

# MOVING ON - FOUR THESES ON ZERO EMISSION MOBILITY.

**ANDREAS KLUGESCHEID.**  
**HEAD STEERING GOVERNMENTAL AFFAIRS, EXTERNAL AFFAIRS AND SUSTAINABILITY COMMUNICATIONS.**



Asilomar 2017.

# **I. THE AUTO INDUSTRY IS CHANGING - DECARBONIZATION IS KEY.**

# ICONIC CHANGES ARE RESHAPING THE INDUSTRY.

**CO<sub>2</sub> & emissions  
targets**

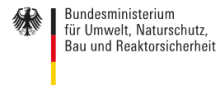
**CO<sub>2</sub>  
Emobility**

**Connected  
Mobility**

**Autonomous Driving**

**Mobility Services**

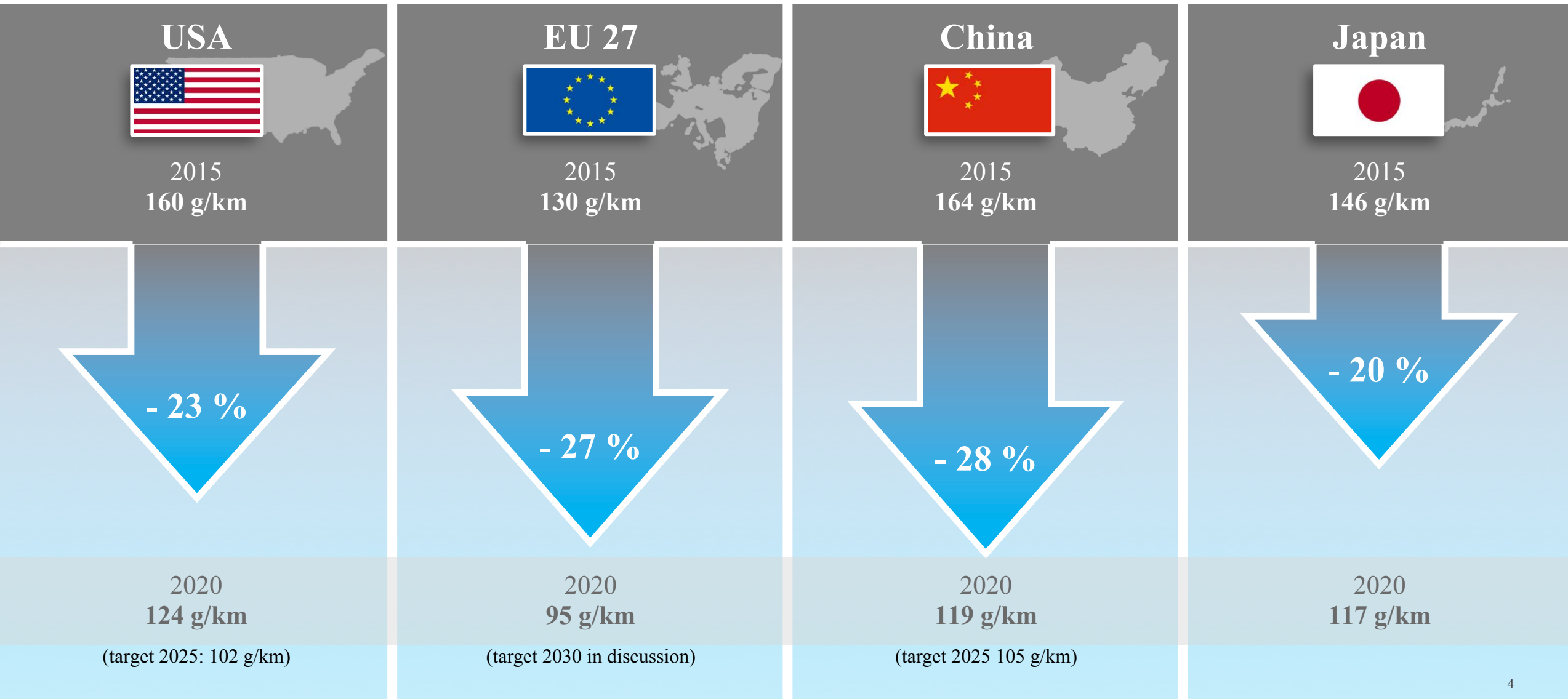
**Driven by climate change**



**Driven by technology**



# POLITICS AND REGULATION.





# MAJOR CHALLENGES FOR THE DEVELOPMENT OF THE EV MARKET ARE...



INFRASTRUCTURE



CHARGING  
TIME



RANGE



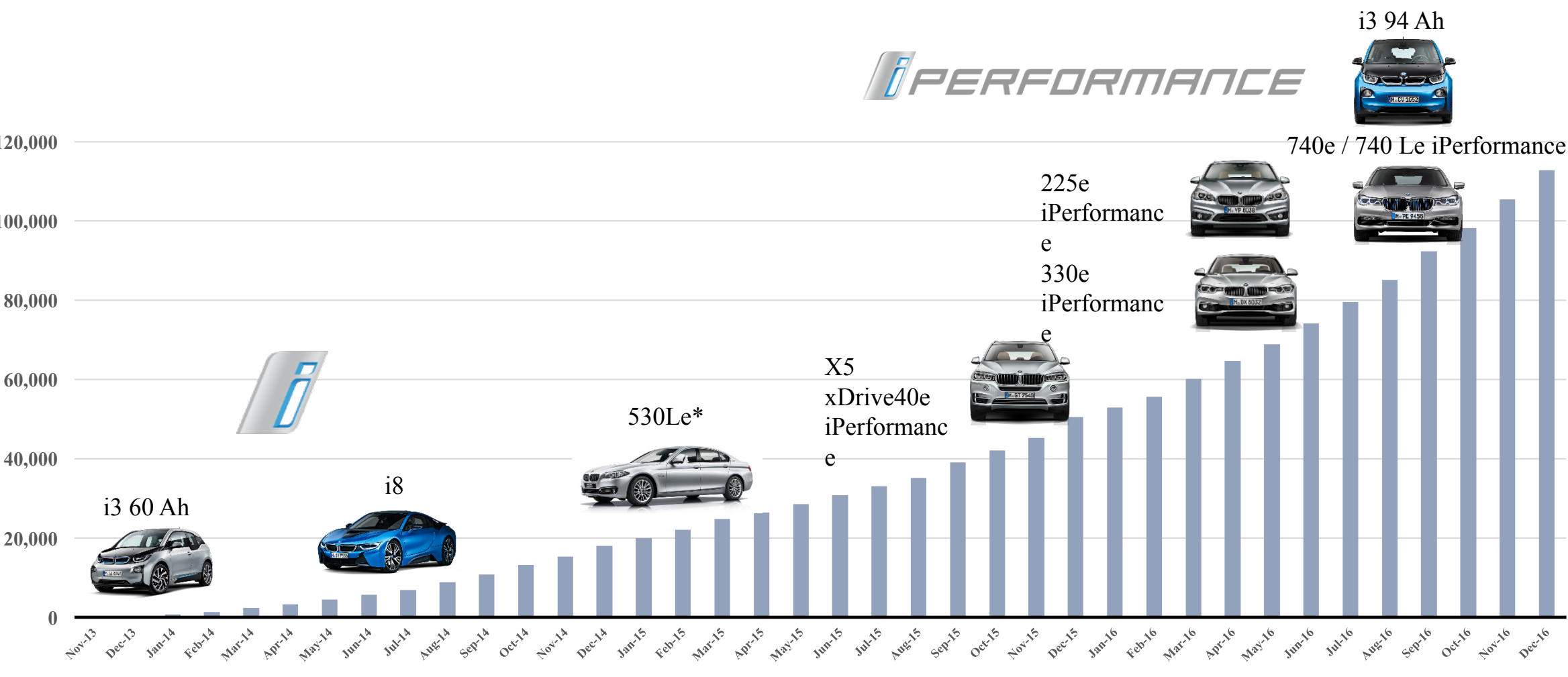
COSTS



RESALE  
VALUE

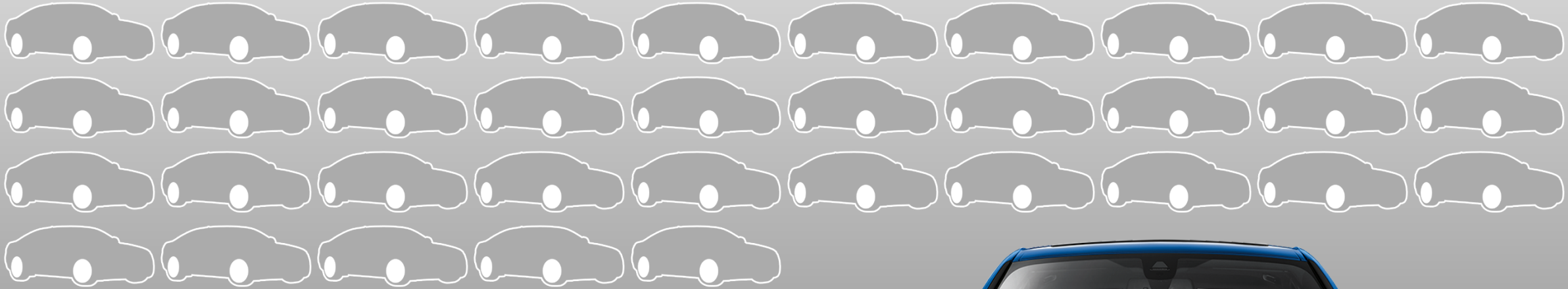
Challenges  
e-mobility

# MORE THAN 100,000 ELECTRIFIED BMW VEHICLES SOLD TILL 2016. ON OUR WAY TO SELL ANOTHER 100.000 UNITS IN 2017.



\* Only available in China  
Figures are for cumulative sales of BEV and PHEV vehicles

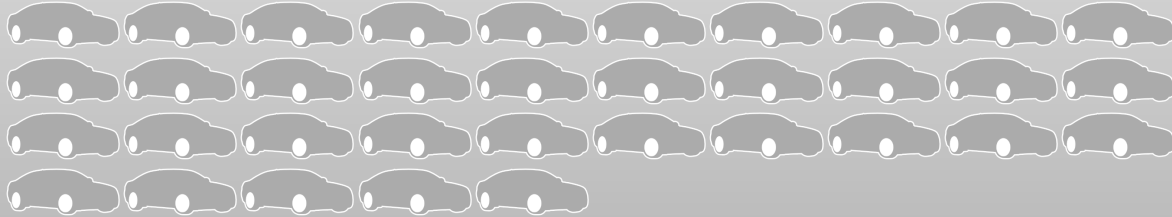
# MARKET SHARE.



Each **36<sup>th</sup>** car worldwide sold is a **BMW**.



# MARKET SHARE.



Each **36<sup>th</sup>** car worldwide sold is a **BMW**.



Each **8<sup>th</sup>** electric car worldwide sold is a **BMW i**.





# THE BMW GROUP OFFERS XEV MODELS IN EVERY SEGMENT.

BEV



BMW i3

2019

MINI BEV

2020

BMW X3 BEV

2021

BMW iNEXT

PHEV



BMW i8



BMW 225xe  
iPerformance



BMW 330e  
iPerformance



BMW 530e  
iPerformance



BMW 740e/Le  
iPerformance



MINI Cooper S E  
Countryman ALL4



BMW X1 xDrive 25Le  
iPerformance (China only)



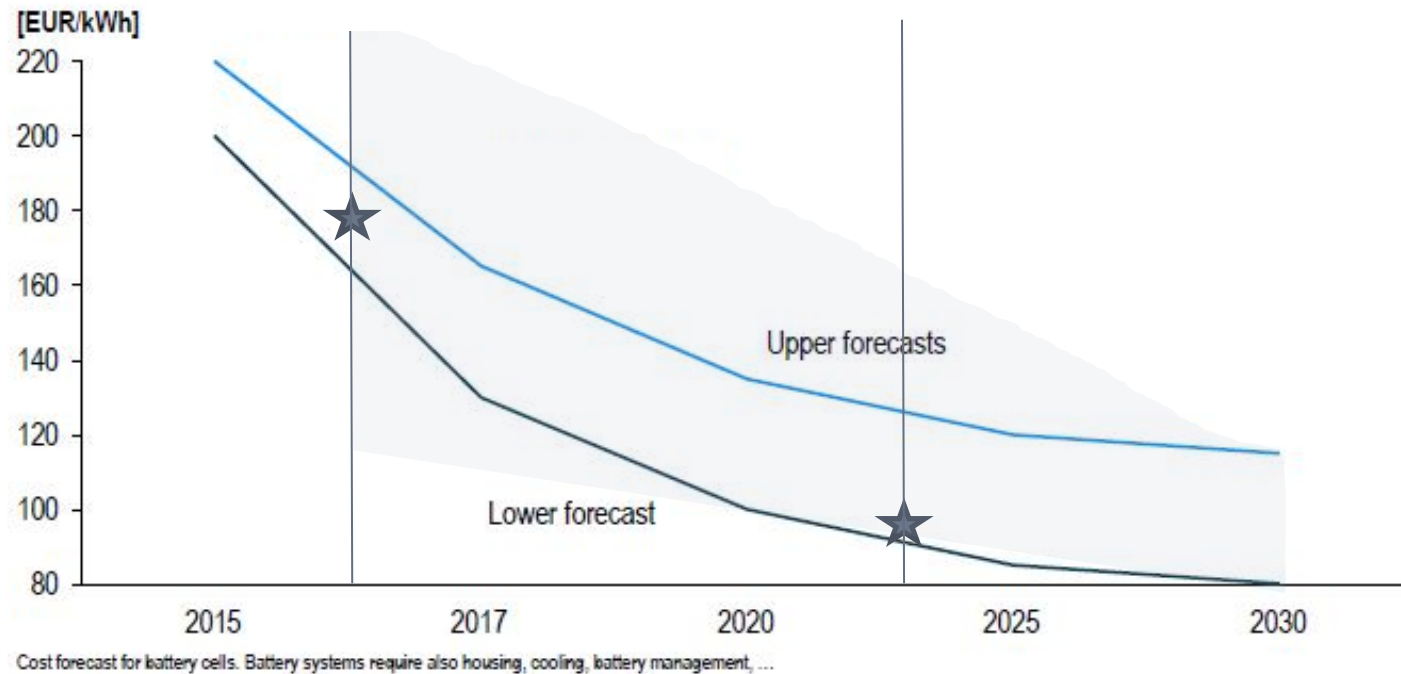
BMW X5 xDrive 40e  
iPerformance

2018

BMW i8 Roadster

# BATTERY CELL COST ASSESSMENT. ROLAND BERGER STUDY.

Figure 14: Price development of battery cells [EUR/kWh]



Source: Roland Berger

[http://www.rolandberger.com/media/pdf/Roland\\_Berger\\_Study\\_Integrated\\_Fuels\\_and\\_Vehicles\\_Roadmap\\_to\\_2030\\_v2\\_20160428.pdf](http://www.rolandberger.com/media/pdf/Roland_Berger_Study_Integrated_Fuels_and_Vehicles_Roadmap_to_2030_v2_20160428.pdf)

[https://www1.eere.energy.gov/vehiclesandfuels/pdfs/ev\\_everywhere/5\\_howell\\_b.pdf](https://www1.eere.energy.gov/vehiclesandfuels/pdfs/ev_everywhere/5_howell_b.pdf) July 2012 EV Everywhere: battery cell cost assumed at 75-82% of battery pack cost

## II. POLICY MATTERS – XEV MARKET IS NOT (YET) SELF SUSTAINING.

# FRAMEWORK CLASSIFICATION FOR ELECTRIC VEHICLE INCENTIVES.

## SUBSTANTIAL PACKAGE OF INCENTIVES FOR XEV IN NORWAY.

### Monetary Incentives

#### Direct financial incentives For EV owners

- Purchase incentive for electric vehicles.
- Reduction / waiver of registration and/ or circulation tax.
- Reduction / waiver of consumption tax.
- Company car incentive.
- Subsidy for the installation wall-box.

### Non-Monetary Incentives

#### Qualitative and indirect support for EV usage

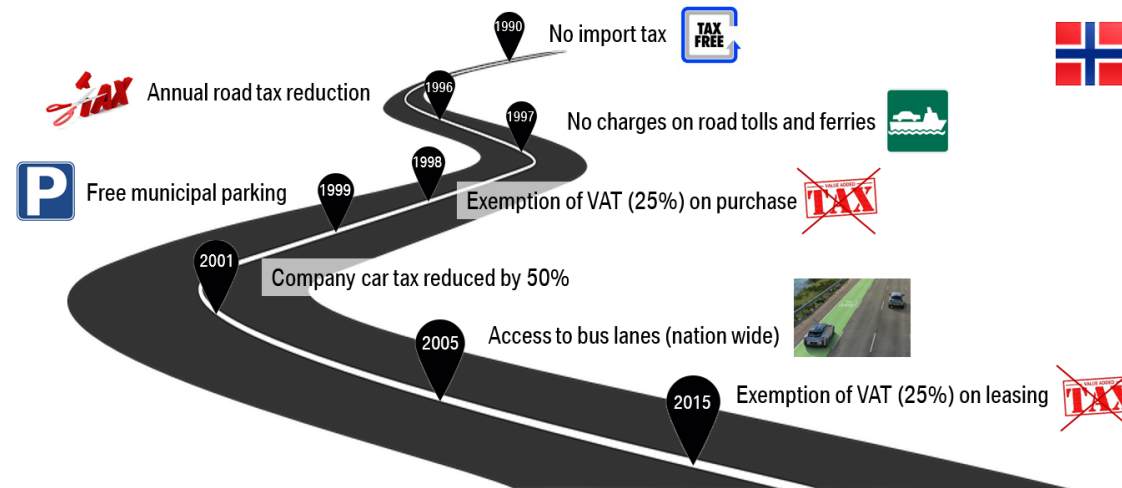
- Use of privileged lanes (e.g. bus or car sharing lane).
- Exclusive parking for electric vehicles; free parking and/ or free charging
- Preferential treatment for inner city toll systems.
- Exemption from congestion charges.

### Framework Conditions

#### Measures to support the environment for EVs



- Public charging infrastructure.
- Awareness due to public demonstration and research projects.
- Public initiatives and cooperations supporting the uptake of EVs.
- Public procurement programs for EV fleets.

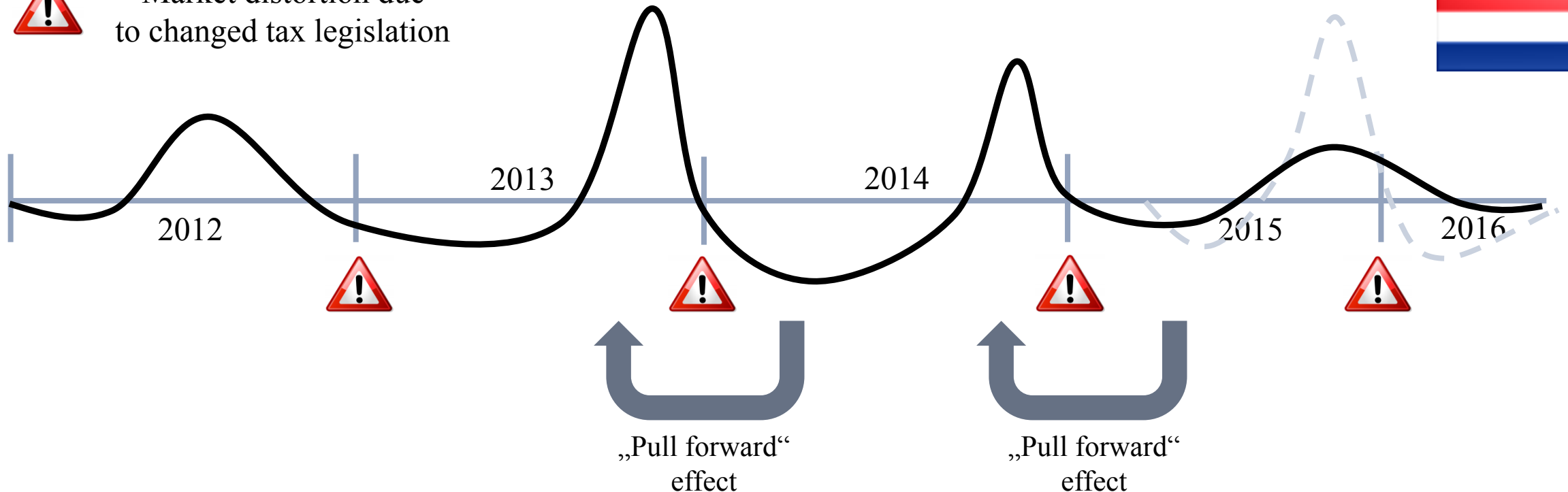




# ANNUAL CHANGES TO THE TAX / INCENTIVE SYSTEM CAN CREATE STRONG DISTORTIONS.



= Market distortion due to changed tax legislation



- If tax / incentive systems are **changed too often**, customers will „rush to buy“ NEVs before the changes take place.
- This is **bad for customers, OEMs and for the market development**, since future planning is made very hard.

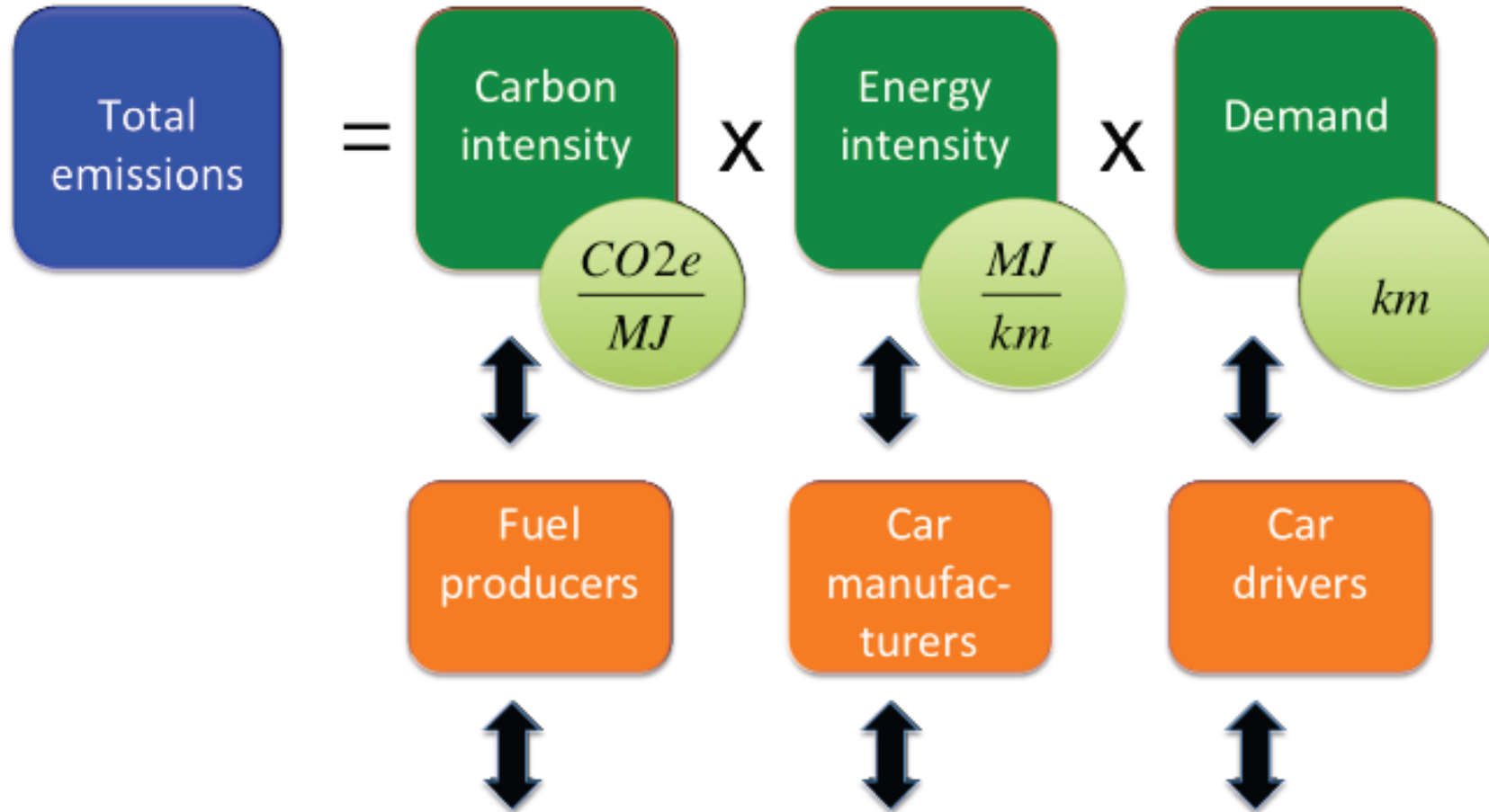




YES, IT WAS GOV. HENRY GAGE – AND THIS IS NOT/BUT COULD BE  
THE WATSONVILLE STEAM POWER PLANT (IN SERVICE SINCE 1901)



# FRUIT FOR THOUGHT.....



Comprehensive instruments	Reduction of carbon intensity	Reduction of energy intensity	Reduction of demand
Cap & Trade	Low carbon fuel standard	Fuel efficiency regulation	Infrastructure investments



### **III. MORE THAN JUST THE CAR – THERE IS A NEED FOR PROGRESS IN INFRASTRUCTURE AND A POTENTIAL FOR SMART MOBILITY.**

# BEV ADOPTION IN EUROPE. JOINT VENTURE FOR AN ULTRA-FAST, HIGH-POWER CHARGING INFRASTRUCTURE.

BMW  
GROUP



Rolls-Royce  
Motor Cars Limited

DAIMLER



VOLKSWAGEN

AKTIENGESELLSCHAFT



PORSCHE



- On 29 November 2016, automakers have signed a **Memorandum of Understanding** on the installation of the **highest-power charging network for BEVs in Europe**.
- Approximately **400 charging sites**, built-up between January 2017 and 2020, aim at facilitating **long-distance travel routes** with BEVs and overall **BEV adoption** in Europe.
- Power levels **up to 350 kW** will significantly decrease charging time for electric vehicle drivers.
- Drawing on CCS (Combined charging system) technology, an open, **brand-independent network for BEVs** is created. The **ultra-fast, high-power charging network** will expand existing AC- and DC charging standards.
- The Joint Venture is **open for cooperations** with other OEMs as well as with regional partners.



# BEST PRACTICE COPENHAGEN: DRIVENOW OPERATED BY ARRIVA.

## INTEGRATING CAR SHARING AND PUBLIC TRANSPORT.



### DriveNow

- Full electric fleet.
- 400 BMW i3.
- Intermodal routing.
- Integration into public transport (Rejsekort).

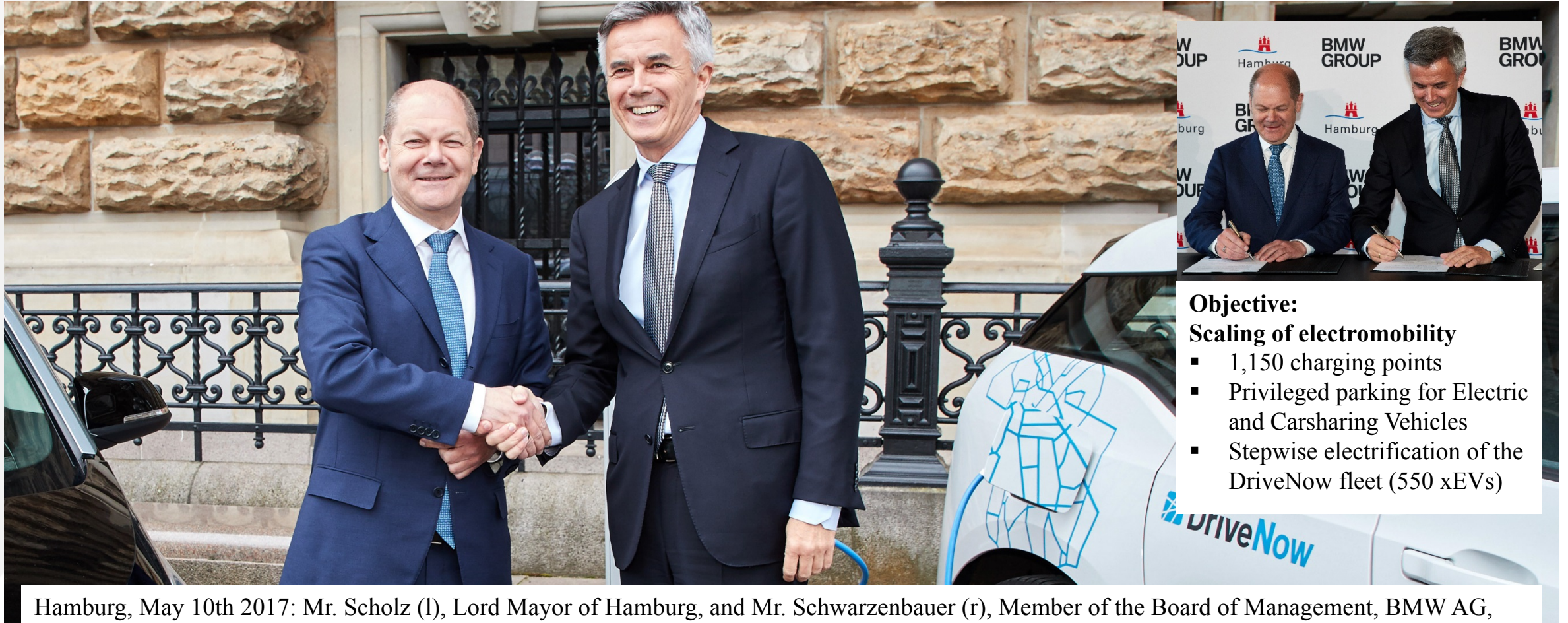
### Rejsekort

- 2 mio. Danes have a Rejsekort.
- Nation-wide access to trains, buses, metro.
- Rejsekort is DriveNow access medium.
- 68 % of DriveNow customers have registered with Rejsekort.





# INNOVATION INSTEAD OF PROHIBITION. BMW AND CITY OF HAMBURG AGREE ON STRATEGIC PARTNERSHIP.



Hamburg, May 10th 2017: Mr. Scholz (l), Lord Mayor of Hamburg, and Mr. Schwarzenbauer (r), Member of the Board of Management, BMW AG, signing the MoU

## Objective:

### Scaling of electromobility

- 1,150 charging points
- Privileged parking for Electric and Carsharing Vehicles
- Stepwise electrification of the DriveNow fleet (550 xEVs)



**IV. WHAT ELSE CAN YOU DO WITH AN EV – CONVERGENCE OF „ENERGIEWENDE“ AND „VERKEHRSWENDE“ IS THE NEXT BIG THING.**





...COMBINED  
WITH OWN  
ELECTRICITY  
TARIFF.



...COMBINED  
WITH OWN VARIABLE  
DYNAMIC TARIFF.



...COMBINED  
WITH OWN  
SOLAR POWER.



...COMBINED  
WITH OWN  
SMART ENERGY.

With BMW i Wallbox Connect

With BMW i Wallbox Connect

With BMW i Wallbox Connect

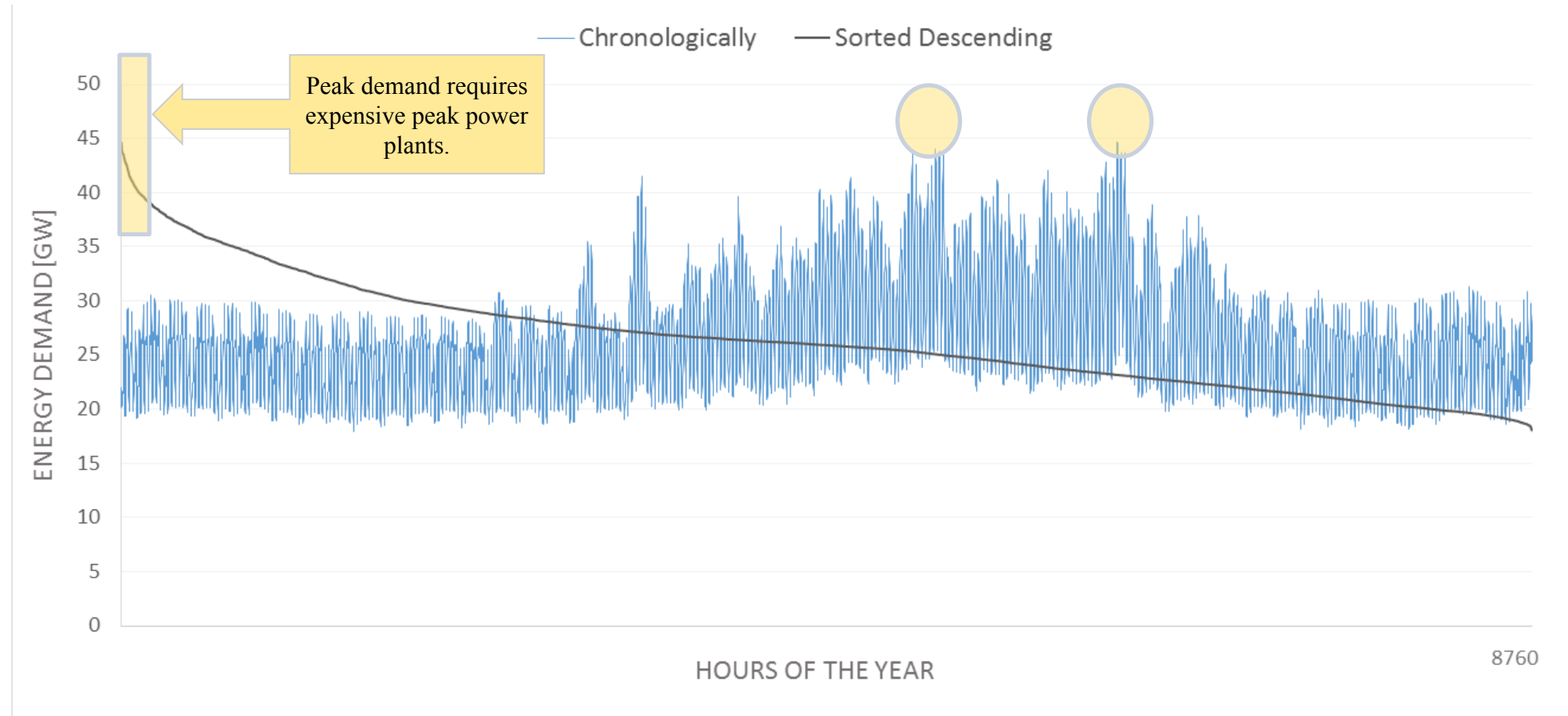
With BMW i Wallbox Connect

BMW DIGITAL CHARGING.  
NEXT LEVEL CHARGING.



**INTRODUCING MICHELLE BOGEN  
FROM BMW GROUP TECHNOLOGY OFFICE, MOUNTAIN VIEW.**

# ELECTRIC VEHICLES AS AN ASSET TO THE ELECTRICITY GRID. DEMAND RESPONSE.





# BMW i CHARGEFORWARD: PROGRAM DETAILS / KEY HIGHLIGHTS.

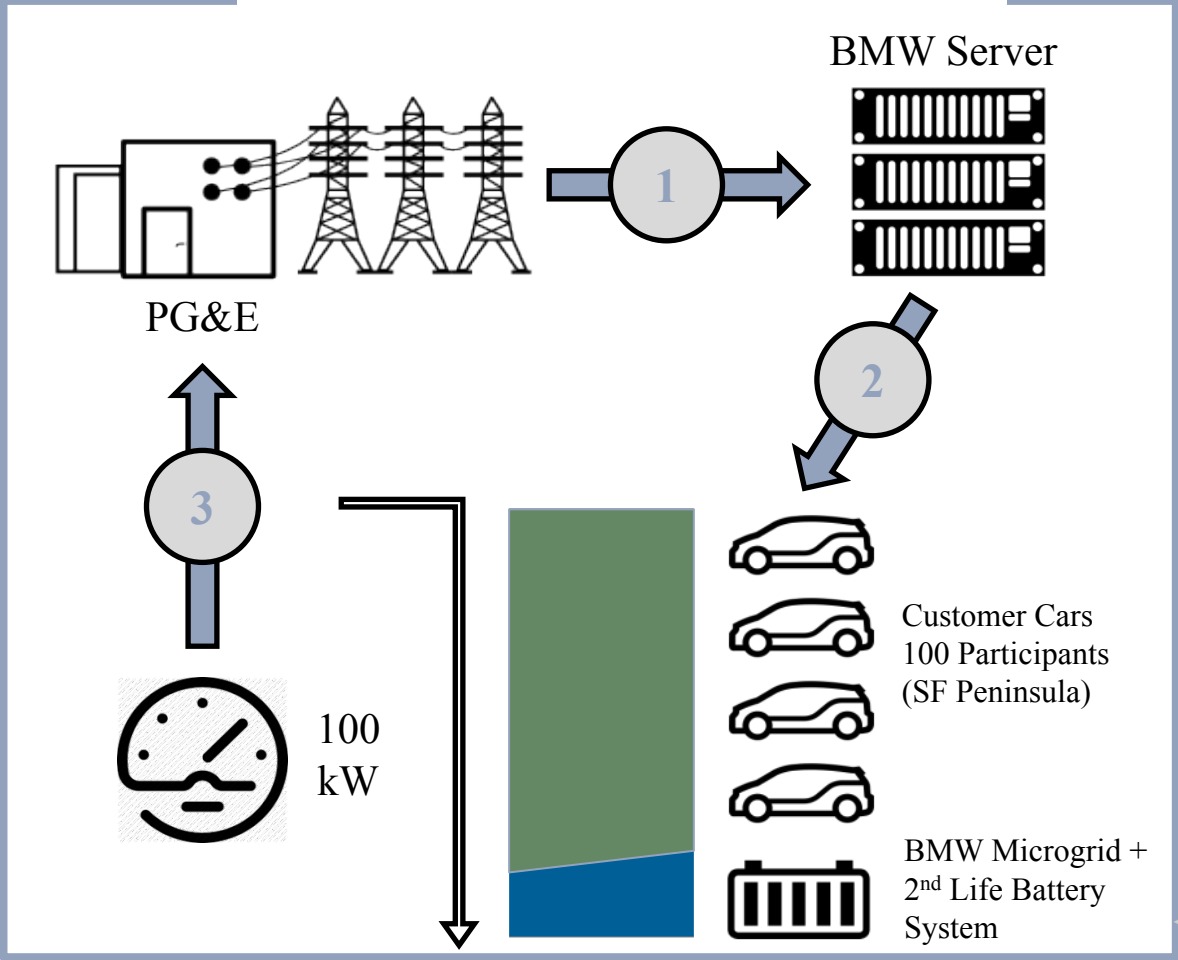
- Approx. 100 BMW i3 customers around the Bay Area
- Every event required 100-kW load drop
- Two types of events: Day Ahead (24 hr response) and Real Time (4 min response)
- PG&E called over 200 events
- 100 kW / 240 kWh second-life battery contributed remaining load drop by discharging to the grid
- BMW customers received \$1k upfront incentive and \$1 / day for ongoing participation
- BMW received \$3000 / month from the utility for successful participation



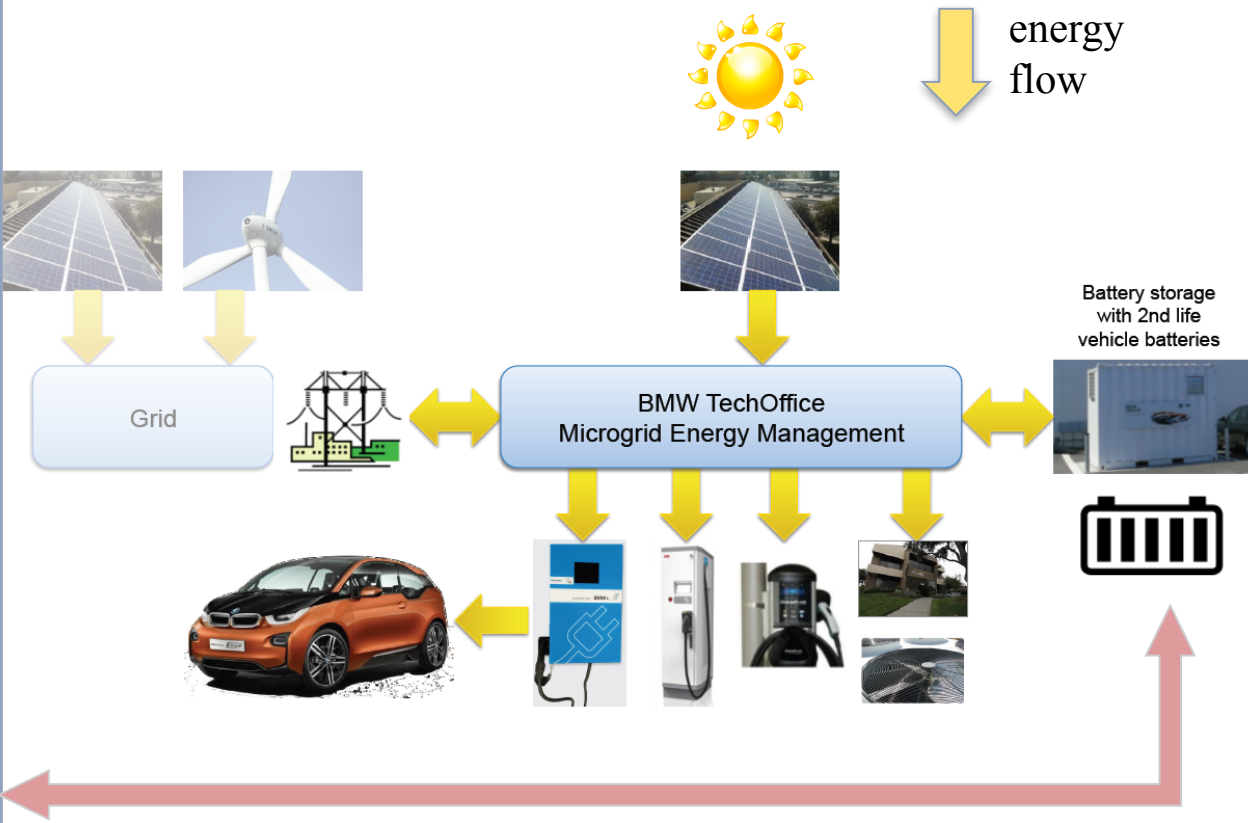


# BMW i CHARGEFORWARD: SYSTEM DESIGN AND TECHNOLOGY OFFICE SMART ENERGY MANAGEMENT SYSTEM.

## CHARGE FORWARD ARCHITECTURE



## LIVING LABORATORY: BMW TECH-OFFICE SMART MICRO-GRID



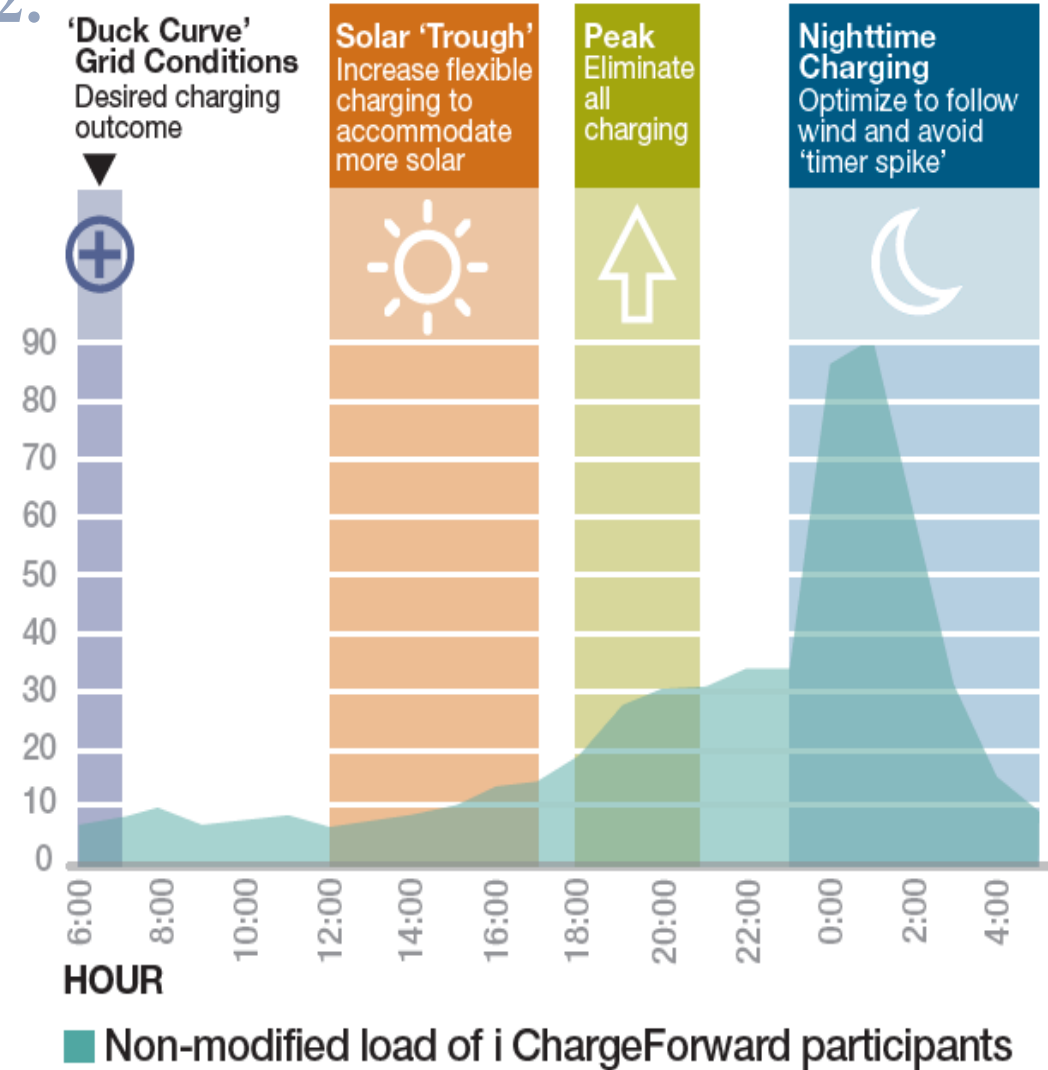
# NEXT STEPS: BMW CHARGEFORWARD PHASE 2.

## – Overview

- 300-400 participants throughout the Bay Area
- Began grid events in April 2017

## – New Features

- Longer curtailment events
- Optimizing nighttime charging
- Increasing charging in response to local/system excess solar on the grid
- Shifting charging across grid locations (home and away-from-home)
- Messaging to engage customers



# A

## utomated



- Smooth traffic flow
- Reduce accidents
- Increase safety
- Increase efficiency

# C

## onnected



- Reduce traffic and VMT
- Optimize eco-routing
- Encourage multimodality
- Improve eco-driving style

# E

## lectrified



- Zero tailpipe emissions
- Increase energy efficiency
- Reduce sound
- Leverage renewable energy

# S

## hared



- Reduce congestion
- Remove vehicles
- Replace old inefficient cars
- Reduce VMT

Leverage innovation to maximize reduction of CO2.





THANK YOU.