HV SYSTEM AT VOLVO CARS

Dr. Alexandra Nafari
Technical Specialist HV system,
Electric Propulsion Systems,
Volvo Cars Group, Göteborg
40 YEARS OF ELECTRIFICATION AT VOLVO CARS

1976

2020
Volvo Cars is going all-in on electrification. T8 Twin Engine is a perfect example of this.

SPA and CMA: Volvo car architectures designed with electrification in mind from the start

Electrified cars will represent 10% of our global volumes in the medium term

Electric volumes will fivefold in the coming years

A fully electric Volvo car
Our platforms are built with electrification from the start
And 100% Volvo Owned
HV system includes:

- Interfaces
- Balancing
- The infrastructure:
  - High voltage bus
  - Electrical safety
  - EMC/EMF
  - Etc.
- Dependability and robustness
- Limp home modes: Ensure availability also in case of malfunction
## FUTURE NEEDS – INCREASED POWER BANDWIDTH

### Electric System power

<table>
<thead>
<tr>
<th>Mild Hybrid</th>
<th>Plug-in Hybrid</th>
<th>Full Electric (BEV) Higher power Plug-in hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak: 10kW – 30kW</td>
<td>70kW</td>
<td>80kW</td>
</tr>
<tr>
<td>Cont.: 40kW</td>
<td>50kW</td>
<td>150kW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90kW (PHEV)</td>
</tr>
</tbody>
</table>

### Charging

<table>
<thead>
<tr>
<th>Over night AC</th>
<th>Fast charging AC</th>
<th>DC Charging</th>
<th>DC Charging</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – 10kW</td>
<td>20kW</td>
<td>50kW</td>
<td>150kW….350kW</td>
</tr>
</tbody>
</table>

- Customer expectations of performance is increasing and needs to be met
Many configurations possible:

- Series Hybrid
- Parallel Hybrid
- Pure Electric

=> Modular and robust system boundaries are needed
RIPPLES AND TRANSIENTS

Constant speed 60 km/h

Acceleration

Voltage, HVDC+ to HVDC- (AC-coupled)

Voltage [V]

Time [ms]

Voltage [V]

Time [ms]
RIPPLE MEASUREMENTS – FREQUENCY SPECTRUM

Constant speed 60 km/h

Acceleration
SUMMARY

- Evolving customer expectations
- Increased power band width
- Longer electrical range
- Simplified charging
- Lower cost

- Balanced system boundary conditions
- System approach to a robust HV net
- Reusability of High Voltage components

=> A Modular Tool Box
THANK YOU