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FEBRUARY, 2019

# Energy Megatrends

EFC's Electri-fyi Summit

Stephanie Medeiros, eMobility North America Business Manager & Eric Deschenes - EVP Electrification Products Business



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# Agenda

- **ABB @ a Glance**
- **The problem: Energy mega trends and their consequences**
- **Solutions and opportunities**
- **Conclusions**

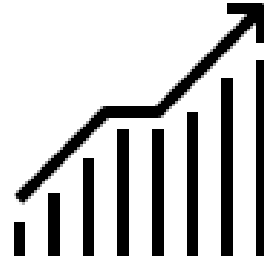
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# ABB – A global technology pioneer

Leading market positions in power & automation



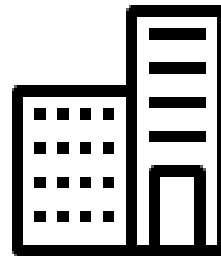
**~147,000**  
employees



**\$ US 34** billion  
in orders (2017)



Present in  
**~100** countries



Formed in **1989**  
merger of Swiss (BBC, 1891)  
& Swedish (ASEA, 1883)  
engineering companies

# ABB in Canada

Coast to coast

## Quick facts



~ **4,500** employees  
in Canada



~ **\$2.1** billion  
revenue



~ **29**  
Manufacturing  
& assembly  
locations



North American  
**Center of  
Excellence** for E-  
Mobility



**50 locations**  
coast to coast



**Canadian market  
leader** in power  
transmission and  
distribution

## HQ in Montreal, Quebec



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# Three energy megatrends that will influence our future



**Urbanization**



**The Energy Revolution**



**The Fourth Industrial Revolution**

**Utilities**

**Industry**

**Transport & Infrastructure**



# Urbanization

## Cities: Energy and CO2 challenges

### Cities today...

Earth's surface

3%

World population

55%

Global energy  
consumption

75%

Global CO<sup>2</sup>  
emissions

80%



### ...and in 2050

70%

World population

55%

Years to double  
the urban  
capacity  
developed over  
the past 4000  
years

# The Energy Revolution

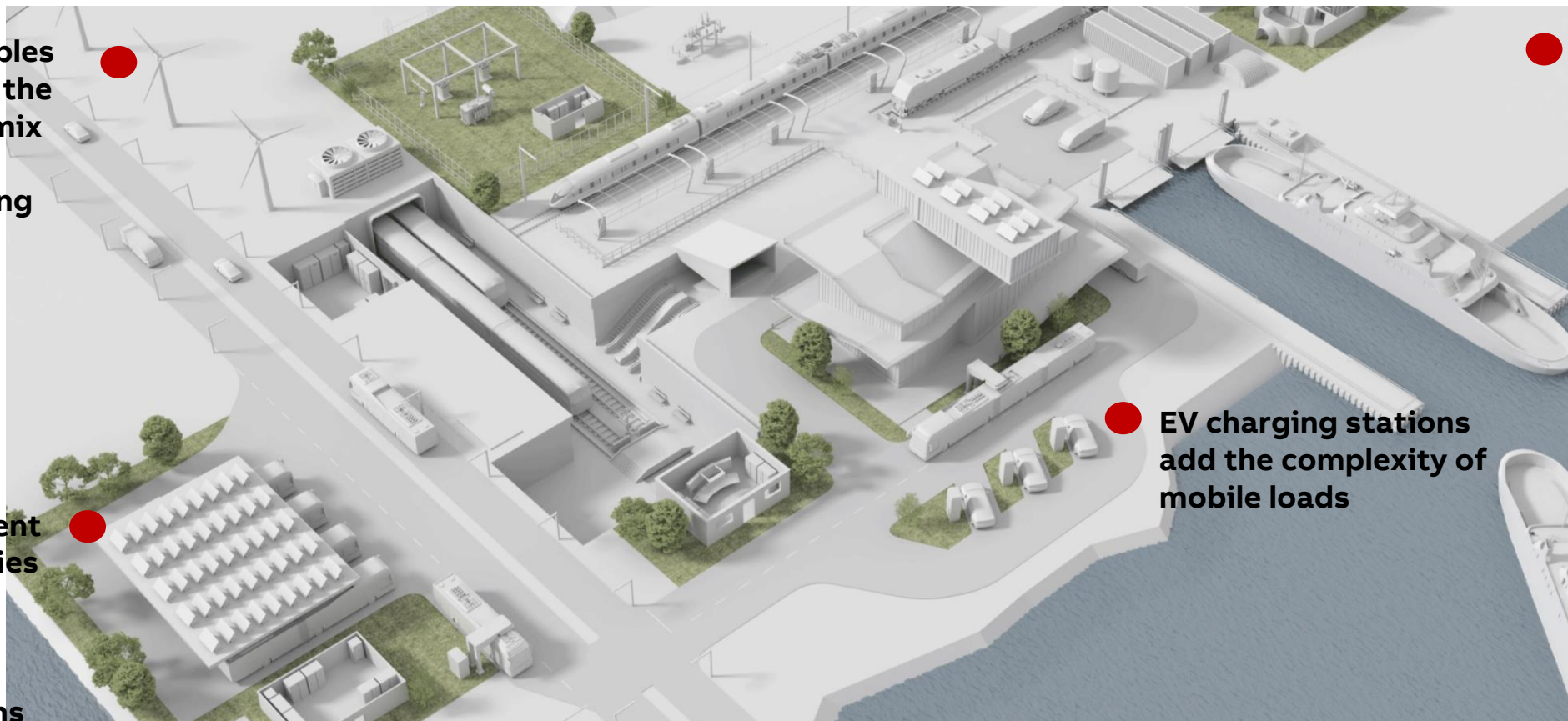
The Jurassic one-way energy-only grid becomes two-way, energy & IT

Renewables share in the energy mix started increasing

Government subsidies fueled a boom in solar and wind farms

1980's wave of deregulation stimulates new energy flows

EV charging stations add the complexity of mobile loads





# The Fourth Industrial Revolution



# What happens in an internet minute?



3.7 million  
**Google**  
searches



375,000  
**Apps**  
downloaded



1.1 million  
**Emails** sent



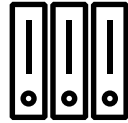
\$USD 862,823  
**Spent online**



973,000  
**Facebook**  
logins



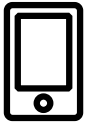
174,000  
**Instagram**  
scrolls



67  
**Voice-First**  
devices  
shipped



266,000  
**Netflix hours**



18 million  
**Text**  
messages



481,000  
**Tweets**  
sent



38 million  
**Messages**



4.3 million  
**YouTube**  
videos viewed



1.1 million  
**Swipes**



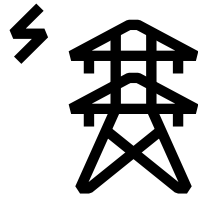
2.4 million  
**Snapchats**

# Consequences of the megatrends

Deep energy transformation needed by 2050



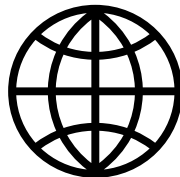
## Consequences



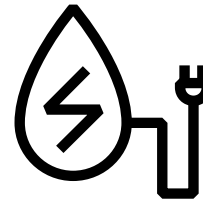
**Frequent power outages**



**Raising energy prices**

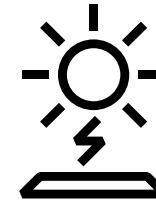


**Climate change**

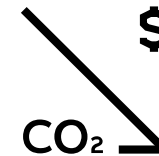


**Conflicts for resource access & control**

## To avoid dramatic climate change by 2020...



**95%** of electricity will need to be **low-carbon** compared to about 1/3 today



**Emissions** need to fall by more than **70%** below today's levels



**7 out of 10** Cars need to be electric **Compared to 1 in 100** today

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# Agenda

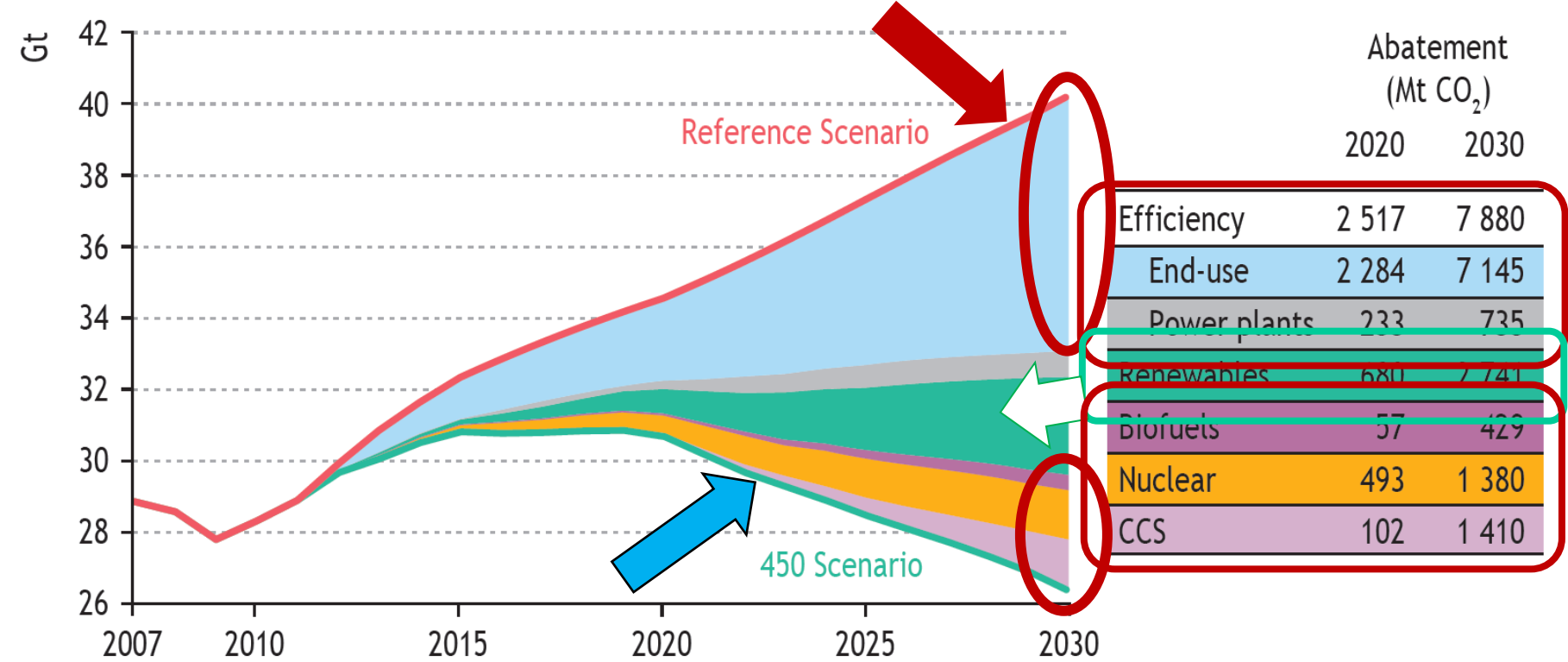
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# Supply matters

but demand behavior matter most, first!

World energy-related CO2 emissions abatement



Over **50%**  
of **CO2**  
reduction  
will come  
from  
**energy  
efficiency**

Source: World Energy Outlook 2009 OECD / International Energy Agency





# Smart Cities

Canada is a world leader

## Intelligent Community Forum (ICF)

Top 7 2019

- **Abbotsford, British Columbia, Canada**
- Sunshine Coast, Queensland, Australia
- Chicago, Illinois, USA
- Taoyuan, Taiwan
- Hudson, Ohio, USA Westerville, Ohio, USA
- **Sarnia-Lambton County, Ontario, Canada**



# Smart Cities

Products and solutions that are at the heart of a city's critical infrastructure

Communications platform

## Electricity grids



Reliable, efficient energy supply and management

- Smart grid
- Demand response
- Microgrid and renewable integration
- Energy storage

## Water networks



Optimized water supply and treatment

- Distribution
- Treatment
- Desalination

## Transportation



Efficient and reliable transport infrastructure

- Electrical vehicle charging
- Shore to ship
- Electric busses
- DC electric rail

## Buildings



Efficient energy management, uses and control

- Homes
- Commercial buildings
- Industry
- Data centers

## District heating and cooling



Efficient flexible heat and cooling supply

- District cooling
- Waste to energy





FEBRUARY 2019

# The Future of Electric Vehicle Infrastructure in Canada

## ABB's Technology Roadmap Plans in Canada

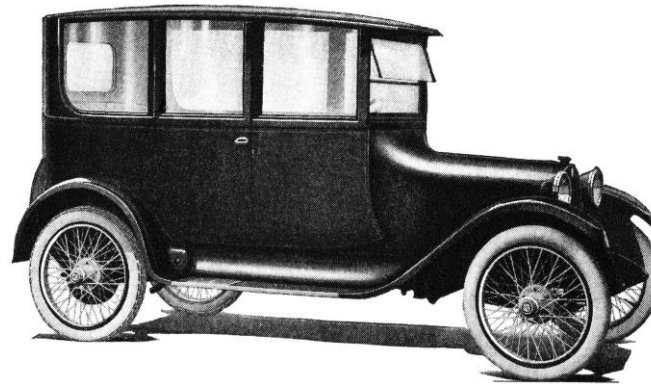
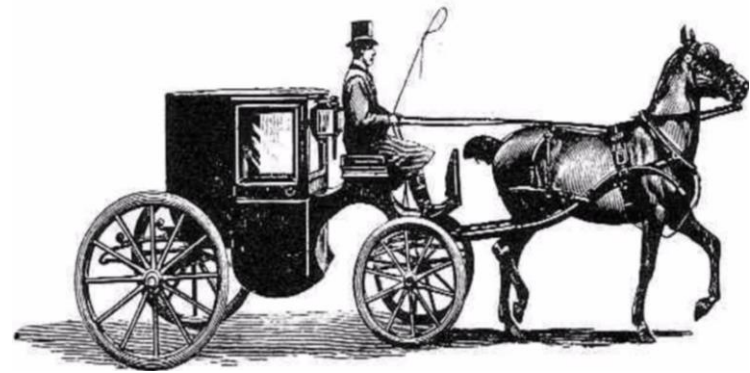
Stephanie Medeiros, EV Charging Canada



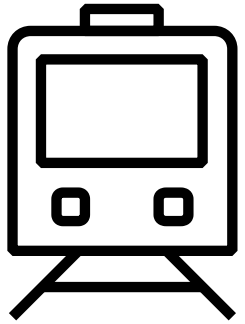
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# The transition to Electric Vehicles

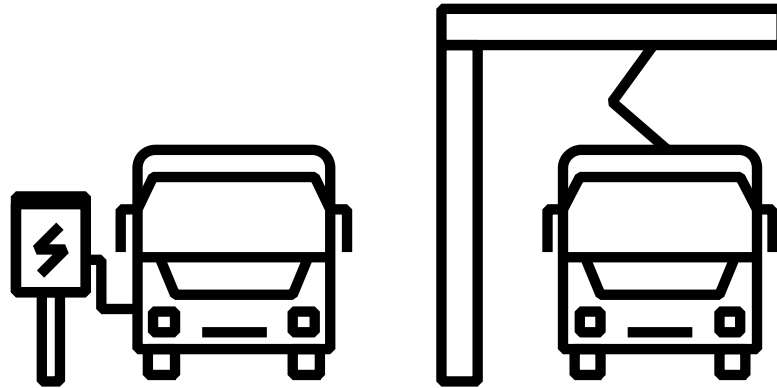
From horse and carriage to the electric vehicle



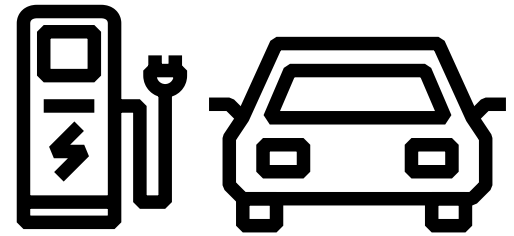
# Emobility is here



Rail



Transit bus

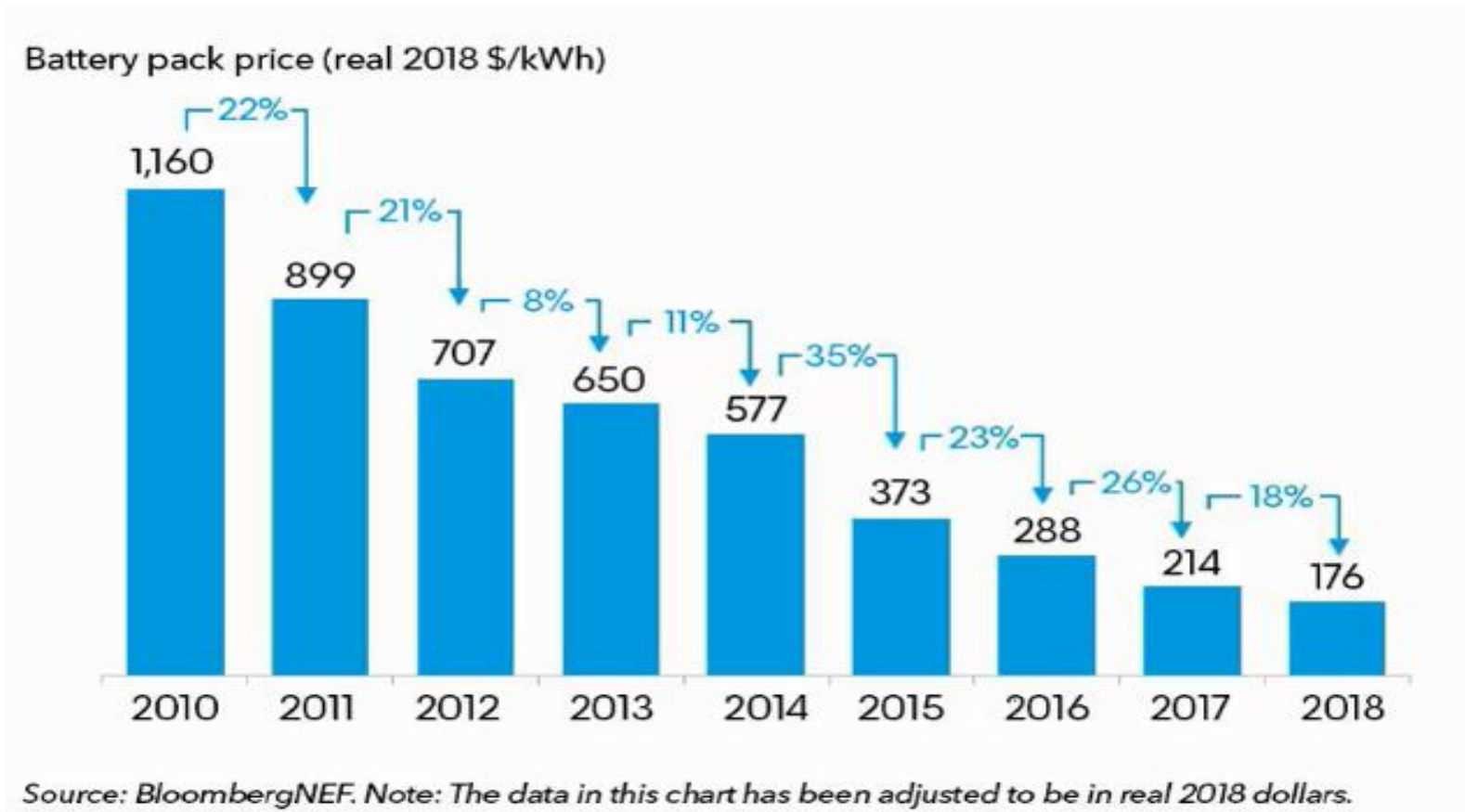


Car



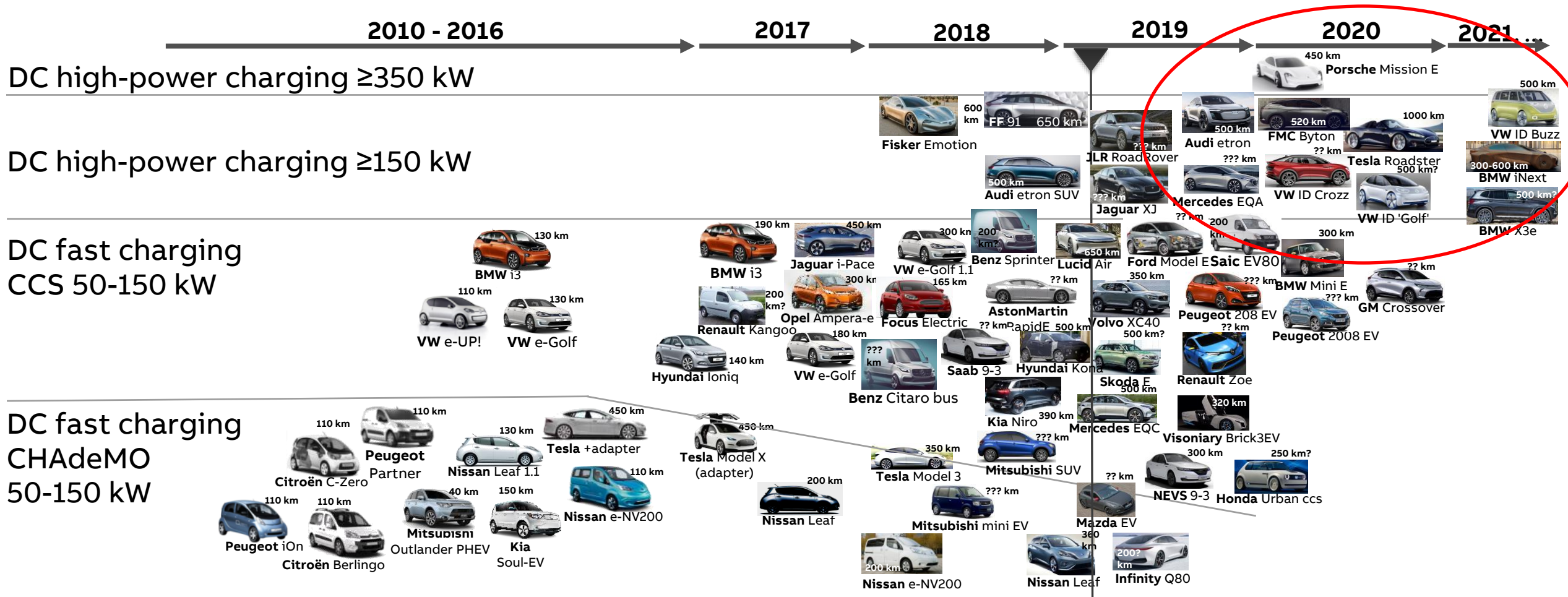
# The Future of Transport

Improvements in battery technology leading to larger capacities and lower prices



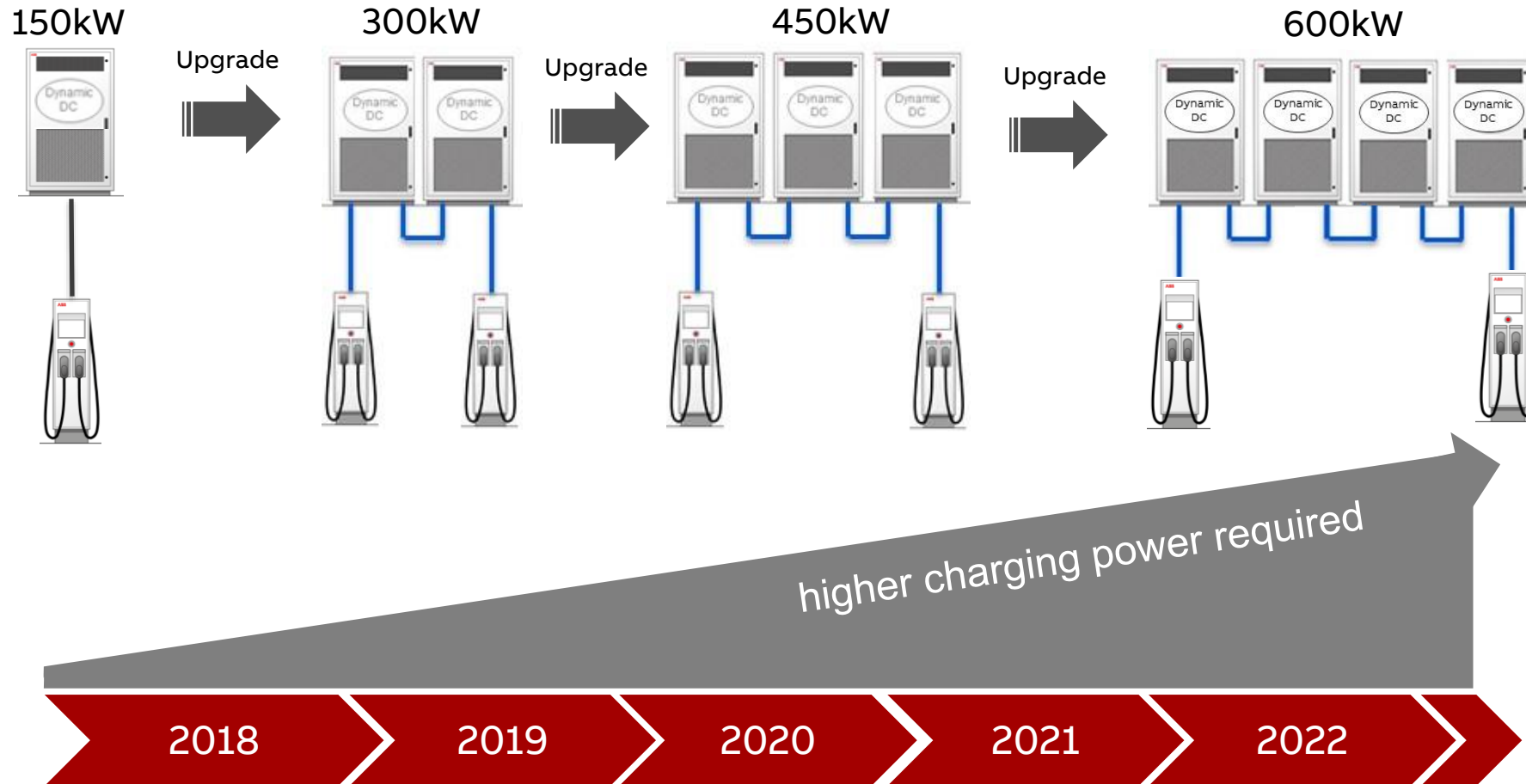
# The Future of Transport

## Electric Vehicle Road Map



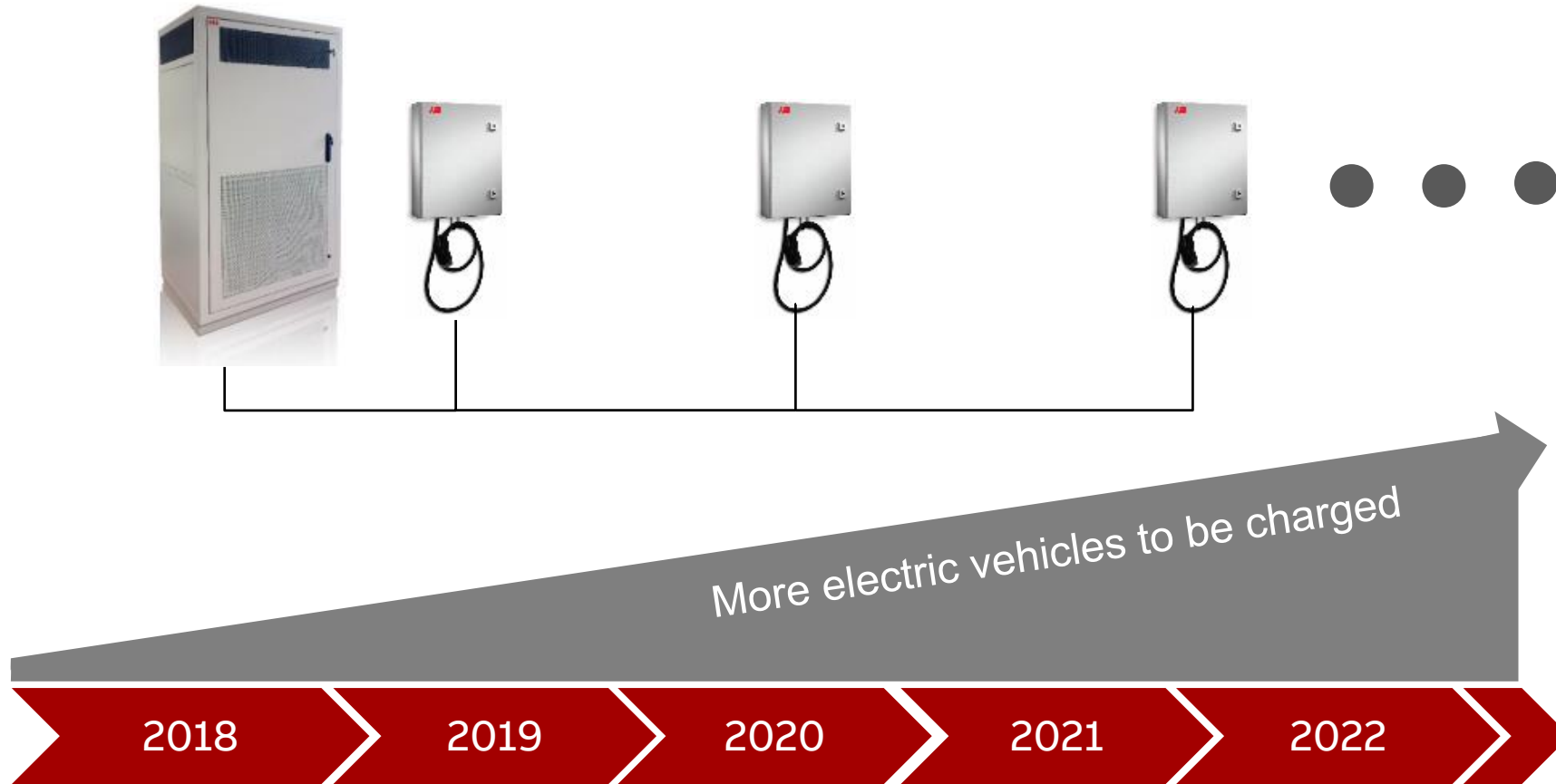
# The Future of EV Charging Infrastructure

Easily upgradable for higher power needs



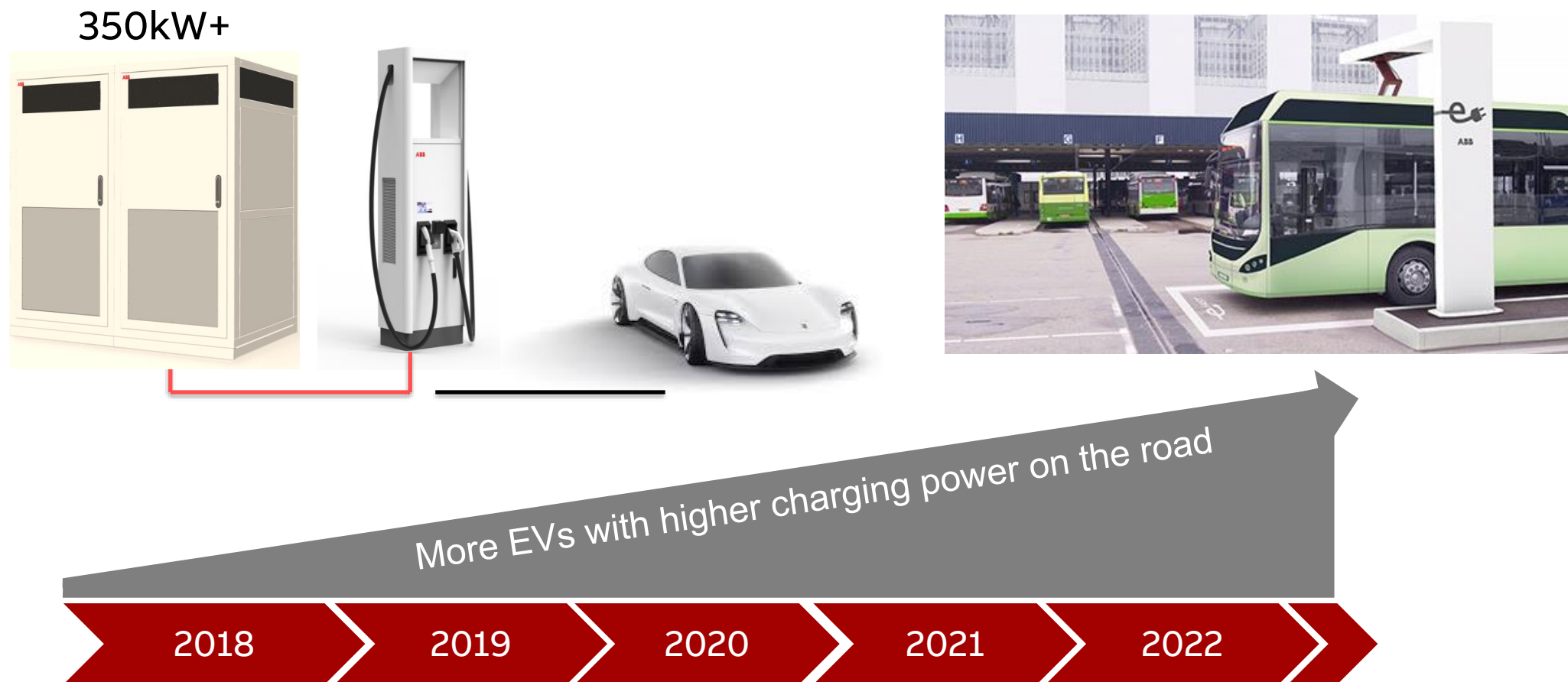
# The Future of EV Charging Infrastructure

Easily expandable to charge more vehicles as fleets grow



# The Future of EV Charging Infrastructure

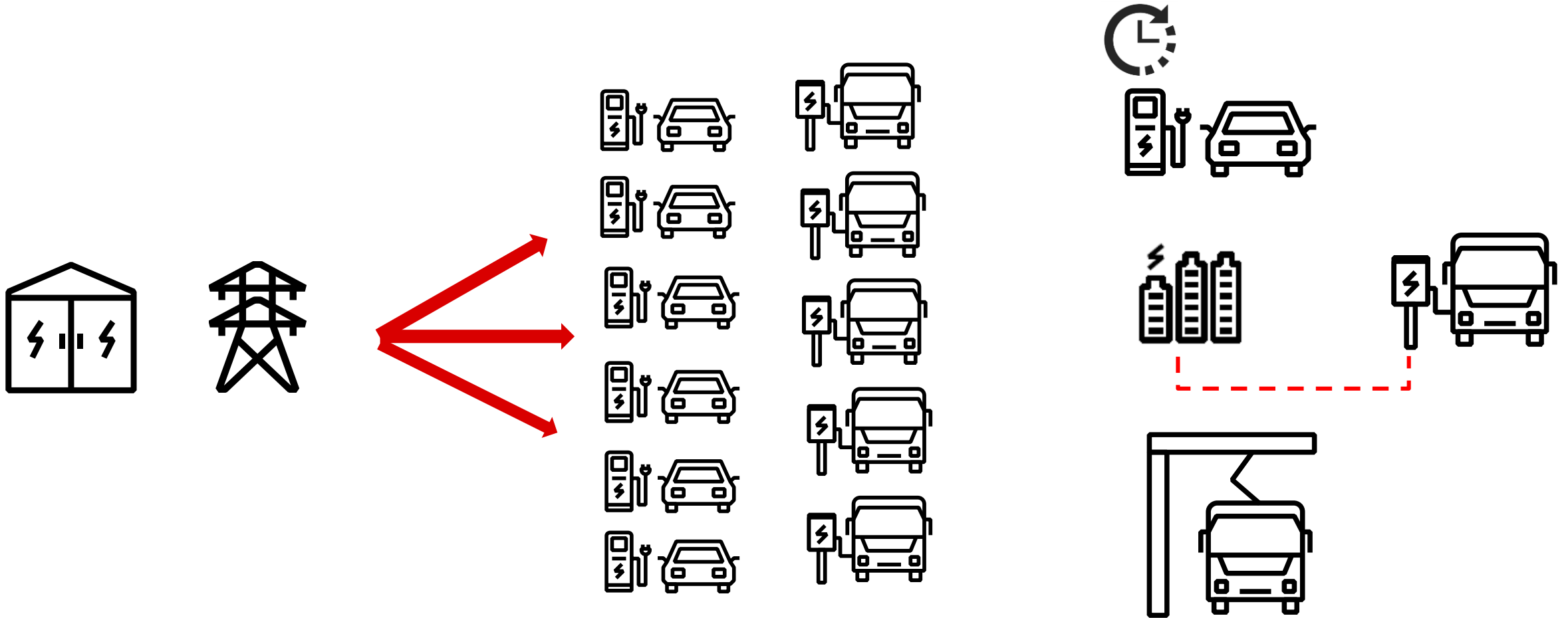
Fast!





# Electrification of Transportation Grid Impact

Solutions to grid impacts



# The Electric Vehicle Charging Infrastructure


The Future is here



# Business case – Resource productivity

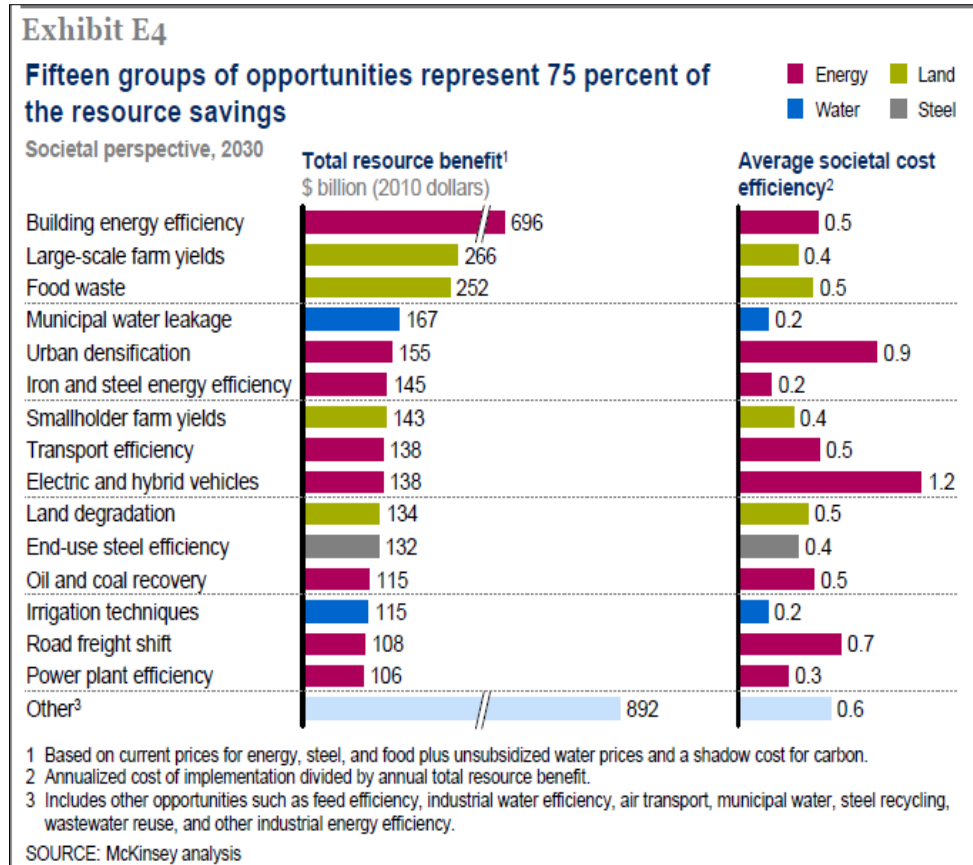

McKinsey – November 2011

McKinsey Global Institute  
McKinsey Sustainability & Resource Productivity Practice



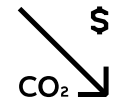
November 2011

Resource Revolution:  
Meeting the world's  
energy, materials, food,  
and water needs




## Quick facts

 Annual investments: \$900 B

 Annual savings: \$2,900 B

 9 to 25 million jobs created

 15 opportunities = 75% savings

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# Conclusions

## Megatrends



Urbanization



Energy Revolution



Fourth Industrial Revolution

... with potentially large consequences

**Energy  
Demand +  
CO<sub>2</sub>  
Emissions**

The time to act is now. Lets write the future. Together.



**ABB**