

#REMforum

8th St. Gallen Forum for Management of Renewable Energies
May 11th & 12th, 2017 – Olma Messen St. Gallen

Forecasting and market reality: Exploring the future of e-mobility

* Yuliya Karneyeva, Chair for Management of Renewable Energies, University of St. Gallen

* Dr. Emmanuelle Reuter, Chair for Management of Renewable Energies, University of St. Gallen

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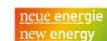
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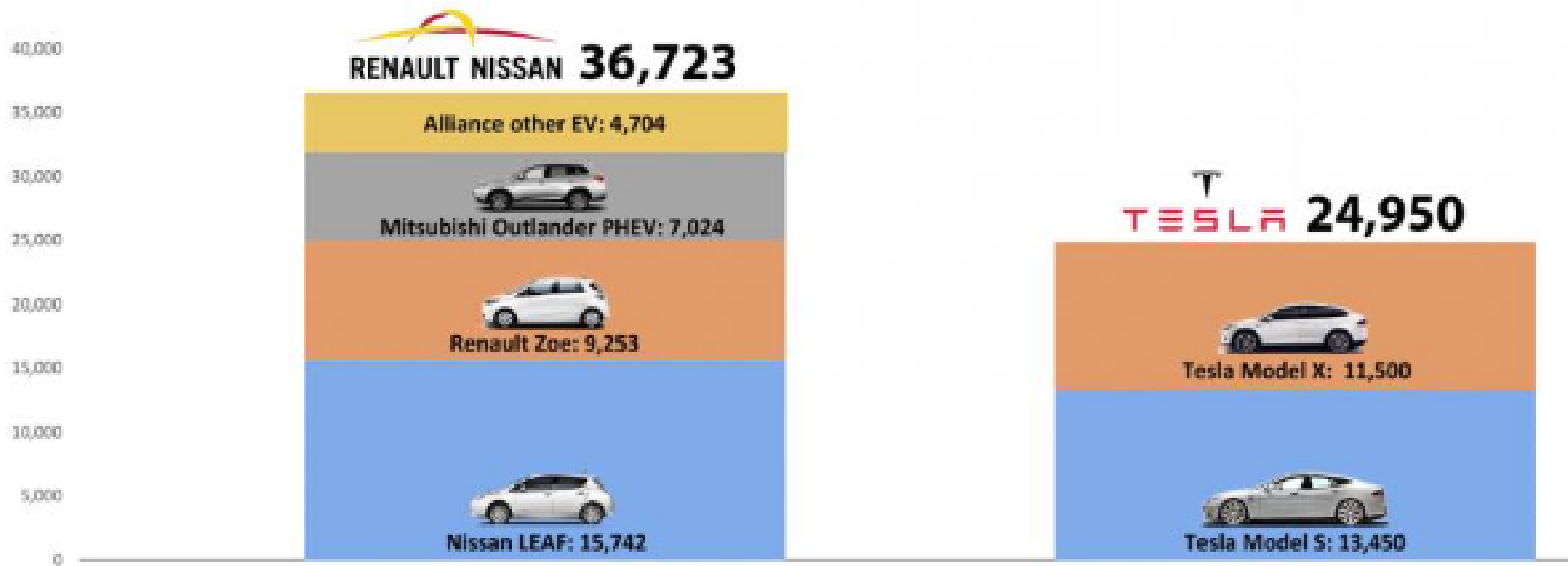
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Who Is The World's Leading EV Maker?

It's not Tesla!

Global EV sales, 1st quarter



Source: Forbes. 2017. May 1.

Timeline

Time	Content
5 min	Introduction
15 min	Introduction to the topic
20 min	Workshop exercise
12 min	Participant debrief – Utility company groups
12 min	Speaker 1: Dr Fereidon Sioshansi
12 min	Speaker 2: Diego A. Bonetta
12 min	Participant debrief - Car importer groups
12 min	Speaker 3: Prof. Dr. T. Lieven
12 min	Speaker 4: A. Burgener
8 min	Summary & questions
10 min	Open questions & closing

Introduction of the speakers



Theo Lieven,
Titular Professor
Marketing and
head of the
Electric Drive
Evolution Lab
International,
University of St.
Gallen



Diego A. Bonetta,
Head of Strategy
and Power Grids,
BKW AG



Andreas
Burgener, Head,
Auto Suisse -
Association of the
official automobile
importers in
Switzerland.



Fereidoon P.
Sioshansi,
President, Menlo
Energy
Economics, USA

What is forecasting?

Forecasting:

The use of historic data to determine the direction of future trends. Businesses utilize forecasting to determine how to allocate their or plan for anticipated expenses for an upcoming period of time. This is typically based on the projected demand for the goods and services they offer.

Forecasting is subject to a number of biases

Belief/ confirmation bias:

The propensity for people to look for what confirms their beliefs and ignore what contradicts their beliefs while not being concerned for the truth.

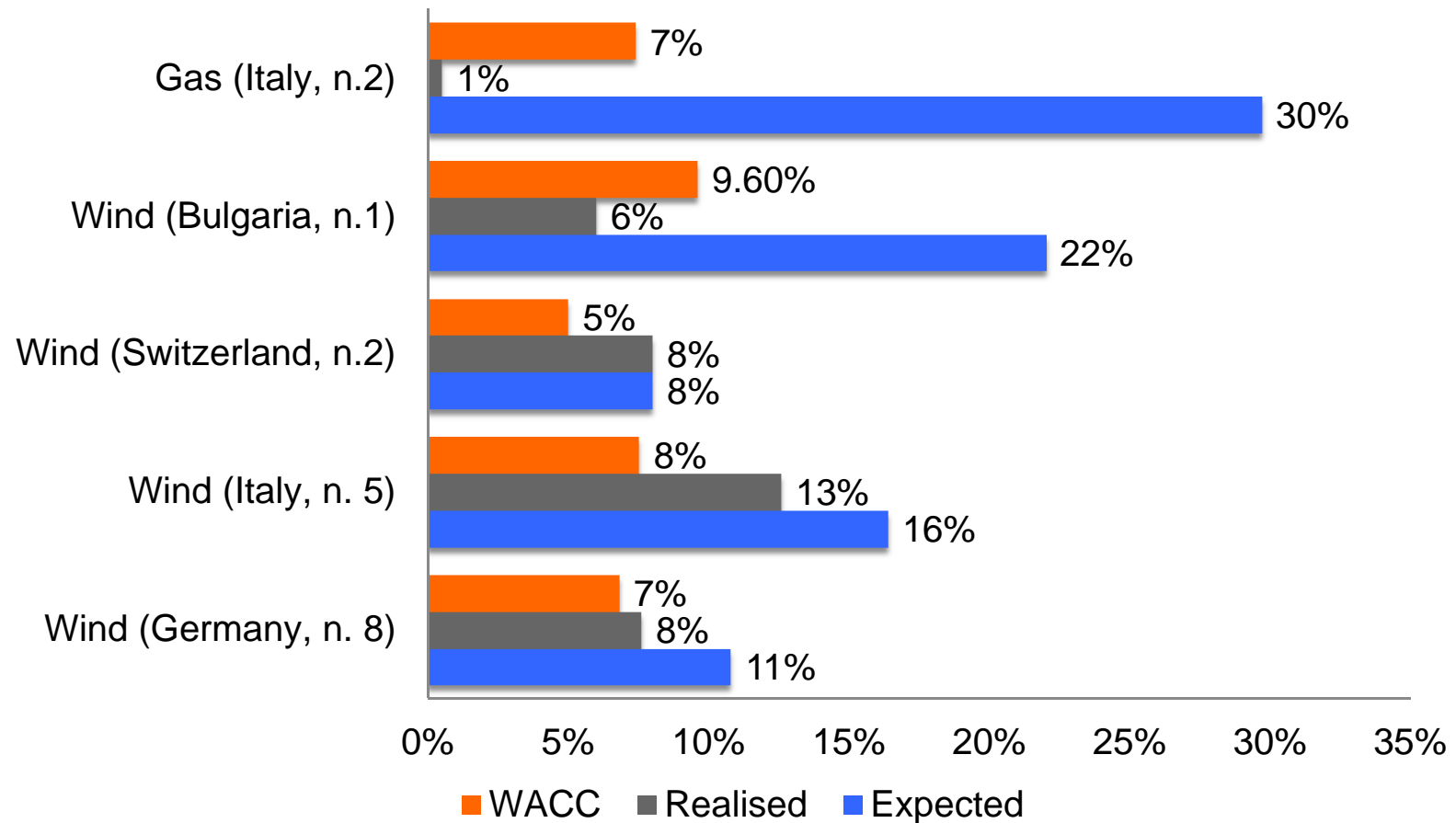


Status quo bias

The preference for things to stay the same by doing nothing (also called inertia) or by sticking to a decision made previously



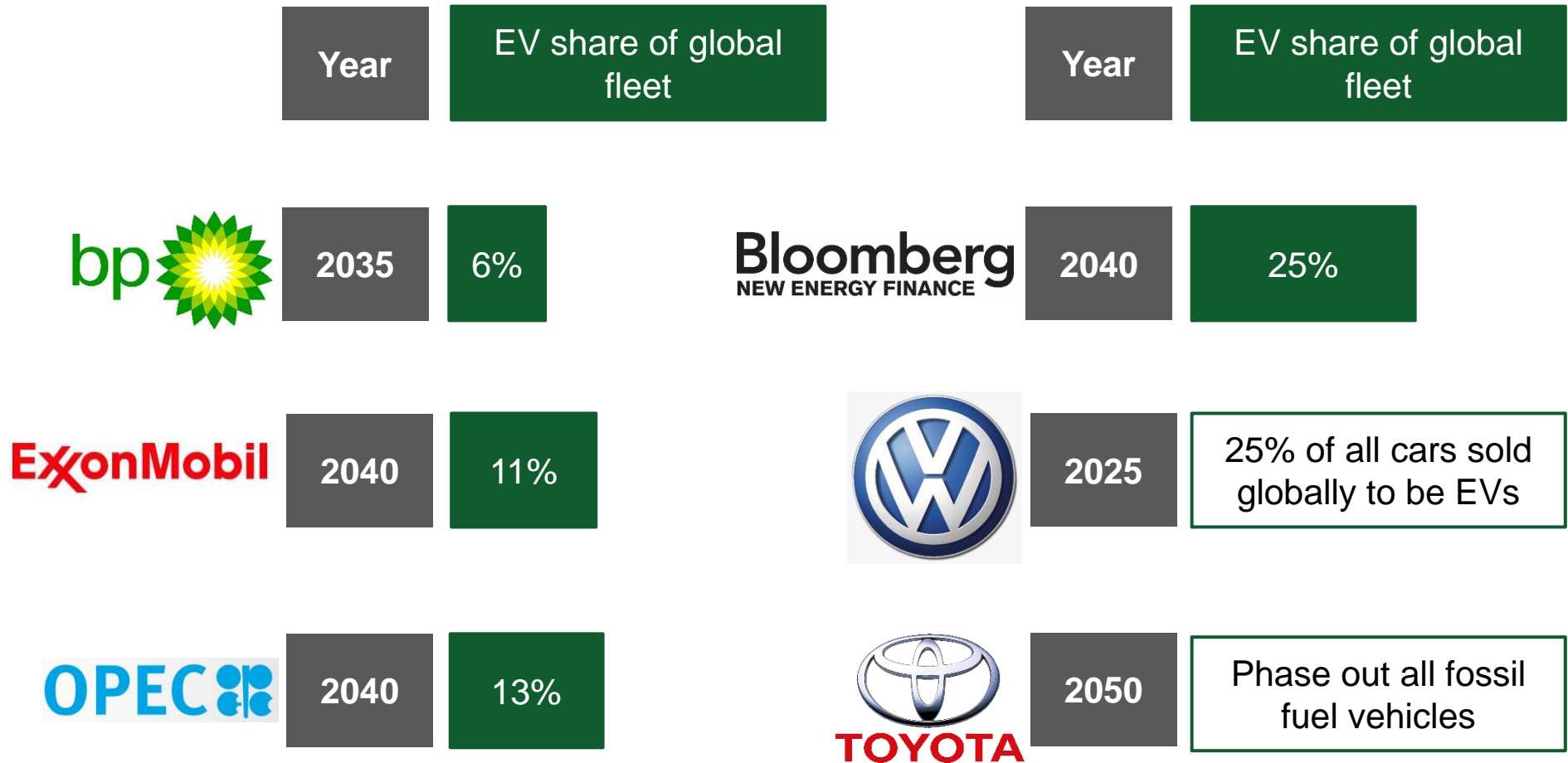
What Happens if Forecasts Do Not Become Reality? Expected vs. Realised Return Profiles of Wind and Gas Projects



Source: a study done by Yuliya Karneyeva as part of the project supported by SFOE (BFE)

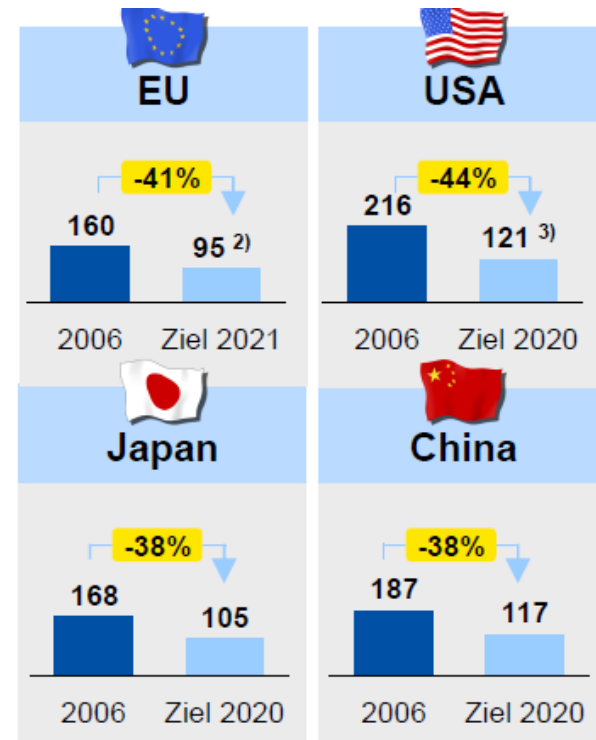
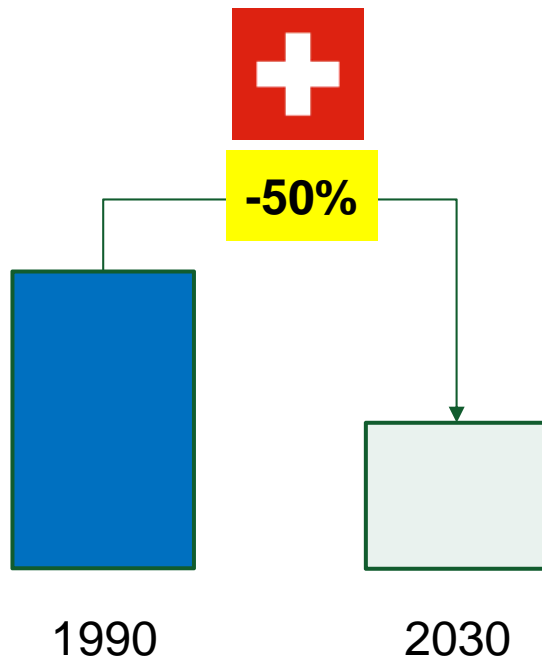
Forecasting electric vehicle growth

Which forecasts will be right?



Climate goal targets

1. gCO₂/km



Key players commit to EVs



Porsche to invest a billion euros at EV plant

Posted February 15, 2016 by [Charles Morris](#) & filed under [Newswire](#), [The Vehicles](#).



As Porsche begins work on its first pure EV, it is embarking on a major program of capital investment. [Reuters](#) reported that the company will invest about 1 billion euros (\$1.12 billion) at its Zuffenhausen plant, where the new EV is in development.

Chief Executive Oliver Blume said that the company has "many new products in the pipeline."

Source: <https://chargedevs.com/newswire/porsche-to-invest-a-billion-euros-at-ev-plant/> A couple of months ago, Porsche announced plans to invest a mere \$700 million, so some have speculated that the increased investment reflects greater interest in EVs.

Key players commit to EVs



Alternativkonzept zum Verkauf an Peugeot

Opel plant Umbau zur reinen Elektromarke

Der Autohersteller Opel ist nach Informationen des manager magazins erst sehr spät in die Verkaufsgespräche von GM und Peugeot eingeweiht worden. Die GM-Tochter hat einen Alternativplan in der Schublade.



Opel-Chef Karl Thomas Neumann im Ampera-e.

Source: Spiegel Online, Feb 2017.

...and shift their thinking



VOLKSWAGEN

AKTIENGESELLSCHAFT

Shift

**Elektrisch, geteilt,
vernetzt –
Mobilität morgen**

EINSICHTEN

*Lehren ziehen
aus einem Skandal
– mit Fehlern
offen umgehen*

So bitter die Krise des Unternehmens war und ist – sie hat uns wachgerüttelt und den Blick für die Erfordernisse der Zukunft und neue Kundenwünsche geschärft. Nun ist der Wandel eingeleitet: vom Autobauer zum Anbieter nachhaltiger Mobilitätslösungen.

Four steps of electrification



01. Mildhybrid

Der **Mildhybrid (mHEV)** fährt nicht im rein elektrischen Betrieb. In Rollphasen schaltet er den Verbrennungsmotor ab und entkoppelt ihn vom Antrieb. Beim Bremsen wird Energie gewonnen, die für das elektrische System oder als „Mini-Schubkraft“ genutzt wird.



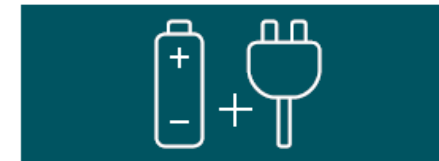
02. Vollhybrid

Die bekannteste Hybridform, der **Vollhybrid (HEV)**, verfügt über zwei Antriebe – den Elektroantrieb und den Verbrennungsmotor. Sie werden einzeln oder in Kombination genutzt. Ein Vollhybrid kann im rein elektrischen Betrieb mehrere Kilometer fahren.



03. Plug-in-Hybrid

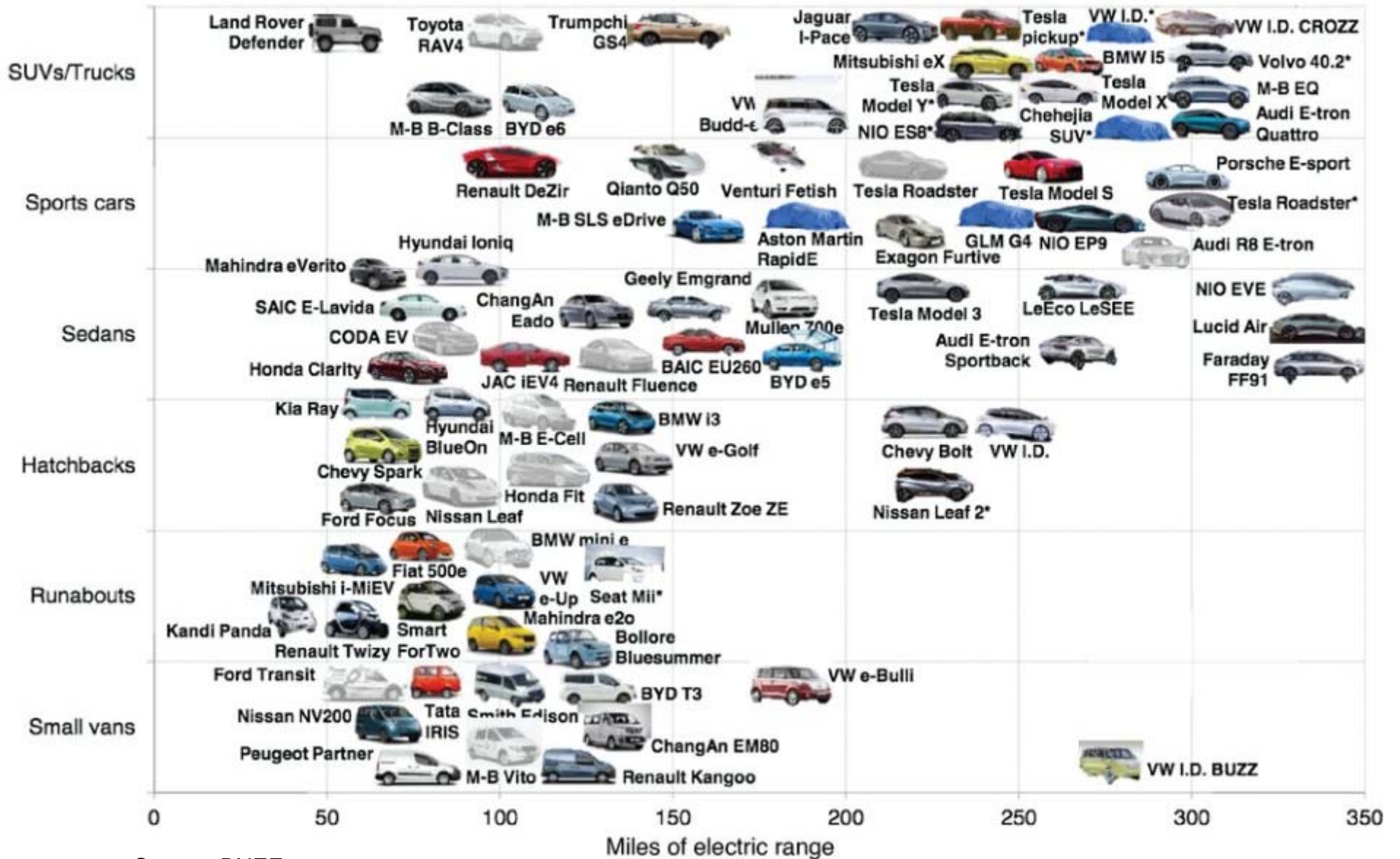
Der **Plug-in-Hybrid (PHEV)** ist ein Vollhybrid, der über eine externe Stromquelle aufgeladen werden kann. Dieser Hybrid hat eine höhere Ladekapazität, sodass er deutlich länger im rein elektrischen Betrieb fährt – seine Reichweite beträgt bis zu 100 Kilometer.



04. Rein elektrisch

Das rein batterieelektrische Fahrzeug (**BEV**) ist der letzte Schritt in Richtung E-Mobilität. Es kommt ohne Verbrennungsmotor aus. Mit Fortschritten in der Akkutechnik und Investitionen in die Ladeinfrastruktur wird das BEV eine zukunftsfähige Lösung für längere Fahrten sein.

EV models through 2020



Source: BNEF.

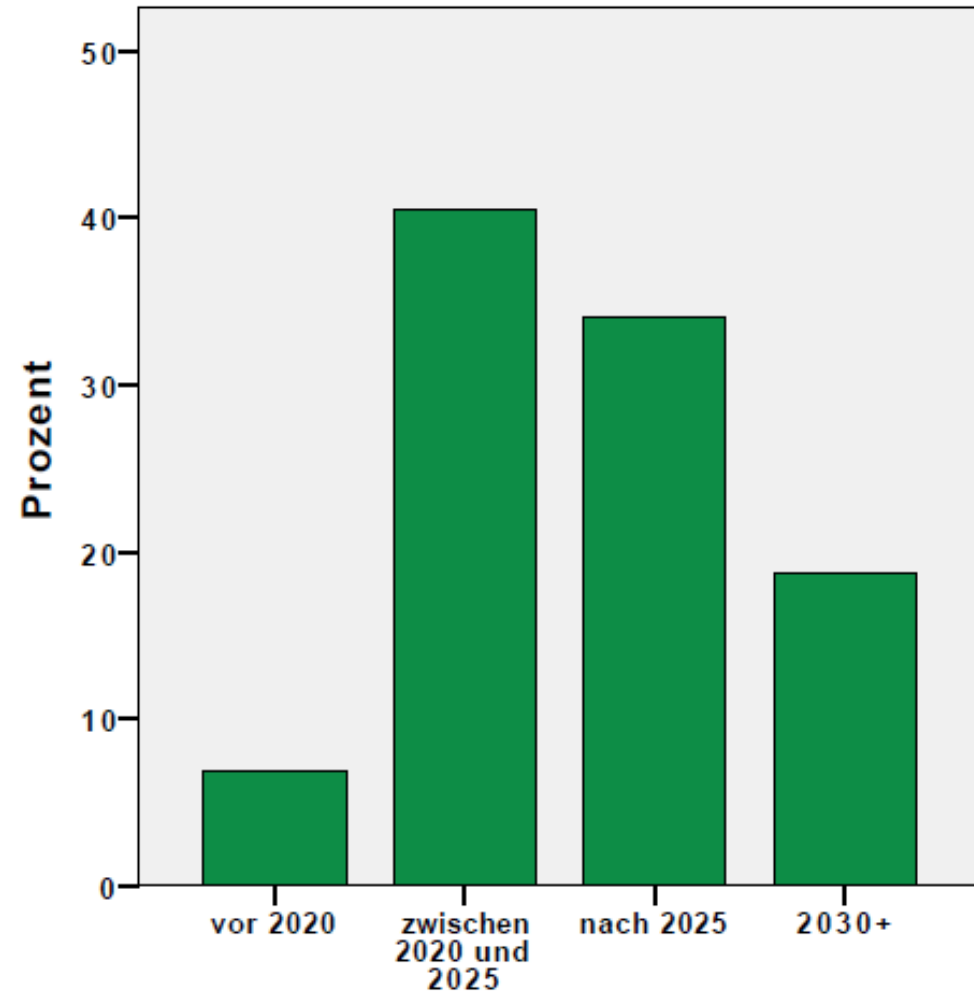
Swiss consumers' perspective on EVs



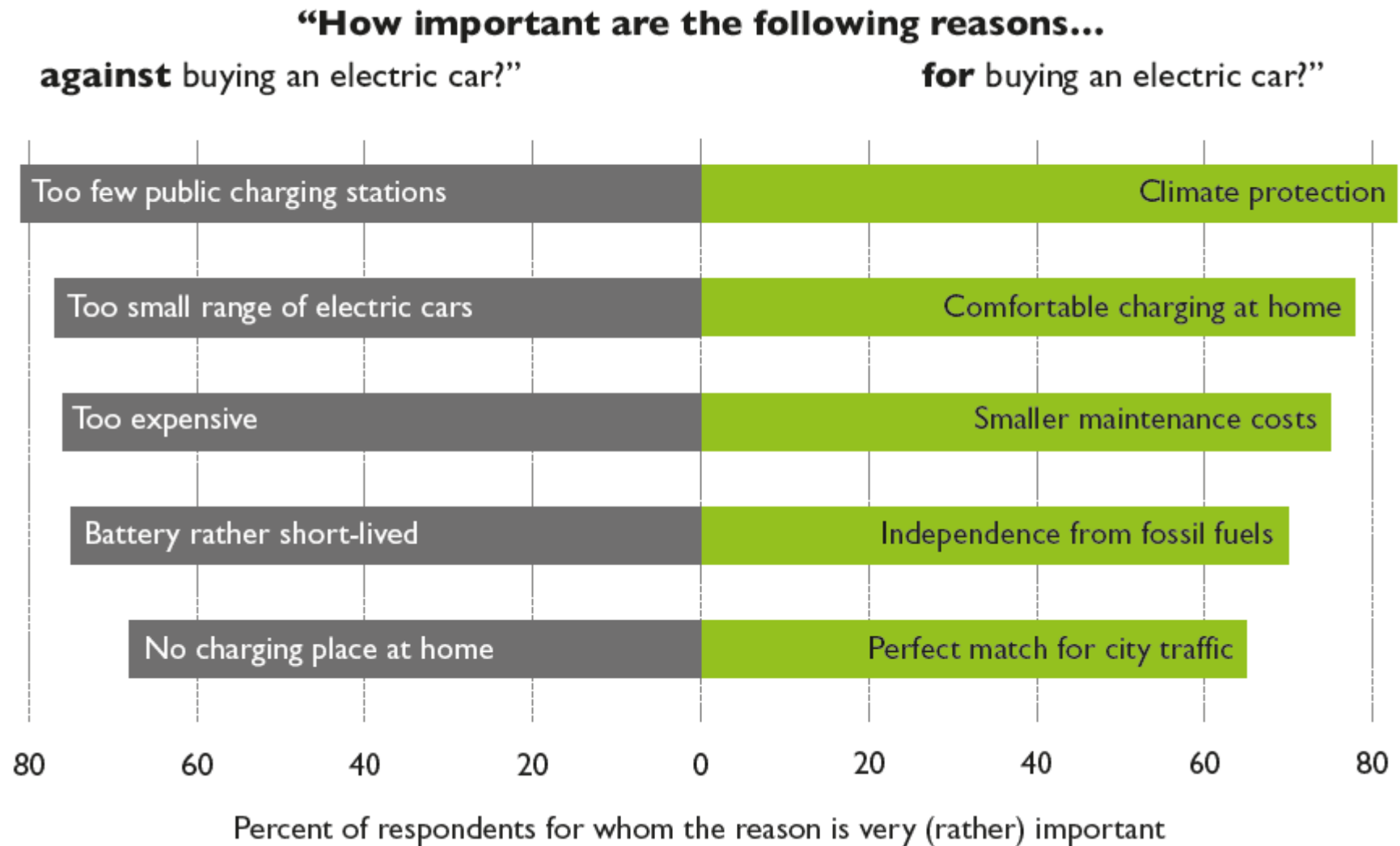
...can imagine buying an electric vehicle as the next car

Swiss consumers' forecasts about EVs differ

When will EVs make up 10% of the car purchases?

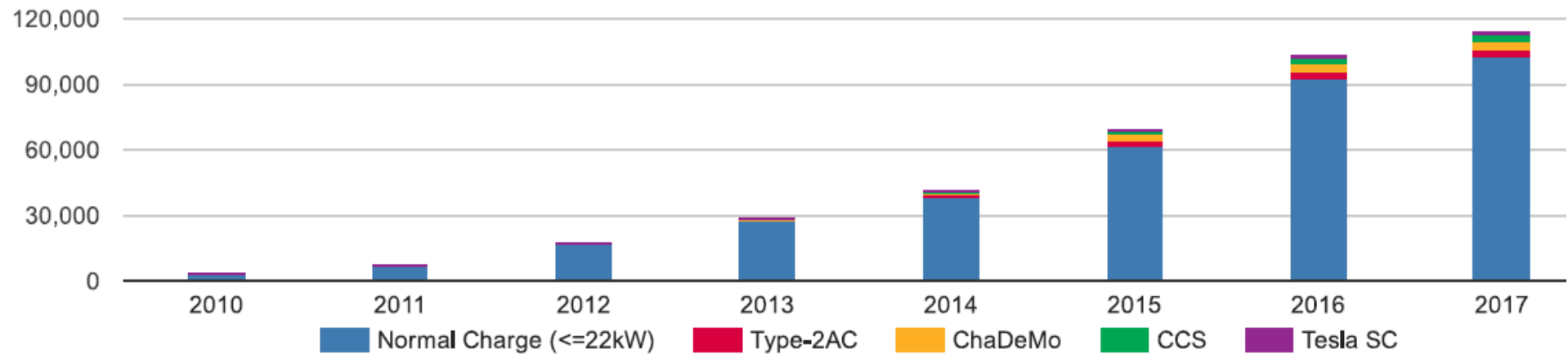


Swiss consumers' preferences for EVs



Source: KUBA. 2017.

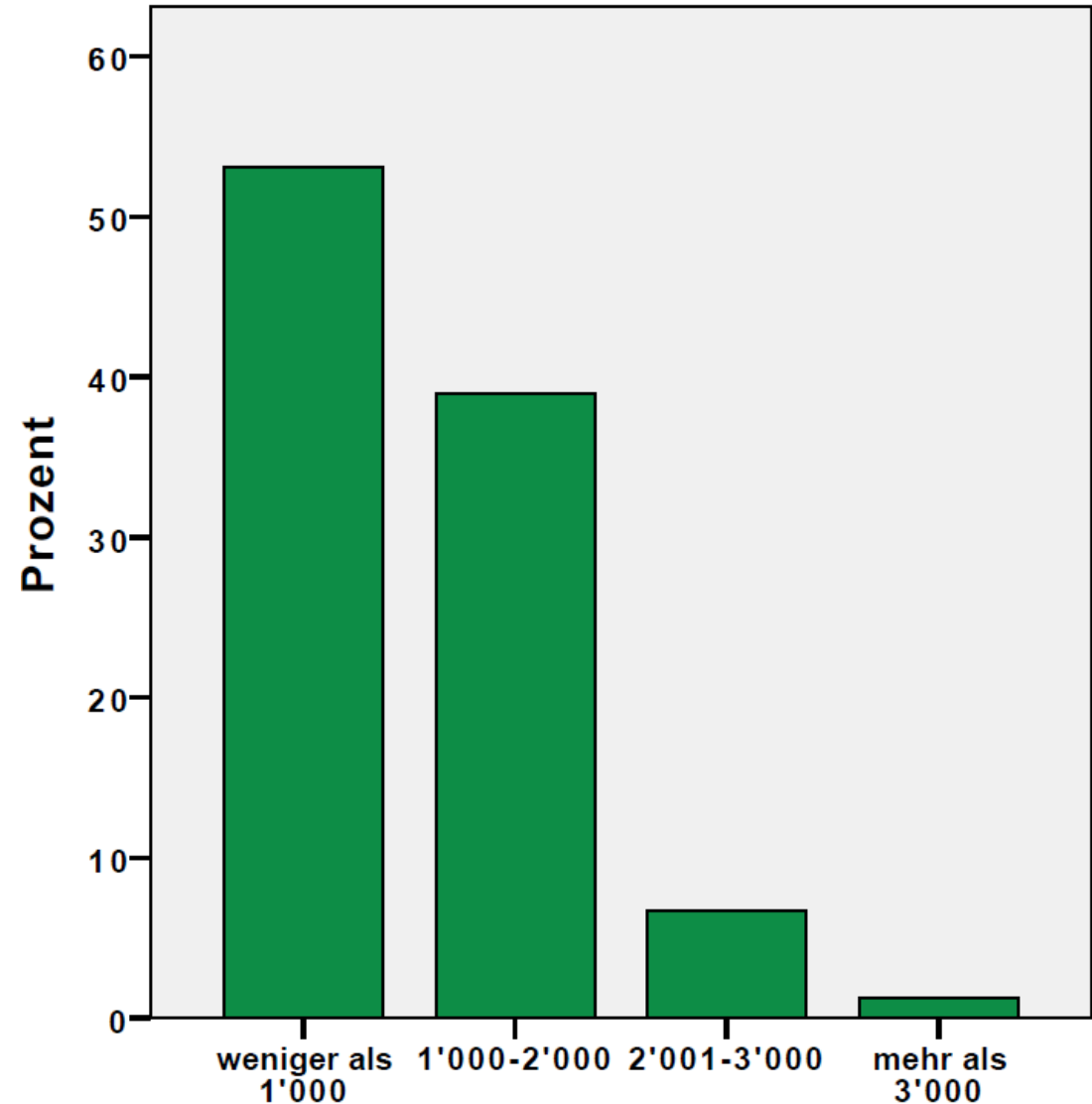
Number of PEV charging positions in Switzerland



Customer perception on charging infrastructure

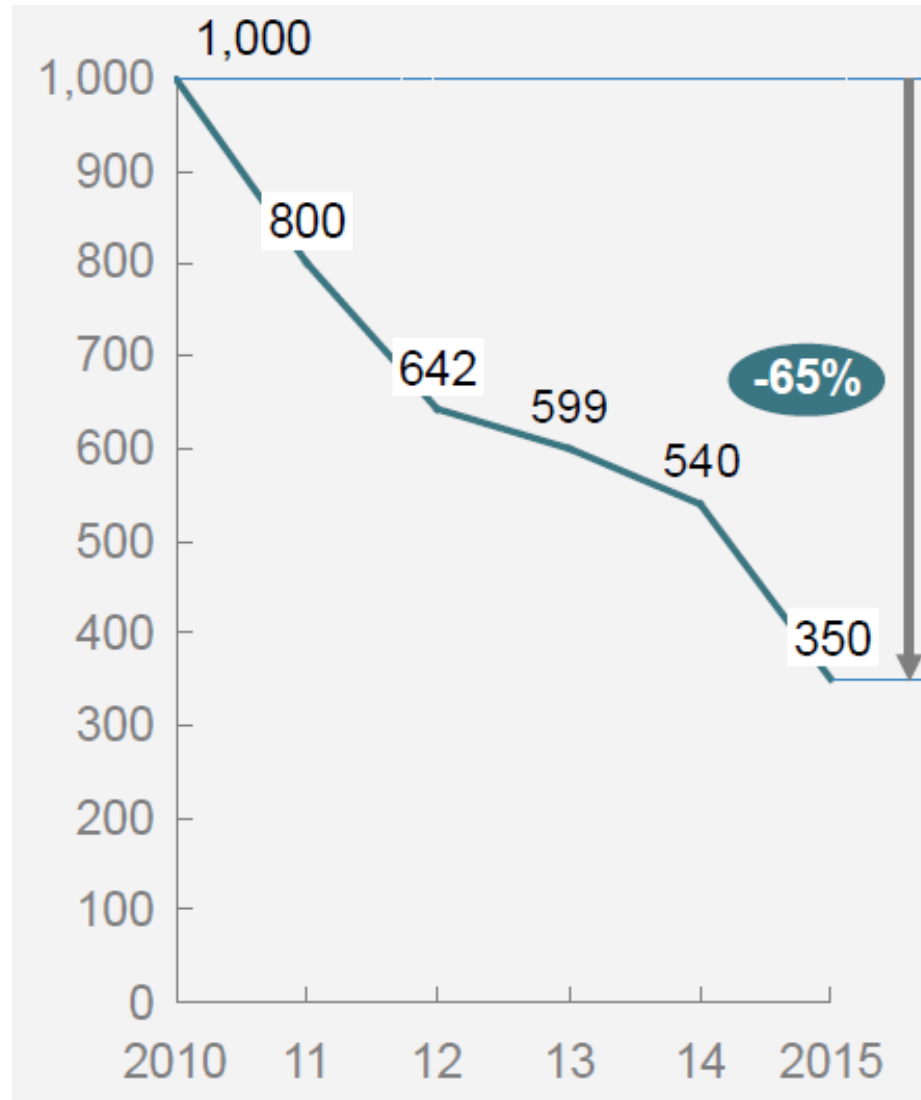
How many charging stations do you think exist in Switzerland?

Perception gap?



Average battery pack price

In USD/kWh



Source: McKinsey. October 2016.

A photograph of Michael Liebreich, Chairman of the Advisory Board at BNEF, speaking at a conference. He is wearing a grey suit and glasses, holding a small device in his right hand. The background is a green wall with abstract patterns. The image is overlaid with a grid pattern and a diagonal line.

//

Once the sticker price of an EV is lower than the price of an internal combustion engine car, you will see a 40% market shift in any country.

- Michael Liebreich | Chairman of the Advisory Board, BNEF

**Bloomberg
New Energy Finance**

#BNEFSummit

EV adoption scenarios

Different possible adoption curves

— Base case curve

- Meets general fleet emission targets

— Regulatory-driven curve

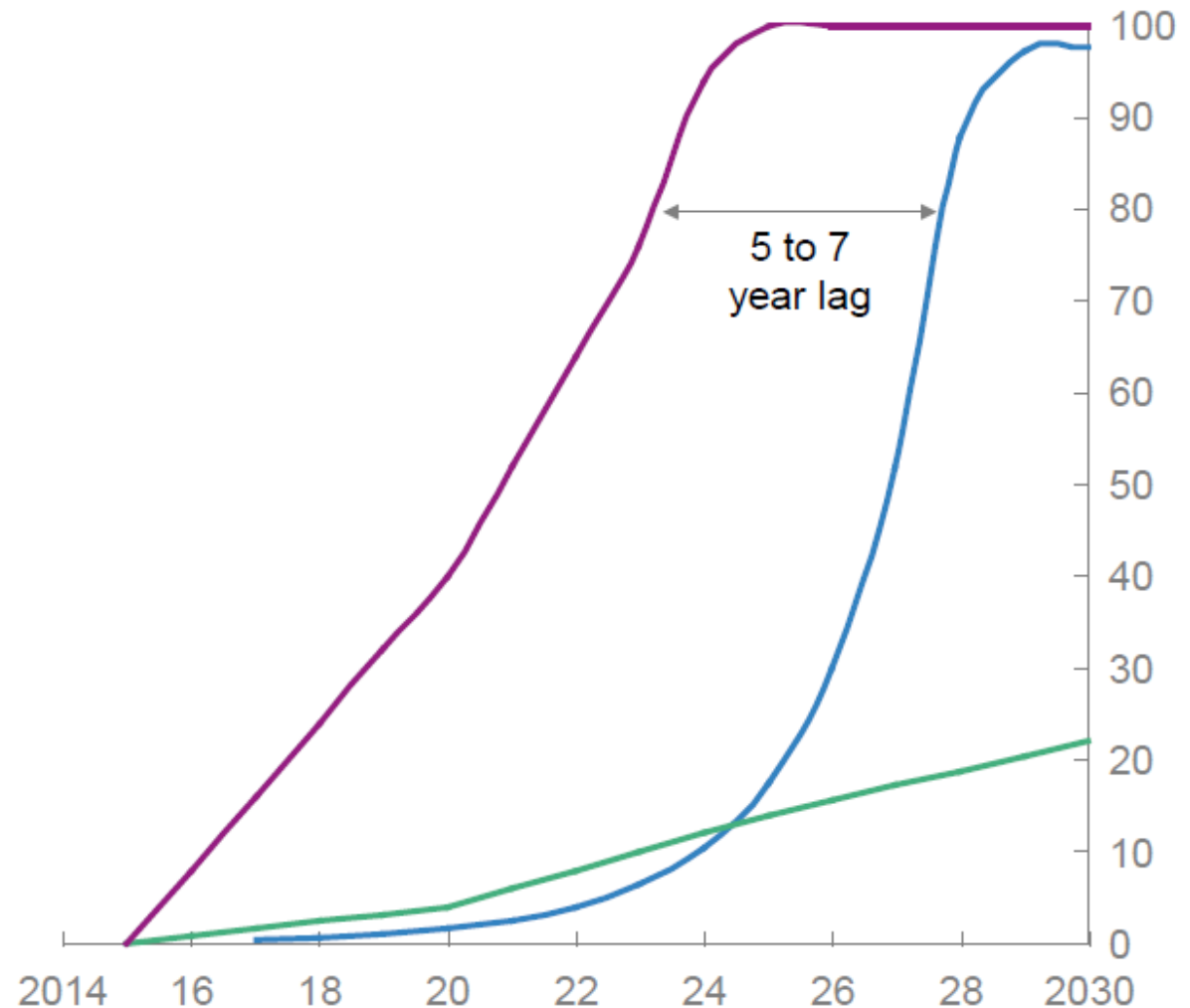
- 100% of light vehicle sales to be electric by 2025 (e.g., Seamless Mobility)
- Based on Norway's intentions

— Innovation and imitation curve

- Assuming early adopter and imitation effect
- Speed of adoption and imitation based on historic sales, and the relative cost of ICE versus EV's

Electric vehicle as share of car sales

Percent



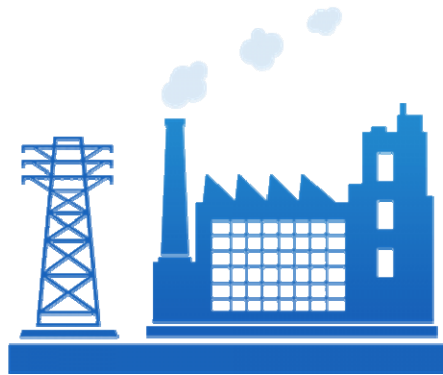


Workshop exercise:

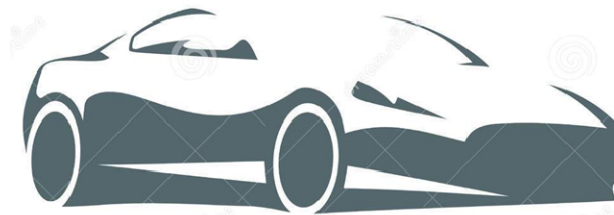
Craft your own forecasts

Imagine, you are a utility (**Group 1; Group 2**), or a car importer (**Group 3; Group 4**) company and you observe the e-mobility trend.

1. What is your forecast about the growth of EVs until 2035?
2. What opportunities do you see in Switzerland for your company, considering this trend?
3. Which opportunity would you choose to invest in?
4. What risks and returns do you forecast?

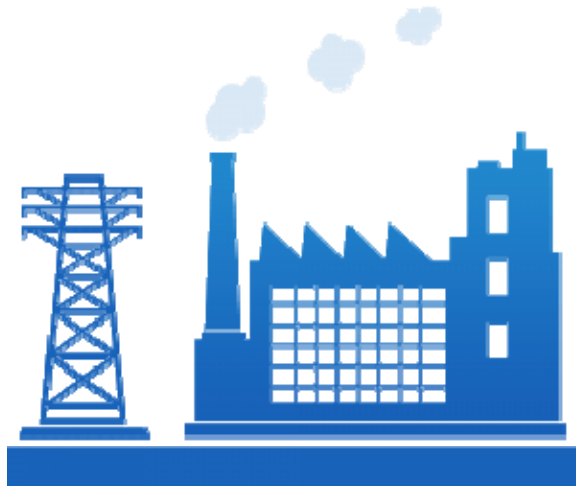


Group 1; Group 2:
Utility perspective

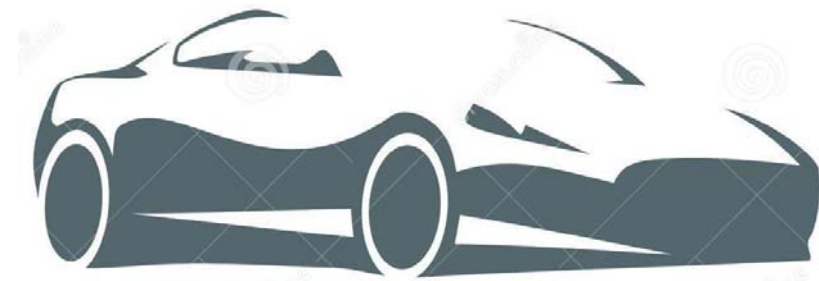


Group 3; Group 4:
Car importer perspective

Participant debrief



**Group 1; Group 2:
Utility perspective**

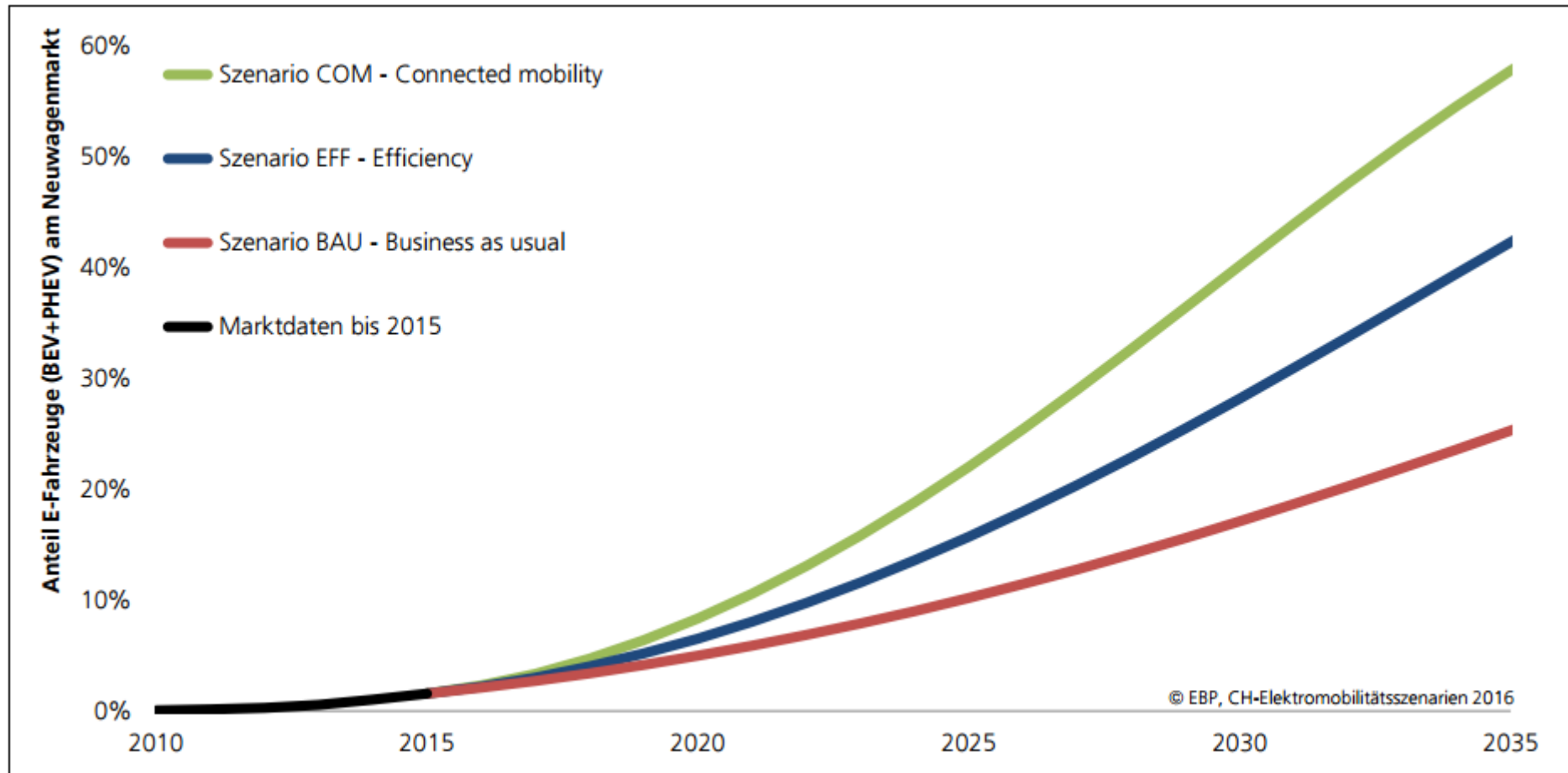


**Group 3; Group 4:
Car importer perspective**

Debrief

Scenarios on the proportion of EVs

Sum of BEV, PHEV in the new car market in Switzerland until 2035



Source: EBP. 2016.

Specification of the scenarios

- **BAU (Business As Usual):** Die Elektromobilität wird nicht speziell gefördert, die Lade-Infrastruktur entwickelt sich ohne zentrale Koordination oder Mindestanforderungen.
- **EFF (Efficiency):** Für effiziente Fahrzeuge werden zusätzliche Förder- und Anreizinstrumente eingeführt. Die Entwicklung der Ladeinfrastruktur wird koordiniert und deren Einführung im öffentlichen Strassenraum erleichtert, für die Schnellladeinfrastruktur werden Mindestanforderungen eingeführt. Der technische Fortschritt manifestiert sich voll bei den Neuwagen.
- **COM (Connected Mobility):** Elektroautos und Schnellladeinfrastruktur werden spezifisch gefördert. Weil längere Strecken mehr durch die Kombination von Auto und Bahn zurückgelegt werden, braucht es weniger langstreckenfähige Personenwagen, dafür mehr Kleinstwagen

EV adoption scenarios

Different possible adoption curves

— Base case curve

- Meets general fleet emission targets

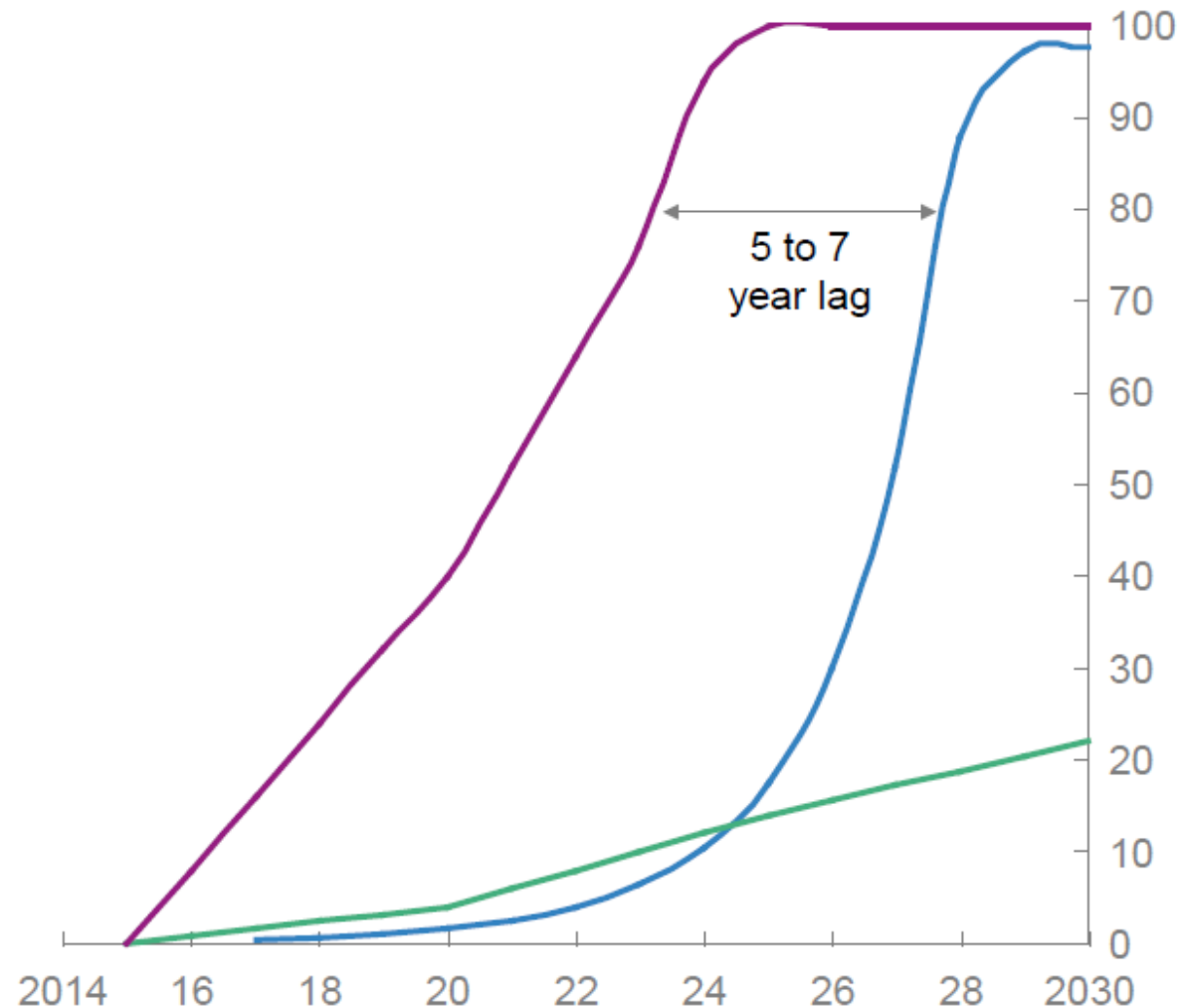
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- 100% of light vehicle sales to be electric by 2025 (e.g., Seamless Mobility)
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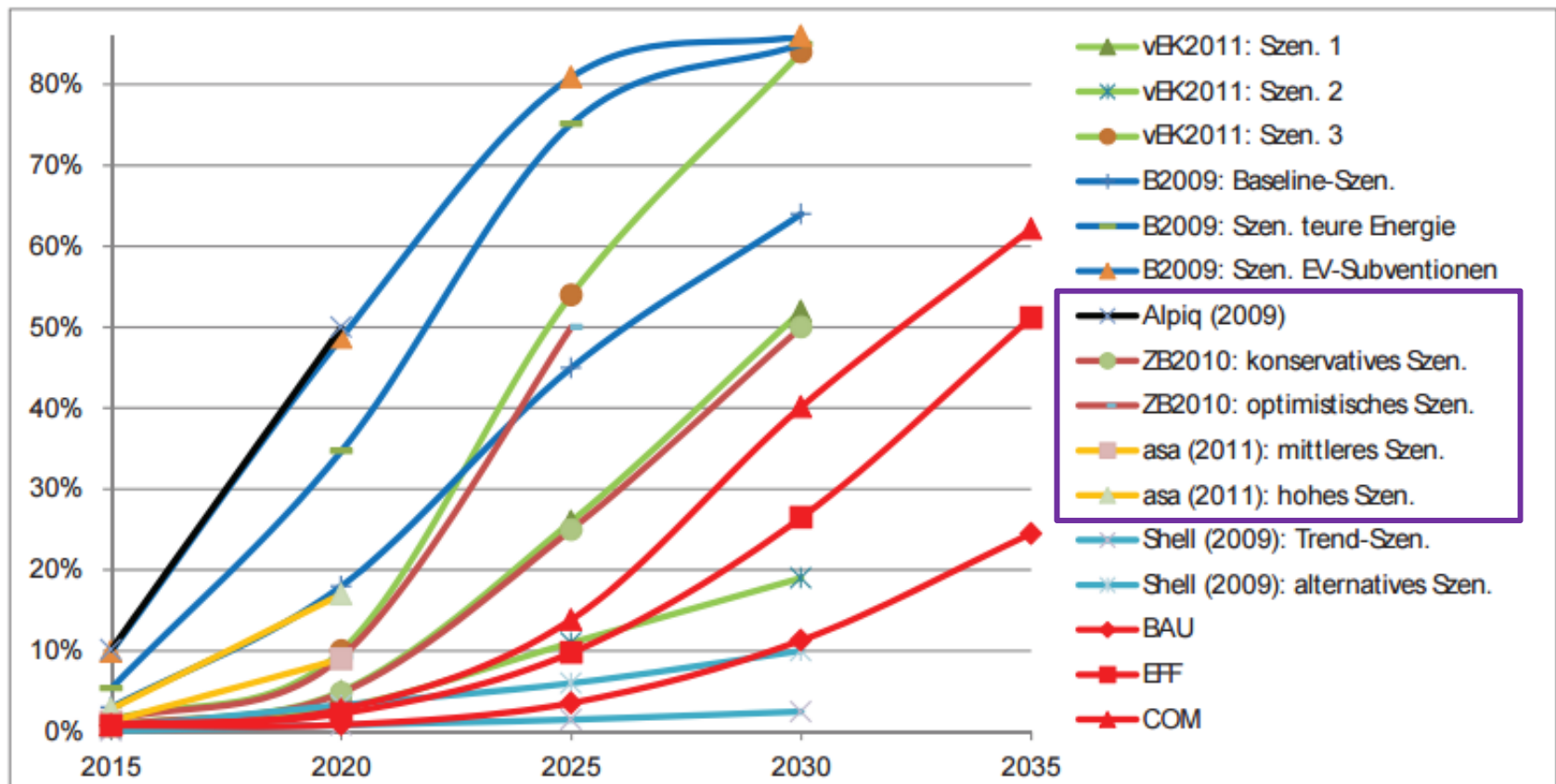
— Innovation and imitation curve

- Assuming early adopter and imitation effect
- Speed of adoption and imitation based on historic sales, and the relative cost of ICE versus EV's

Electric vehicle as share of car sales Percent



Scenarios on the proportion of EVs in different regions



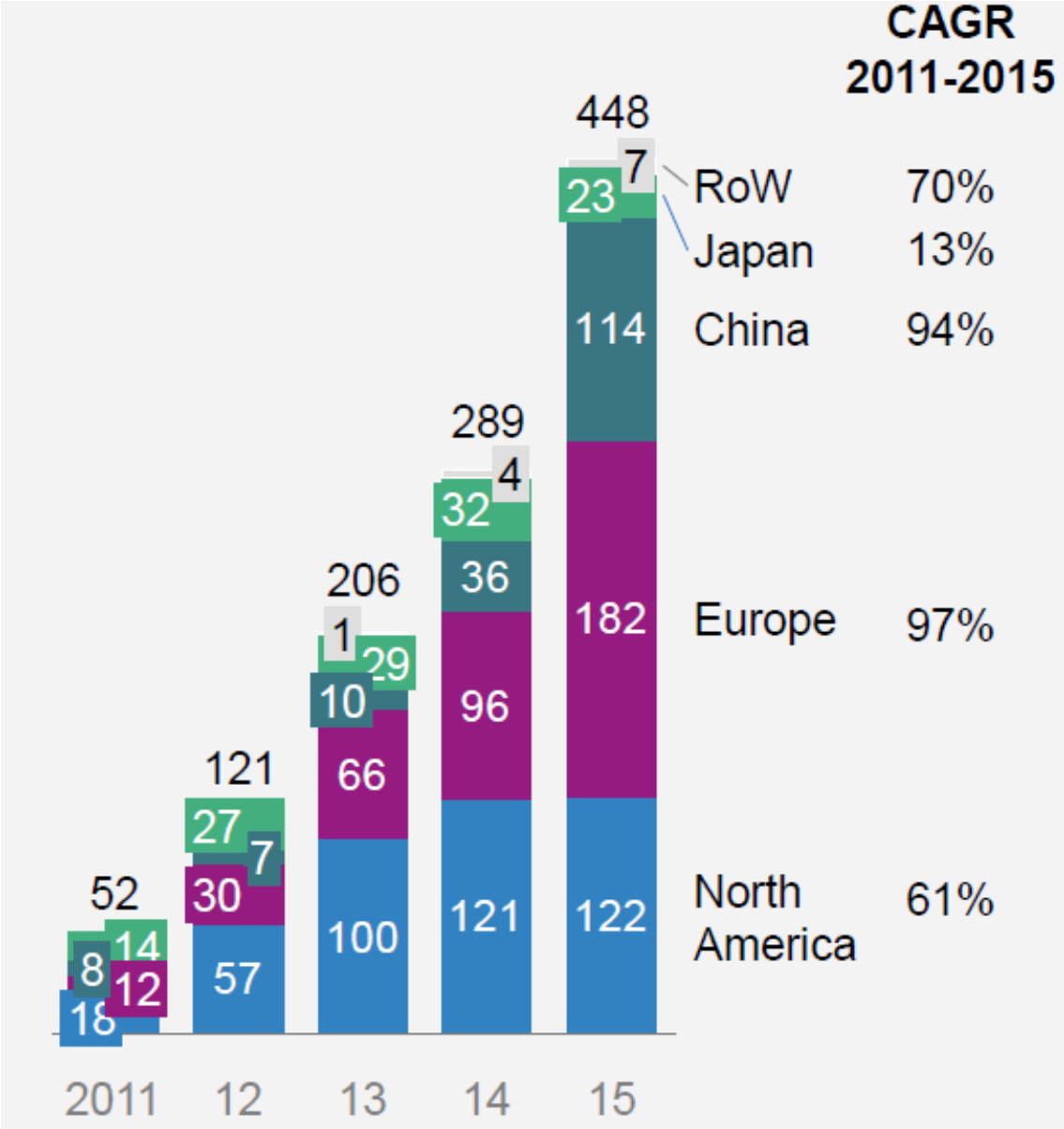
Schätzungen zum Anteil der Elektrofahrzeuge am Neuwagenmarkt in der EU (van Essen und Kampmann), den USA (Becker et al.), Deutschland (Shell) und in der Schweiz (alpiq; Zah und Binder; asa); rot eingezeichnet die Ergebnisse für die drei Szenarien BAU, EFF und COM der vorliegenden Studie.

Thank you very much for your attention!

APPENDIX

Electric vehicle sales across regions

vehicles sold, thousands



Source: McKinsey. October 2016.