEVELS.

LEVEL 0

No assistance

Driver

LEVEL 1

Assisted

Feet off

Driver role:
Steering and supervising acceleration and braking.

LEVEL 2

Partially automated

Hands off

Driver role:
Supervising the vehicle control.

LEVEL 3

Highly automated

Eyes off

Driver role:
Always prepared to take over.

LEVEL 4

Fully automated

Mind off

Driver role:
Required only on certain road sections.

LEVEL 5

Autonomous

Passenger

Human driver always responsible for supervision

Machine sometimes responsible for supervision

Machine always responsible

AUTONOMOUS DRIVING REQUIRES COLLABORATION.

COOPERATION

– Sensors: camera, radar, LIDAR
– Object fusion
– Road model
– Driving strategy/planning

AUTONOMOUS DRIVING

OEMs

HD-MAP

– Centimeter precision
– Real-time capable
– Highly available and reliable

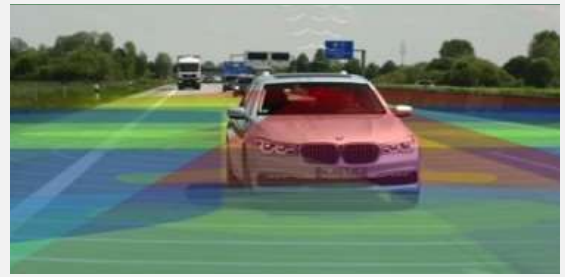
OEM-COOPERATION

INFRASTRUCTURE 5G

– Ultra low latency
– Ultra high reliability
– Ultra high data rates

5G AUTOMOTIVE ASSOCIATION

TEST FIELDS



– Worldwide regulation
– Unified homologation
– Safe and secure Development

AUTHORITIES AND ASSOCIATIONS

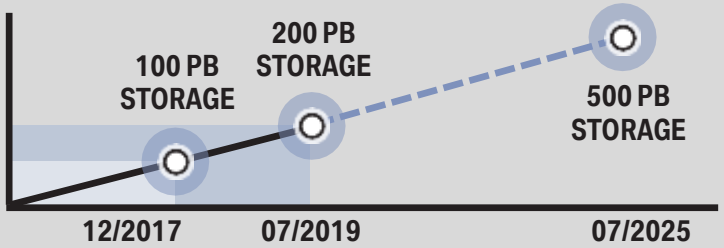
SAFETY FIRST: 240 MILLION KILOMETERS WITHOUT ACCIDENTS TO BE COMPLETED.

DRIVING SIMULATION AND SW IN THE LOOP

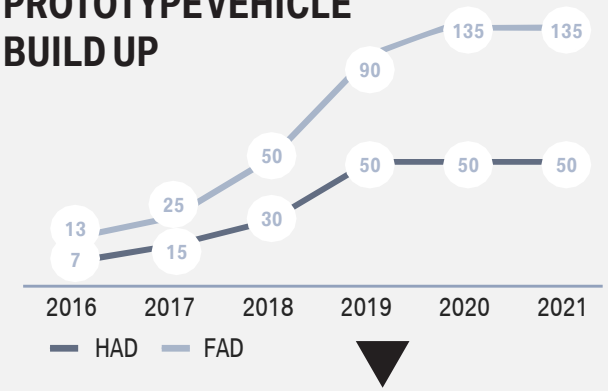
REPRODUCIBLE CUSTOMER USE CASES:
REQUIRED > 95 %

DATA CENTER

Co-Location in Unterschleißheim



PROTOTYPE VEHICLE BUILD UP



FAD (Fully Autonomous Driving, Level 4):
5TB/H > 40TB/DAY 8H/5 DAY RUNNING
HAD (Highly Autonomous Driving, Level 3):
2TB/H > 16TB/DAY 8H/5 DAY RUNNING

MOBILITY TRANSFORMATION (ACES).

AUTONOMOUS

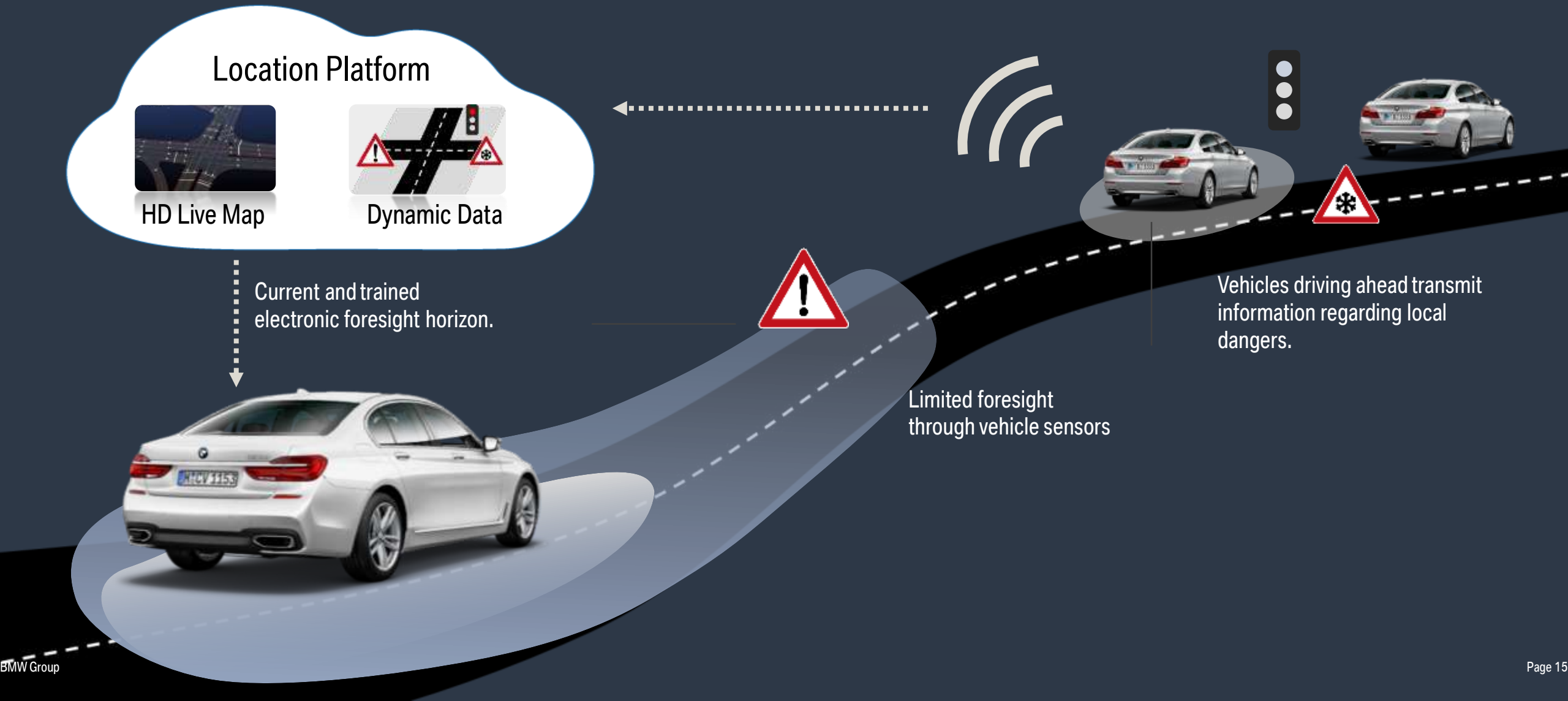
CONNECTED

ELECTRIFIED

SHARED & SERVICES

CONNECTED VEHICLES: BMW CLOUD-BASED HAZARD WARNING. 650.000 CARS SENSING EVENTS, TRANSMITTED TO MORE THAN 1.5 MIO BMWs.

HIGH DEFINITION LIVE MAPS.



MOBILITY TRANSFORMATION (ACES).

AUTONOMOUS

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SHARED & SERVICES

WE ARE INDUSTRY FRONTRUNNERS IN E-MOBILITY.

2013

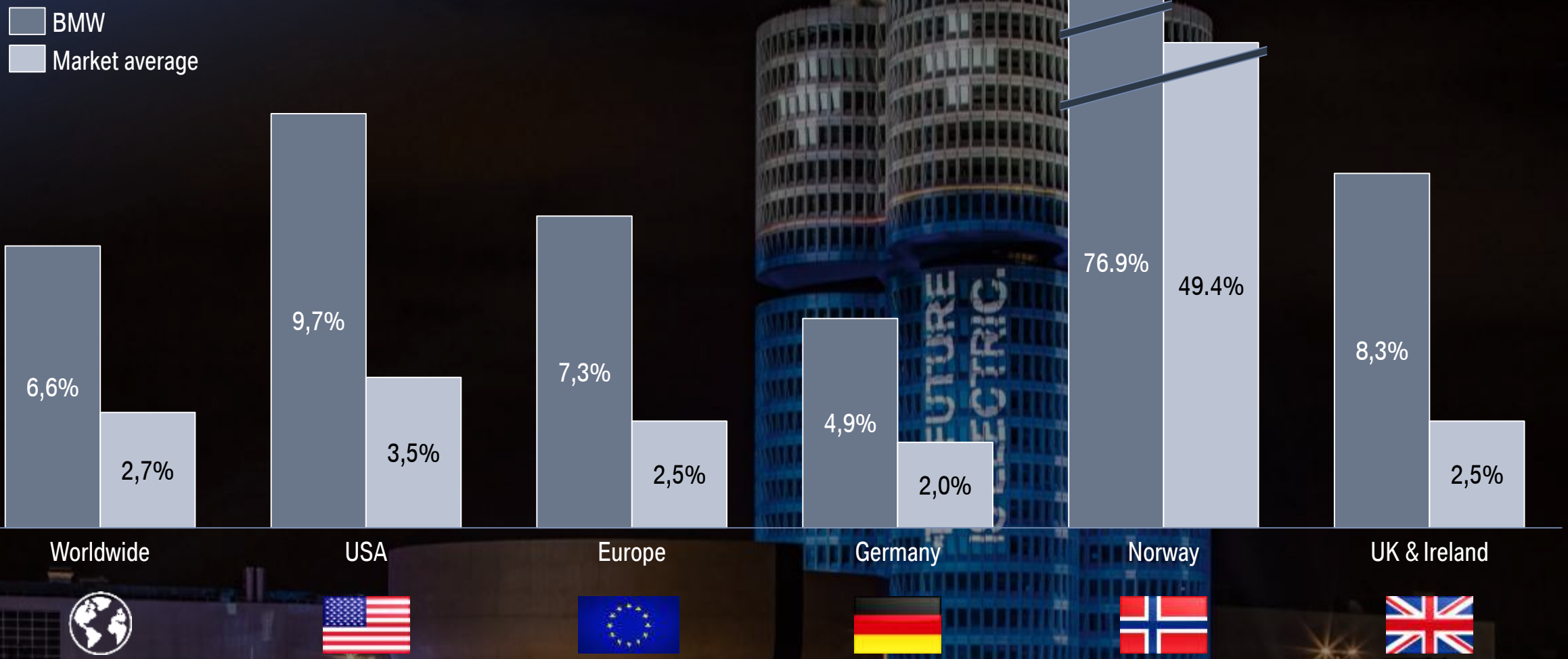
10% share
of the global EV market

2017

500,000
electrified vehicles sold

2019

SHARE OF ELECTRIFIED* VEHICLES.



*PHEV & BEV
Data source: IHS Markit New Registrations 03.2018-02.2019

CONSCIOUS FOCUS ON BOTH BEV AND PHEV.
25 ELECTRIFIED MODELS BY 2023.

Battery electric


BMW i3
60 Ah / 22 kWh


BMW i3
94 Ah / 33 kWh


BMW i3, BMW i3s
94 Ah / 33 kWh


BMW i3, BMW i3s
120 Ah / 42 kWh


MINI BEV


BMW iX3


BMW iNext


BMW i4

Until 2023
at least
12 BEVs

2014 — 2015 — 2016 — 2017 — 2018 — 2019 — 2020 — 2021 — 2025


BMW i8


BMW X5
xDrive 40e


BMW 740e
BMW 740Le


BMW 330e


BMW 225xe


BMW X1 xDrive
25Le (CN only)


BMW 530e


MINI Cooper S E
Countryman ALL4


BMW i8 Roadster


BMW 530Le
(CN only)


BMW 745e, Le,
Le xDrive


BMW 330e


BMW 225xe


BMW 530e

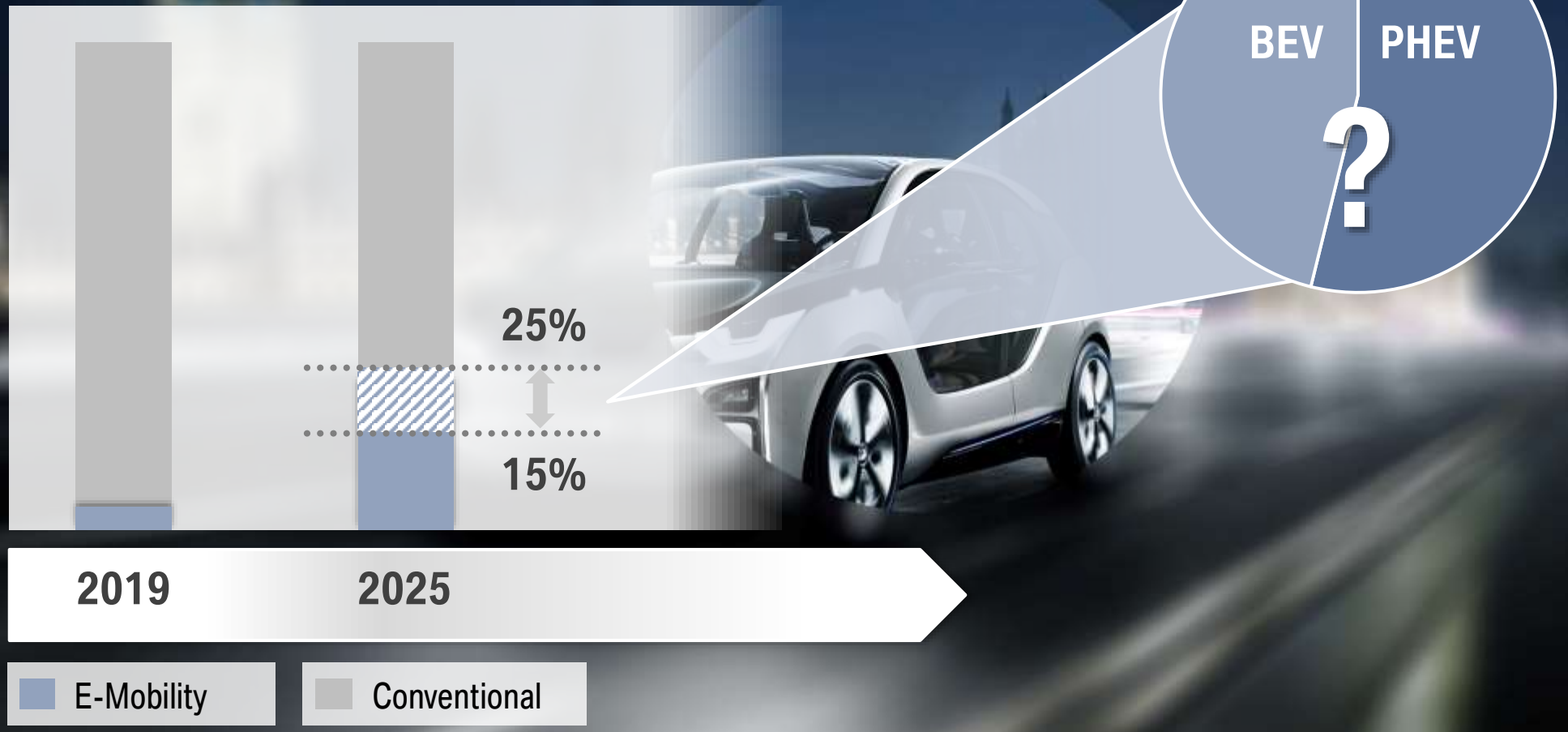

BMW X5
xDrive 45e


BMW X3
xDrive30e

Until 2023
at least
13 PHEVs

Plug-In-Hybrid

SHARE OF BEV AND PHEV IS INCREASING BUT UNCERTAIN.

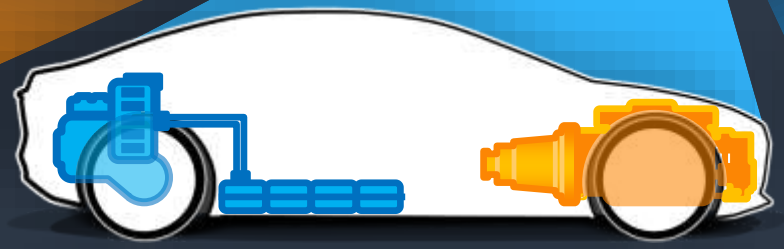


COMMON ARCHITECTURE FOR ANY TYPE OF DRIVETRAIN BRINGS SCALABILITY AND FLEXIBILITY.

2013

2020 ONWARDS

Combustion engine



Plug-in hybrid

Battery electric

NEXT MEMBERS OF THE BMW I MODEL LINEUP…

Segment:	SAV	SAV	4 door Gran Coupé
Range in WLTP:	> 400 km	> 600 km	> 600 km
Launch year:	2020	2021	2021
Production site:	China	Dingolfing	Munich

BMW i.
A HOLISTIC APPROACH.

New brand BMW i

New vehicle concepts

Sustainability

360° Electric

Mobility Services

Connectivity

MOBILITY TRANSFORMATION (ACES).

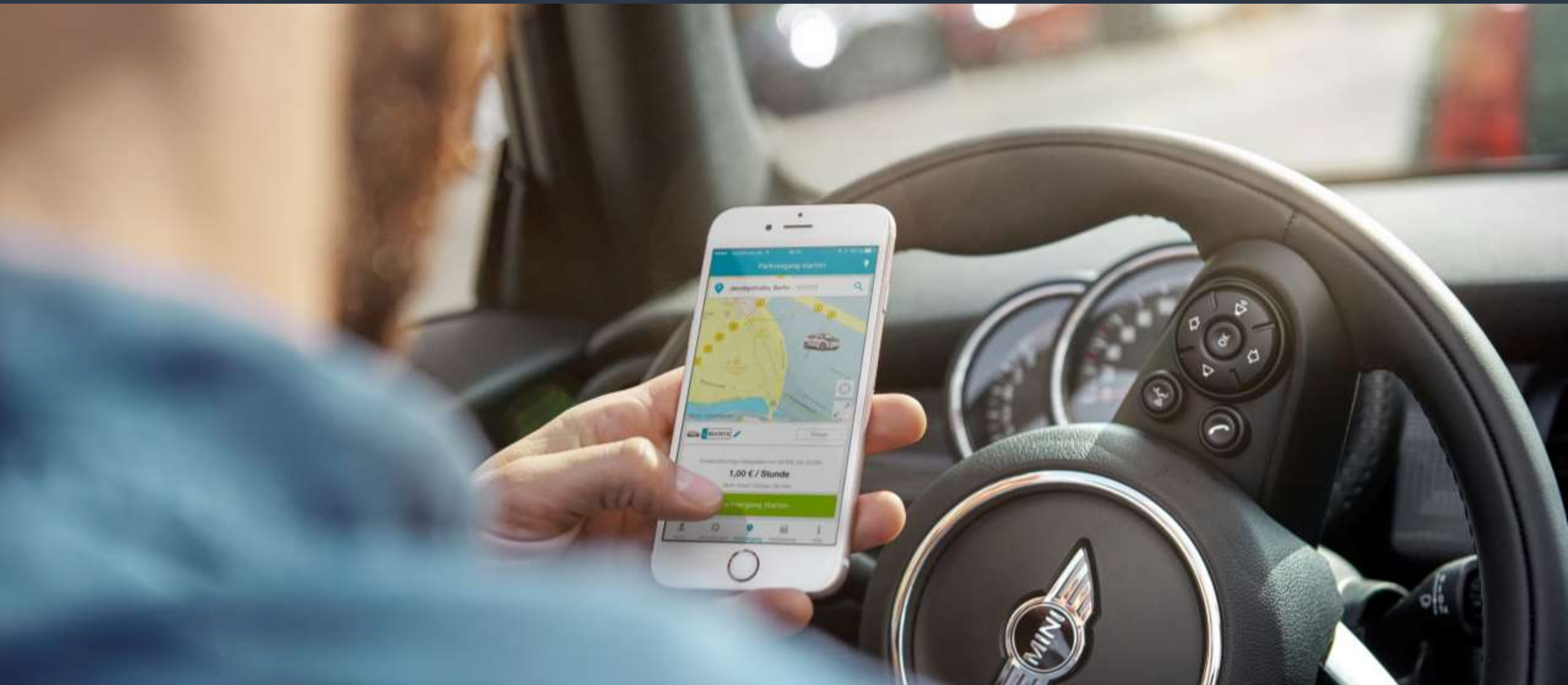
AUTONOMOUS

CONNECTED

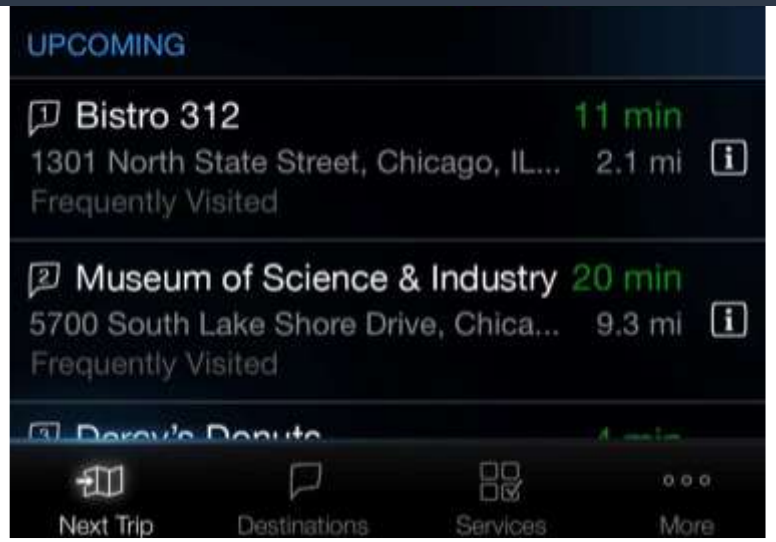
ELECTRIFIED

SHARED & SERVICES

DIGITALIZATION AND CONNECTIVITY.
ENABLING ON-DEMAND BUSINESS MODELS.



BMW I REMOTE APP: CONNECTED ON THE WAY. SEAMLESS GUIDANCE OUTSIDE THE VEHICLE.



THANK YOU VERY MUCH FOR YOUR ATTENTION.