Future transportation and infrastructure electrification

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Megatrends shape the future

Urbanization

70% of the world's population will live in cities by 2050[1]

UN study

Digitalization

By 2020, 33bn+ internet-connected devices will be used worldwide[2]

Strategy Analytics study

Integration of flexible supply

The solar market will grow to 150 GW in 2025

Frost&Sullivan

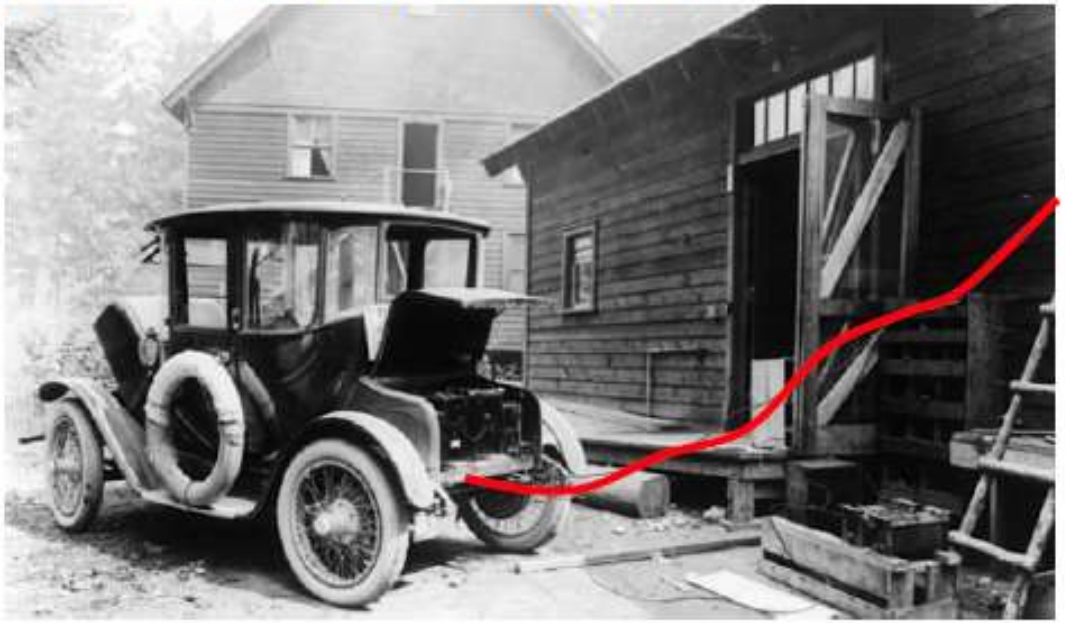
Integration of flexible demand

EVs will represent over 55% of the market by 2040

Bloomberg

E-mobility?

It is all about a new mindset



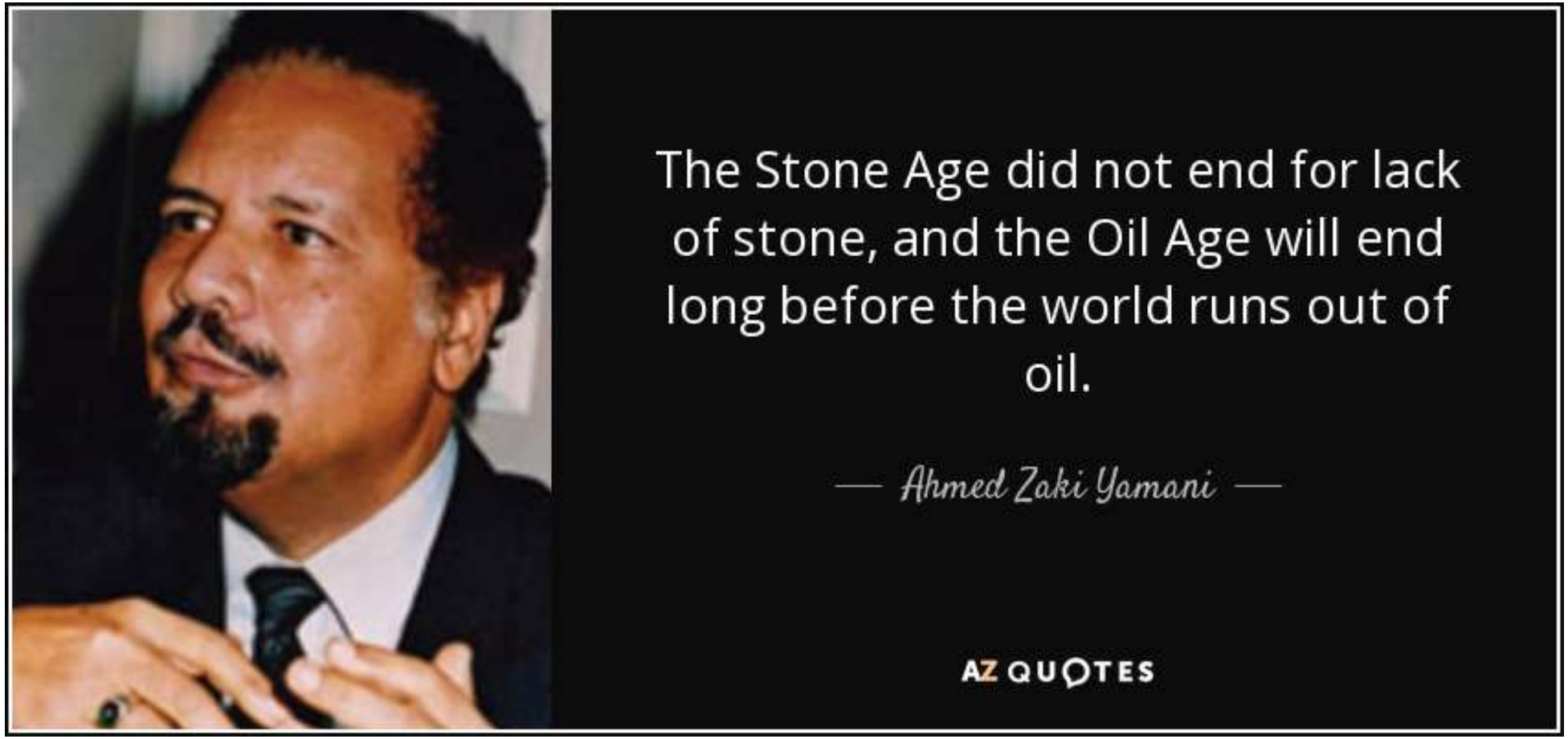
Charging in 1911
Old stuff!

„I believe in the horse. The automobile is only a temporary phenomenon.“

Bundesarchiv, Bild 130-96242
Foto: Tellgmann, Oscar | 1913

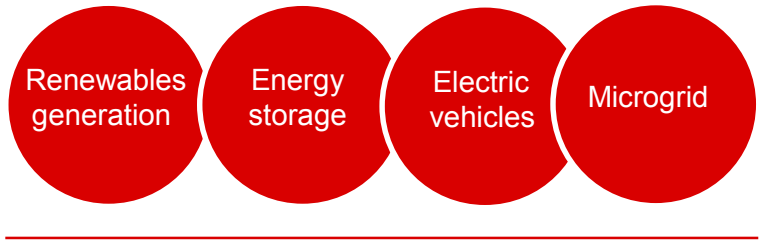
The future is Electric

Autonomous electrical cars, buses, trucks, trains and vessels will change the world



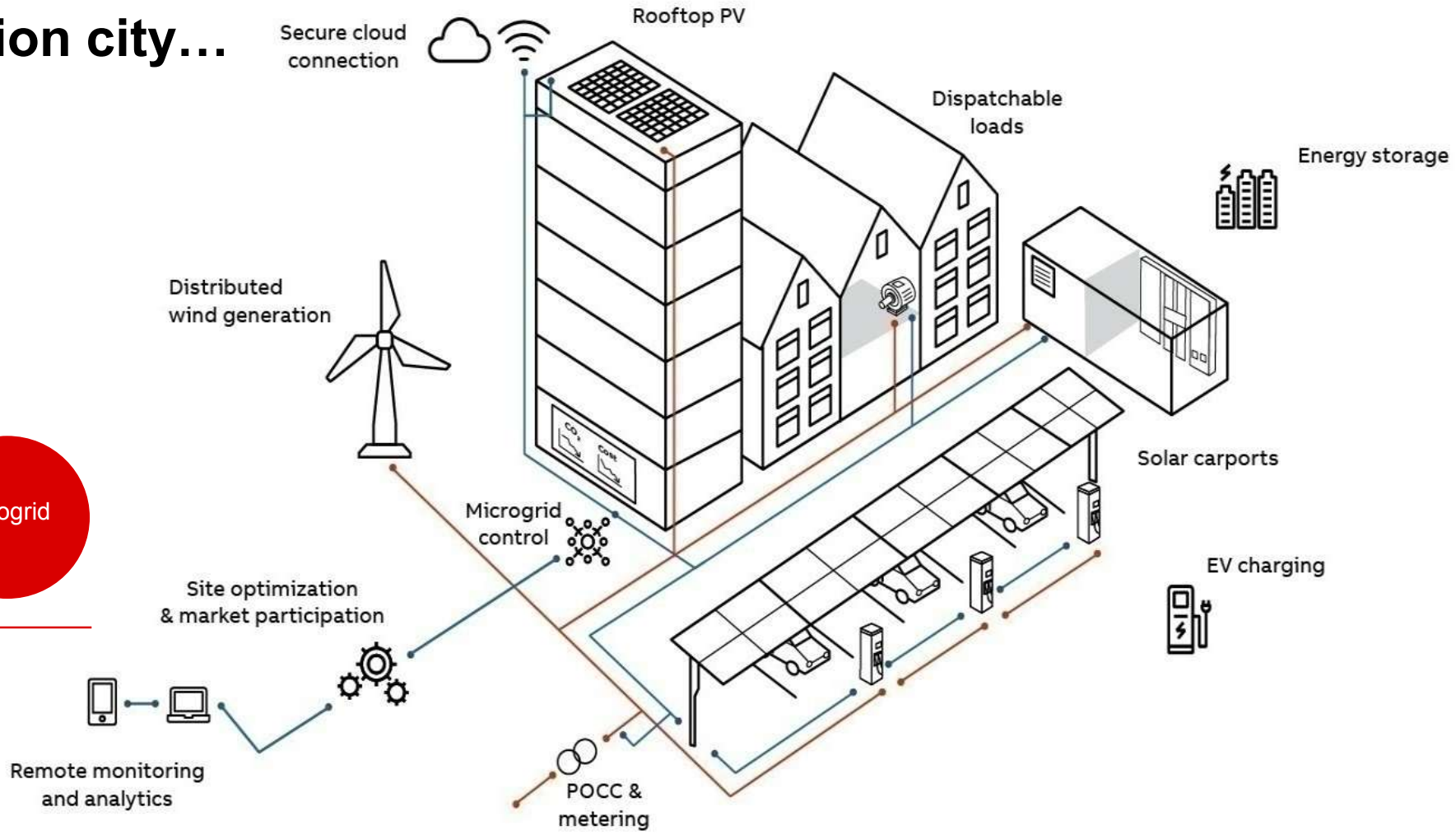
Imagine a zero emission city…

Residential and commercial customers and communities become active participants in the energy revolution by optimizing local resources



digitally enabled by ABB Ability

Zero emission target



Consumers become prosumers: from homes, to commercial buildings to cities

What does it take to get to zero emissions?

1

Electric vehicles must be available

2

We need to be able to charge our electric cars

3

We need to reinforce the grid

4

Integrate renewable power generation

Challenges for the industry

Challenges

Acceptance level of EV's for Drivers / Fleets

- Range anxiety
- Charging times
- Charging convenience & accessibility

For Operators

- Up-Times
- Serviceability
- Utility / Grid-codes / permits

For OEM

- Technical (standards; EMC; insulation;….)
- New business models

ABB as a partner

Global Player, native in over 100 countries

Front-runners in High-Power Charging, over 600 patents in power-conversion and charging

Leading development of key components for HPC with industry suppliers

Field experience from installed base and thousand of service engineers; since 2015 only more than 100 GWh charged in ~ 15 Mio charge sessions

Highly interoperable with all EV models and with more than 50 different backends

Seamless grid integration from single 50kW to multiple output 350kW charging parks

Reference project: Trondheim, Norway

35 **fully electric** buses

2 **bus brands**

25 Volvo (12M)
7900 buses

10 Heuliez (18M)
GX 437 buses

1 charging infrastructure supplier

ABB Ability™ cloud based technology and **real time data** for remote and proactive control

8 ABB Heavy Vehicle Chargers (**HVCs**)

4 **routes** covering 12-15km each

3-6 **minutes** charging time

450kW **charging power** per HVC

100% **emission-free**

OppCharge compatible interoperable and open interface for DC electric bus charging

10 **year SLA***

AtB

Trøndelag County Authority

*Service Level Agreement

Reference project: TEC in Namur & Charleroi, Belgium

101 Electric Hybrid buses & 15 Opportunity chargers

100+
electric hybrid buses are charged by ABB fast chargers in the cities Namur and Charleroi in Belgium

15
DC fast chargers installed in Namur and Charleroi based on open interface OppCharge

16
year service contract to ensure reliable operation during the entire lifetime of the project

15
electric substations and switchgear from ABB to power the chargers

150 kW
per charger

90%
of Namur's city bus routes to be served by electric hybrid buses

Electric Hybrid
equipped with an electric motor, batteries and a small diesel engine

70-90%
lower emissions of carbon dioxide compared with a conventional diesel bus, depending on the fuel used

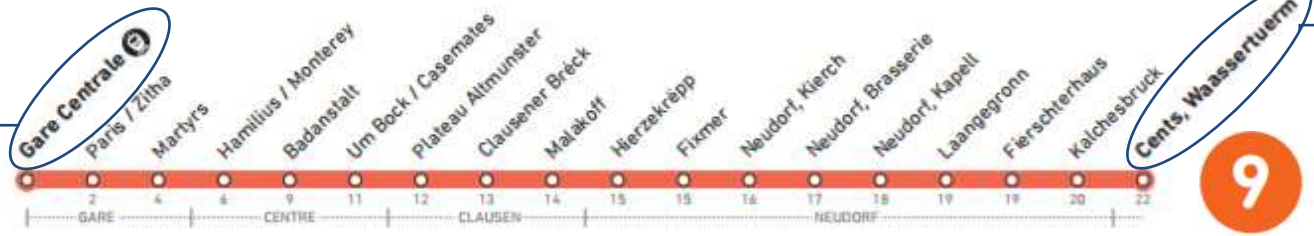
60%
lower energy consumption than a corresponding diesel bus

Quiet

Slide

Reference project:

Ville de Luxembourg



- 2 lines operated by Ville de Luxembourg:
  - line 9
  - line 13
- Volvo Electric Hybrid buses
  - 4 x HVC 150P
- Transformers and substations
- In commercial operation since Feb 2017
- +/- 80 charge sessions per charger per day
- ..... compatible OPPcharge

Reference project:

Luxembourg MDDI

Luxembourgh 2016

- MDDI
- 1 pilot line operated by Sales-Lentz
- Volvo Electric Hybrid
- 1 x 150kW ACS – 2016
- 3 x 150kW ACS – 2017
- Intensive passenger operation
- Operational 2016

OPPcharge compatible

LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère du Développement durable
et des Infrastructures
Département de l'environnement

Sales-Lentz
moving people

Reference project:

Östersund Brittsbo-Torvalla, Sweden

Östersund, Sweden 2018

- Östersund (SE)
- 1 commercial line
- 3 + 3 Scania full electric buses

SCANIA

- 2 x HVC 300P with ACS
- Part of installation work performed by ABB
- 2 x AC feeder from ABB Kabeldon
- In operation since Q1-2018

OPPcharge compatible

ÖSTERSUNDS KOMMUN

Krokoms kommun
KROKOMEN TJIELTE

REGION JÄMTLAND HÄRJEDALEN

To conclude

We must accelerate the adoption of sustainable energy solutions in Romania

We must run the world without consuming the earth

Let’s write the future. Together.


ABB