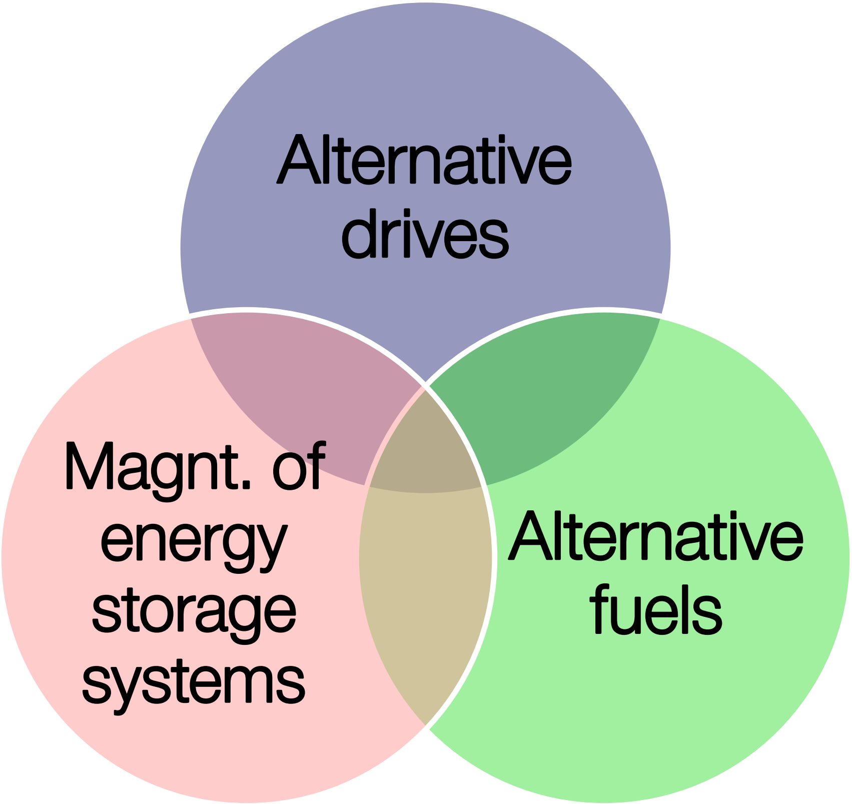
SBB CFF FFS

Center of Competence – Energy Storage

Ueli Kramer (SBB) – Head of CoC
End of fossil fuels, 13.11.2019
Zuerich

Center of Competence – Energy Storage



Alternative drives

- SBB knows which drive can be used where and how in terms of TCO, resource efficiency, CO2 and user-friendliness (employee health).

Alternative fuels

- SBB knows whether and which applications of "alternative fuels" such as SynFuel, H2, etc. are in terms of TCO, resource efficiency and CO2 are favorable in perspective of the entire value-chain.

Management of energy storage systems

- SBB is in a position to use new renewable energies efficiently over all seasons and can keep the TCO of the overall system low through the efficient management and targeted installation of energy storage systems in the grid.

Our vision

the entire SBB will use only renewable energies by 2040.

Ambition

We achieve this by:

- working directly with the experts in the individual divisions.
- Measures in the fields of action.

Focus 1:
Gas Shunting Switches

Focus 3:
Diesel Traction

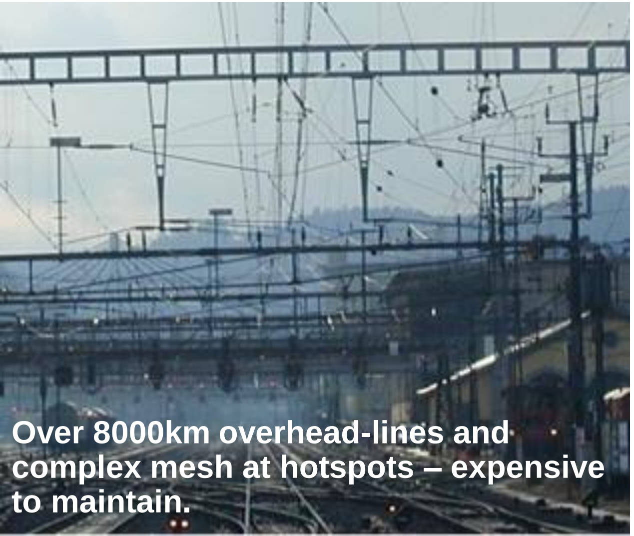
Focus 5: Rental and Services

Focus 2:
Building heatings

Focus 4: Road- and Specialvehicles

Some of the challenges and questions

Over 10’000 systems spread over all fleets. No control, no reliability, heavy, old technology.



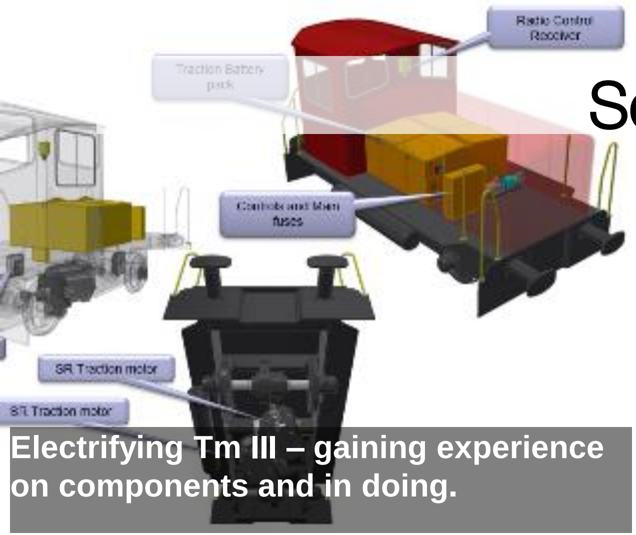
Over 8000km overhead-lines and complex mesh at hotspots – expensive to maintain.

Over 46% of the SBB CO_2 emission by diesel powered engines

Noise and health of employee on the construction fields

Over 2200 cars powered by diesel

Some of the actual projects



Electrifying Tm III – gaining experience on components and in doing.

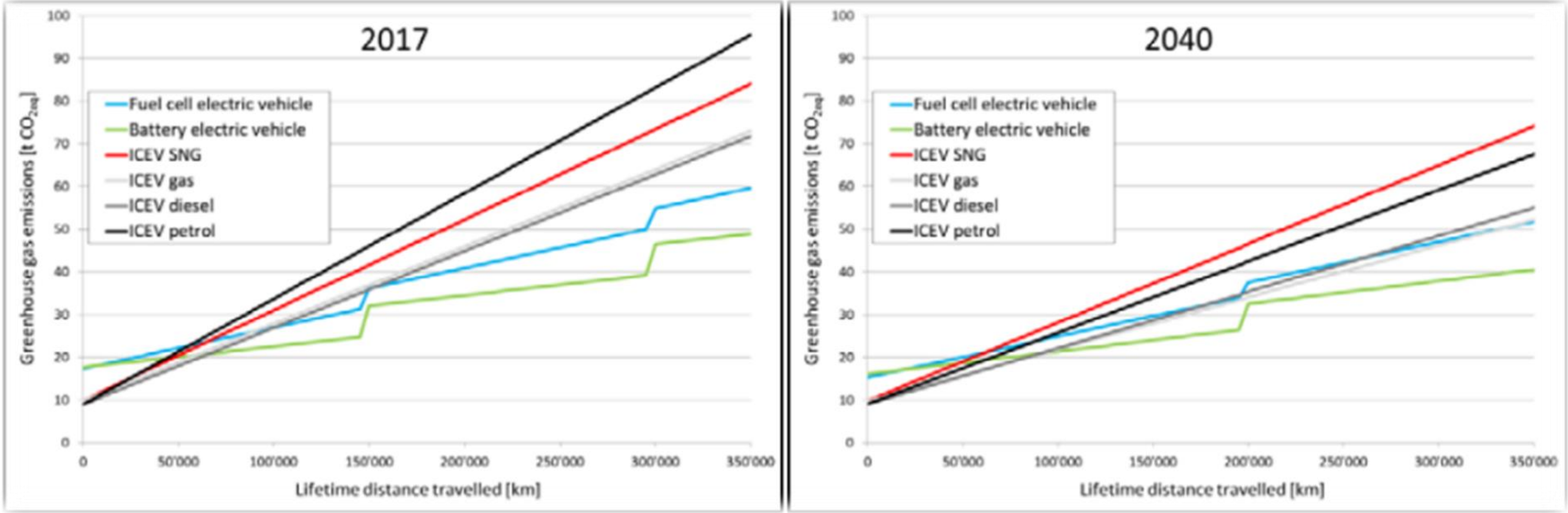
Exploring new tools and change-management – human factor

Zero Emission maintenance – using Second-Life Li-Batteries

Developed a whole new system to fit needs and gaining experience

Self developed Second-Life storage for remote connectivity

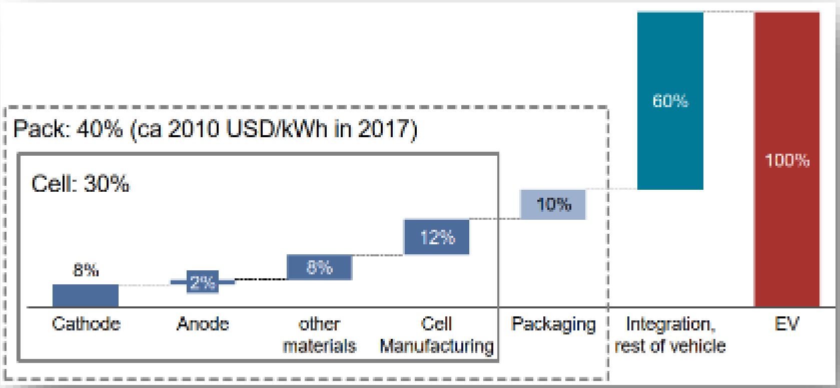
The question about CO2 and technology comparison

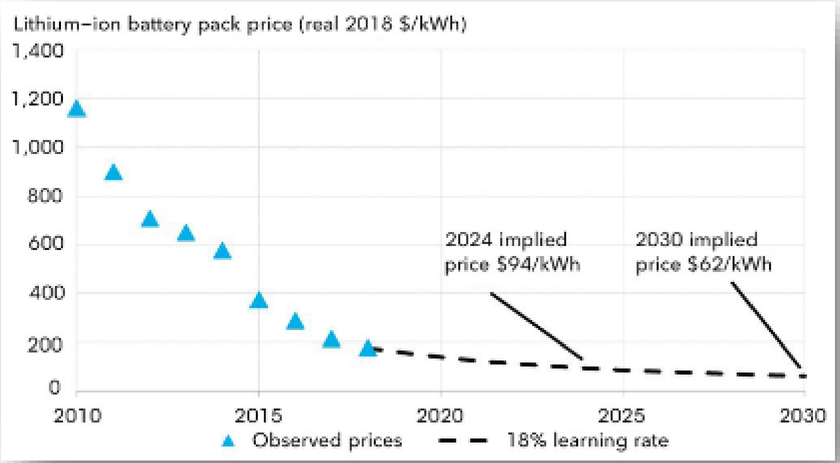


Greenhouse gas emissions during the entire life cycle of different vehicle powertrain types in 2017 (left) and 2040 (right). „ICEV“: vehicle with combustion motor; „SNG“: Synthetic natural gas, here produced via electrolysis using the Swiss electricity mix and CO_2 captured from ambient air. The Swiss electricity mix is assumed here for both the charging of batteries for battery electric vehicles and for the production of hydrogen for use in fuel cell vehicles. „Gas“ is a mix of 90% fossil natural gas and 10% biogas. Batteries and fuel cells are assumed to be replaced after 150’000 km (2017) and 200’000 km (2040).

Source: ETH -DISS. ETH NO: 25081

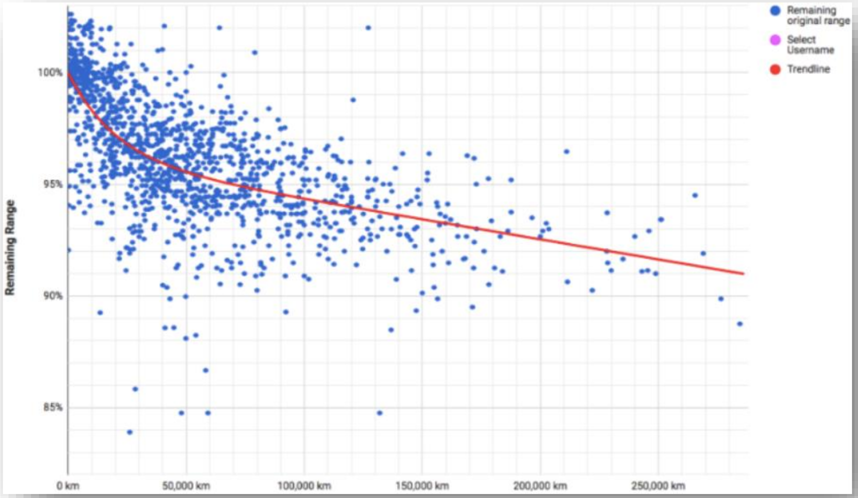
Why electric mobility will win – the disruptive change

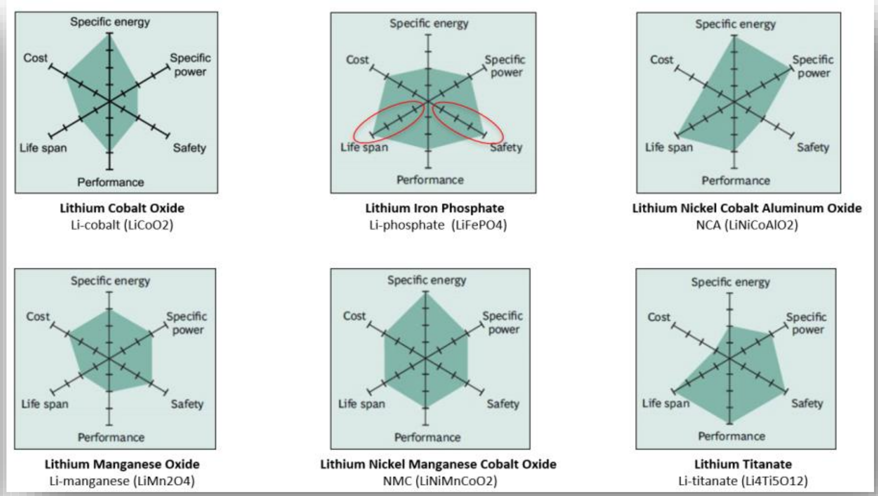




Source: EPG/ETH Zurich, based on 2017 market numbers / Bloomberg

Aging and technology comparison …





Source: www.teslaupdates.co / Battery University

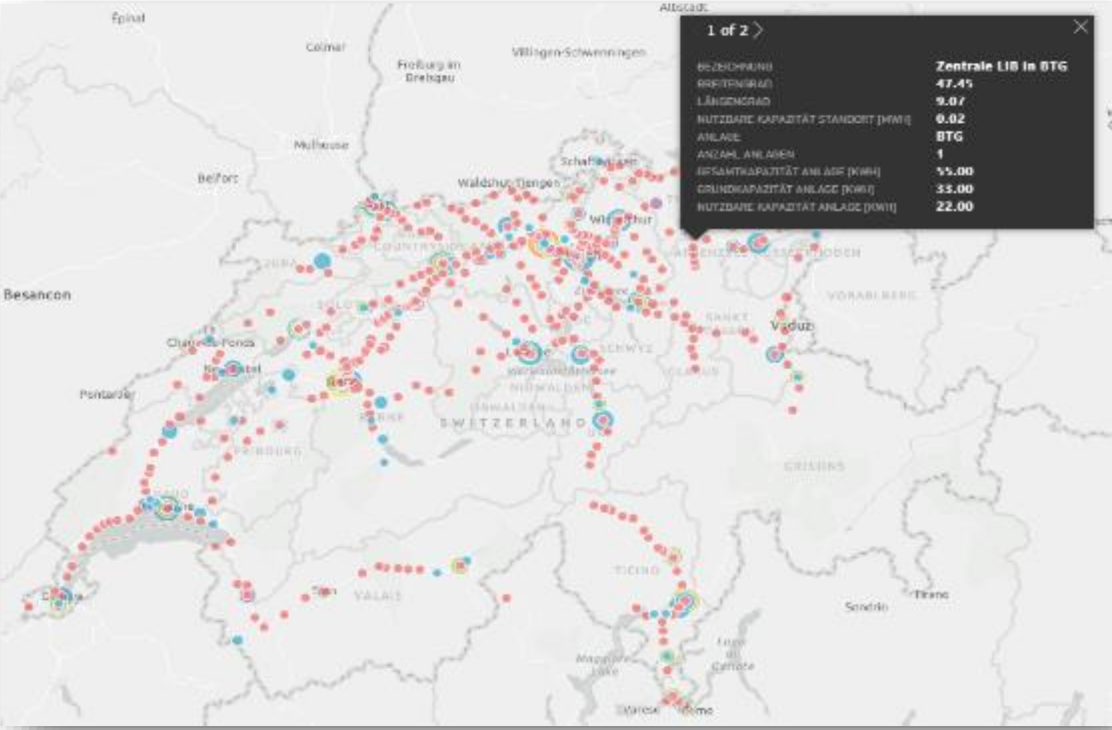
What does it mean for the grid, having lots of batteries?

By 2040 SBB is going to have around 340 MWh installed batteries.

According to simulations: 240 MW available as a virtual power-plant!

Main questions are

- How and when to charge?
- Using for grid regulation or not?
- Control and connectivity as well as maintenance and second-life approaches ...



Thanks

ueli.kramer@sbb.ch