punch powertrain
Gear up for the future

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Addressing a Complete Hybrid Configuration Range with a Single Concept

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Punch Powertrain

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Introduction Punch Powertrain

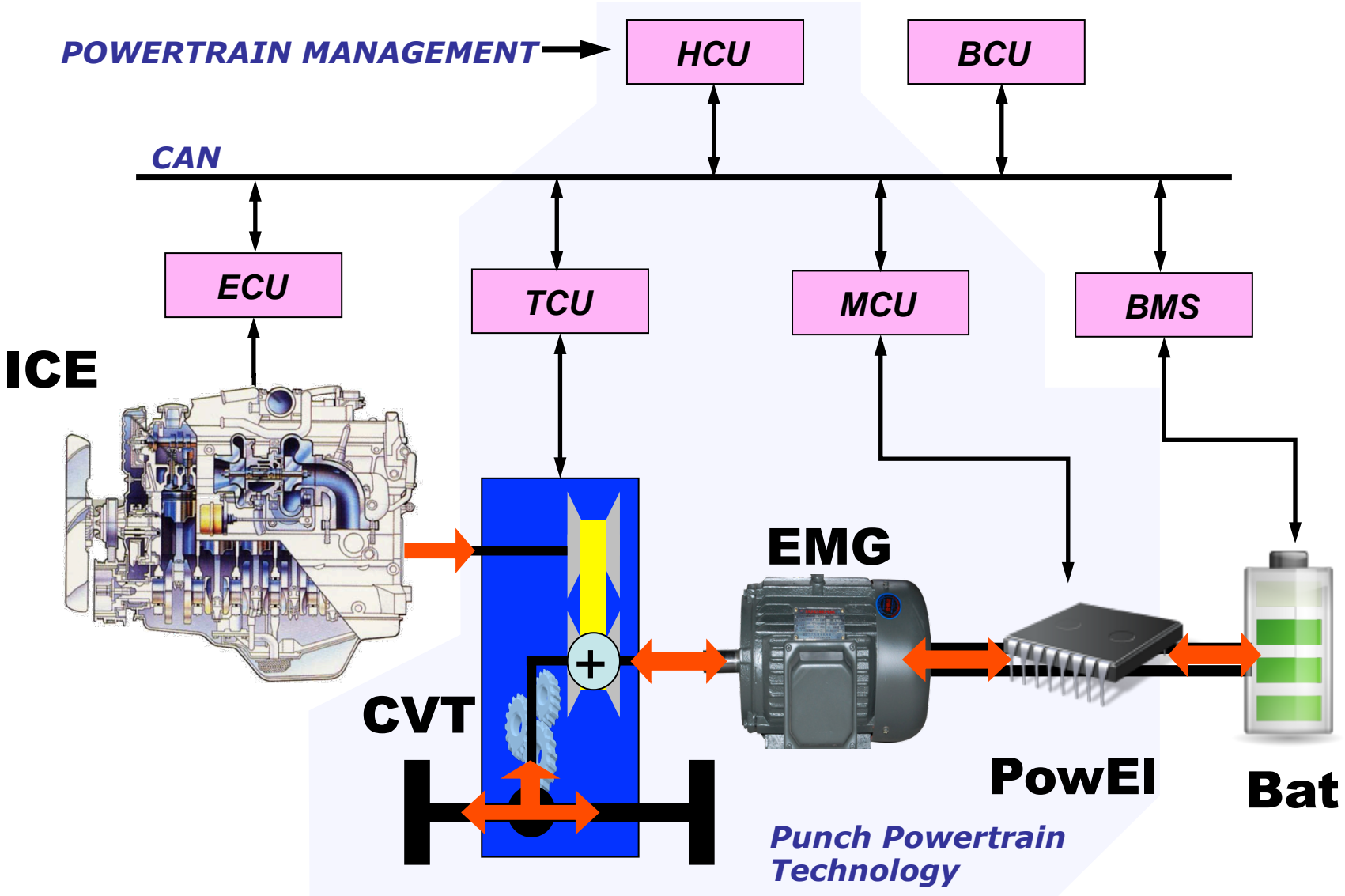
Independent supplier of

- CVTs
- Hybrid powertrains
- Electric powertrains

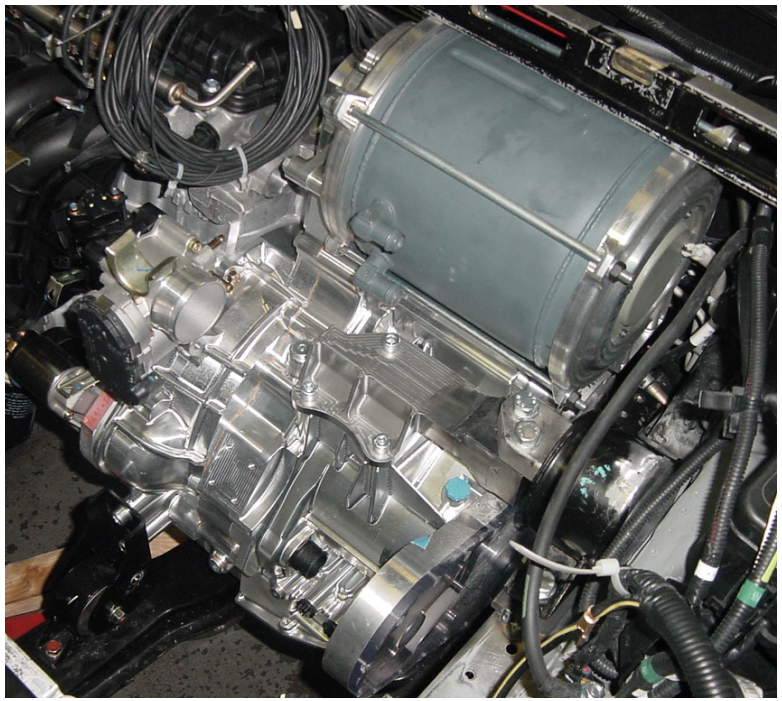
Key technologies

- CVT
- Hybrid controls
- Switched reluctance motors incl. power electronics

Hybrid Concept



Hybrid Concept Main Features

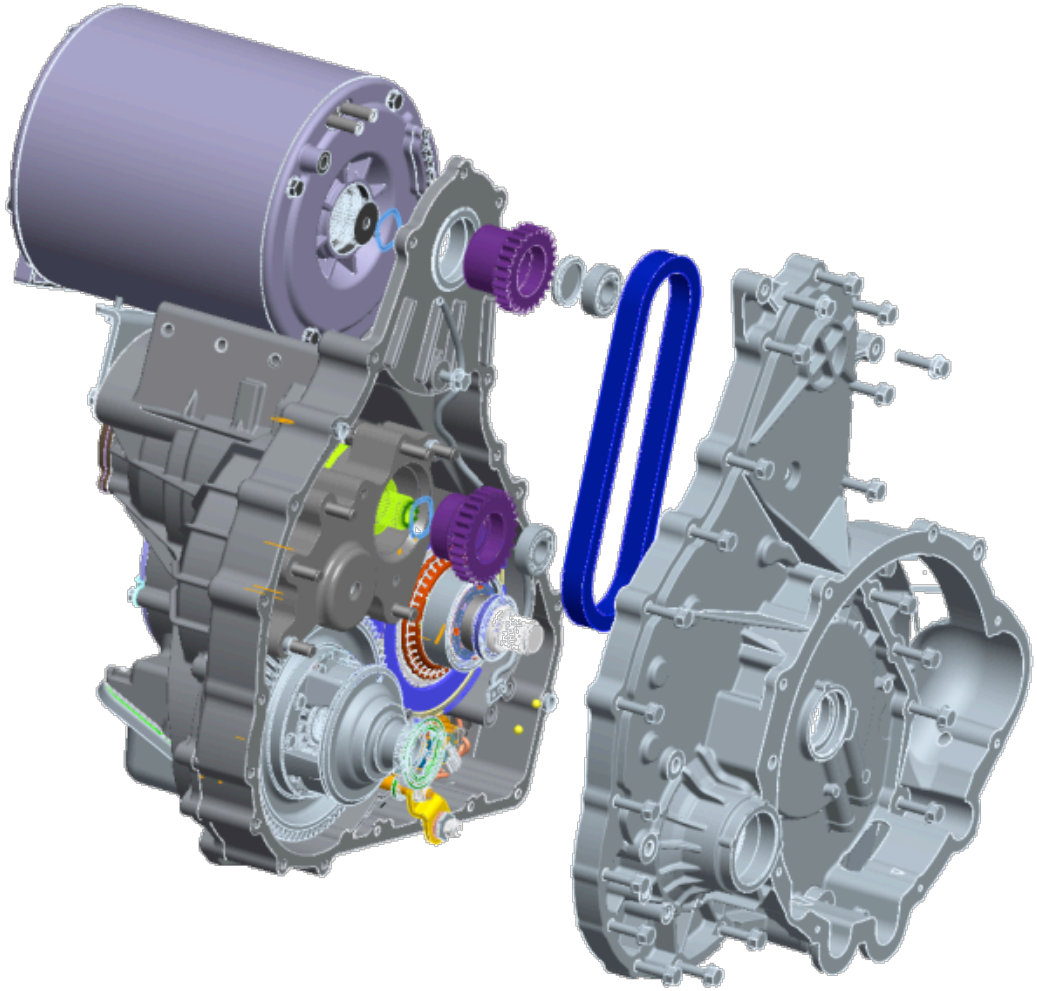


High efficiciency:

- Motor in POST position
- CVT allows in depth optimisation for efficiency
- Robust strategy developed

⇨ Fuel saving potential for charge sustaining > 25%

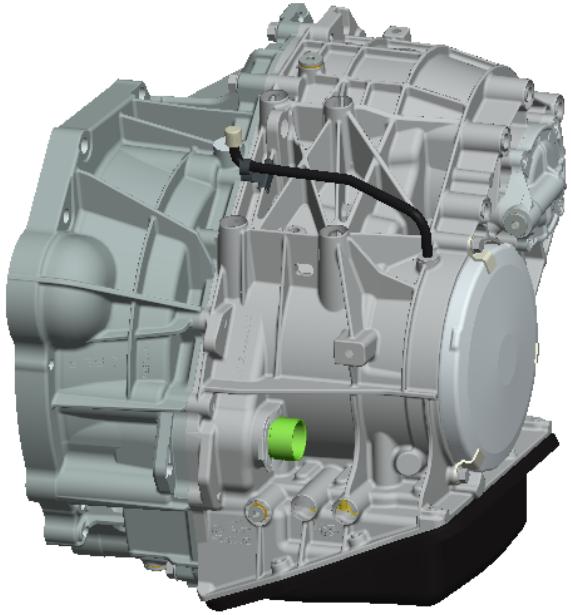
Hybrid Concept Main Features

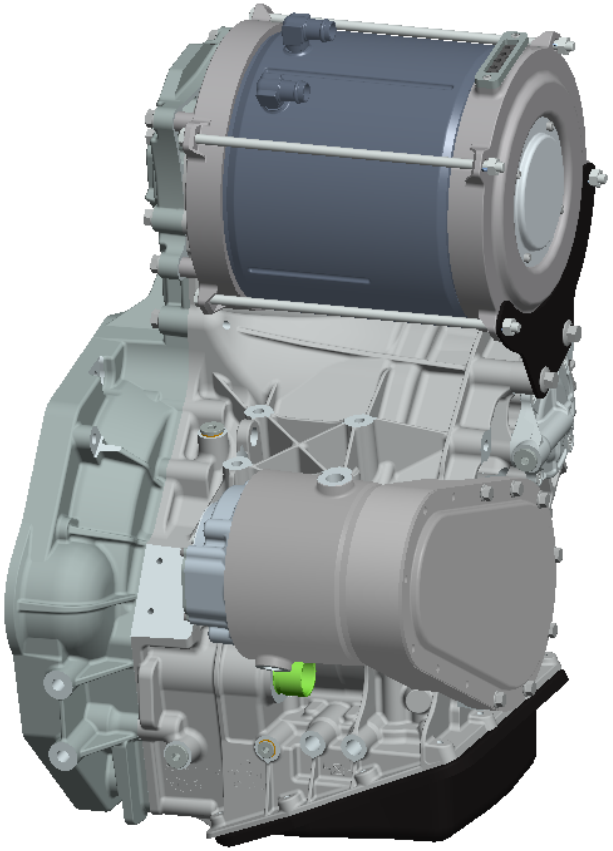


Relative low cost:

- Integration of electric motor by chain
- Carry over of many standard VT2 parts
- Switched reluctance motor (no PM)

VT2 Component Carry Over

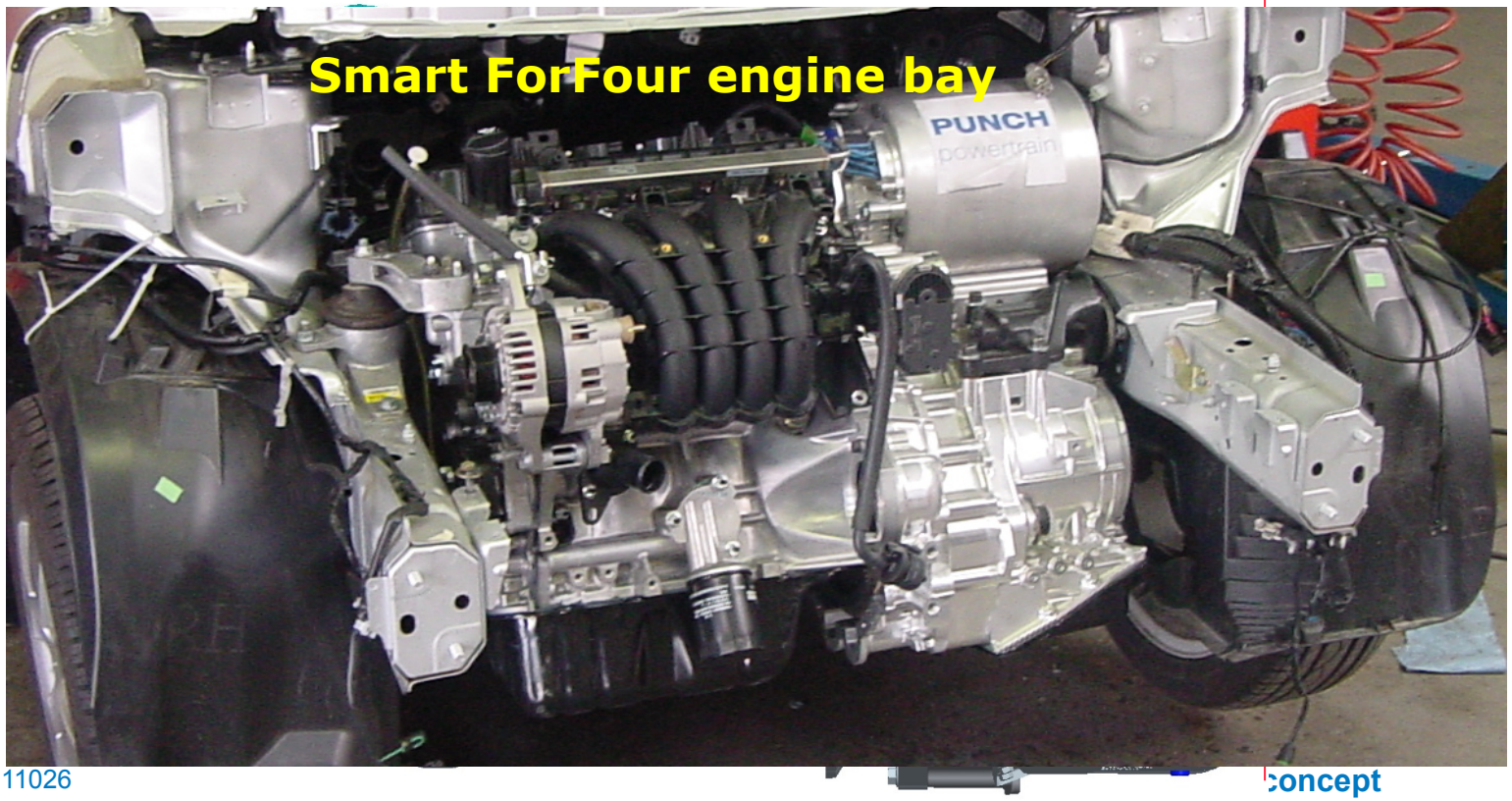




Hybrid Concept Main Features

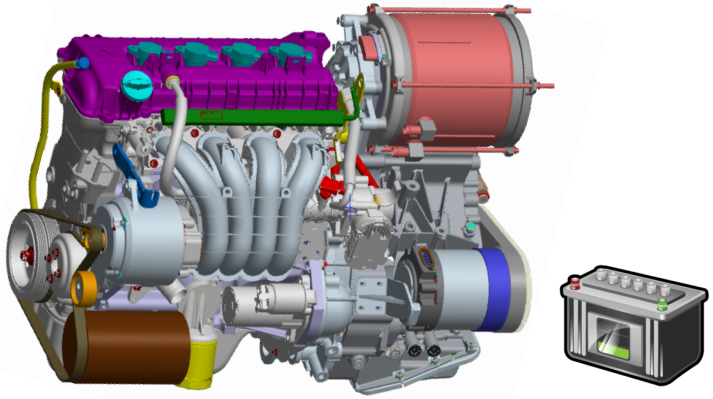
Straightforward vehicle integration:

- Minimal changes in the engine bay
- Powertrain length = identical to non-hybrid
- Powertrain height = identical to non-hybrid

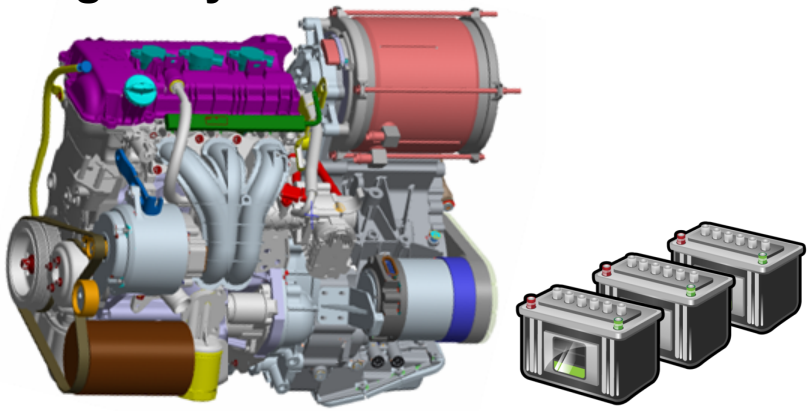


Hybrid Concept Main Features

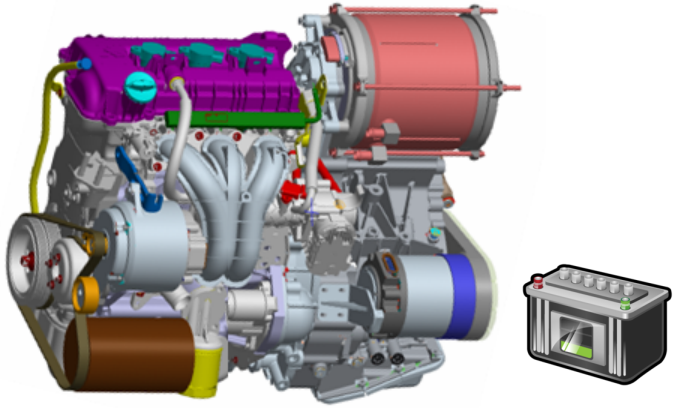
Power hybrid 20-25% / 3kWh / 30 kW



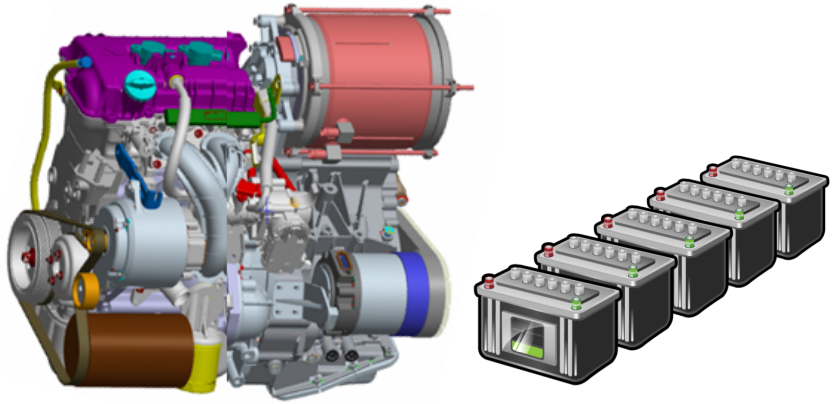
Plug-in hybrid / 6-10 kWh / 45 kW



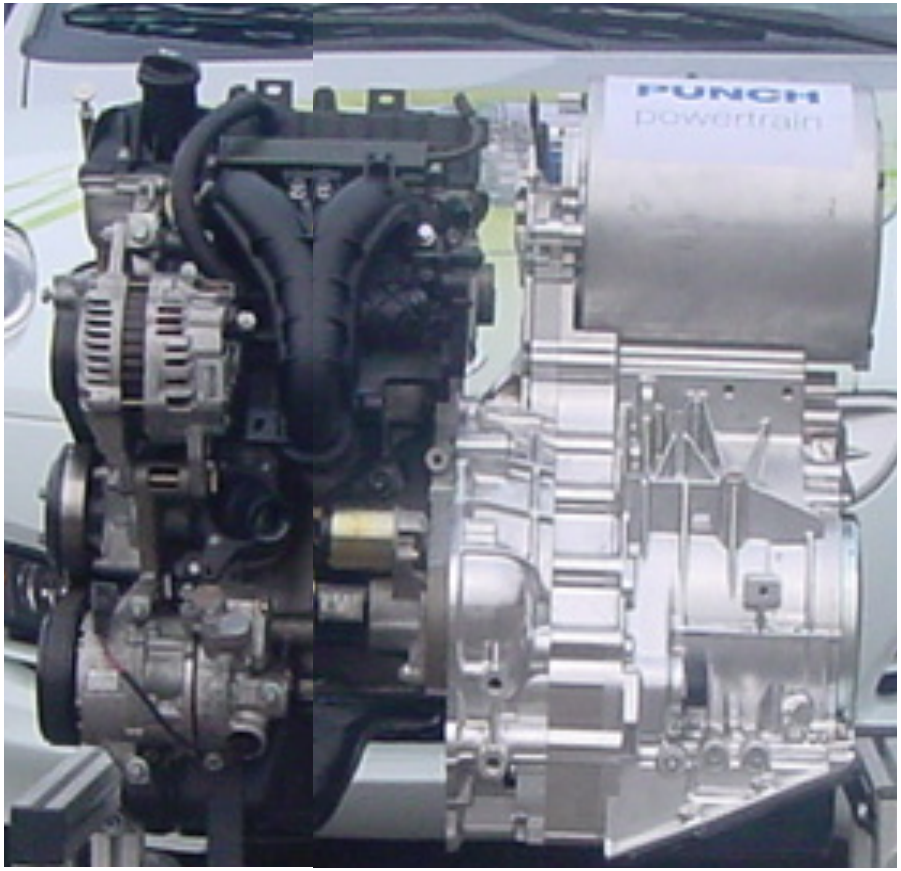
Economy hybrid 25-30% / 3kWh / 30 kW



Range extender / >12kWh / 45-60 kW



Range Extender Configuration



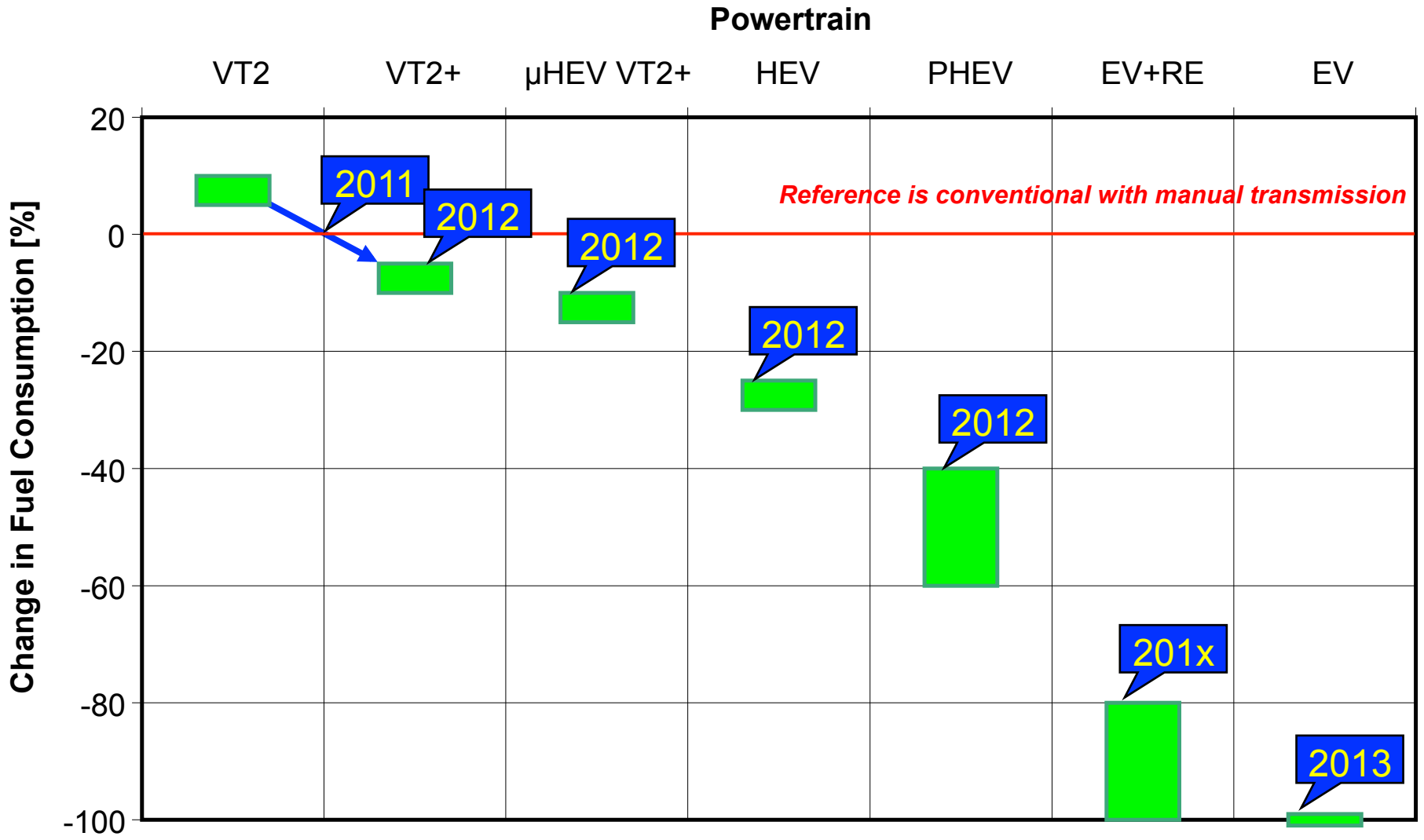
- Motor 45-60 kW
- Engine 2-3 cylinder
- Battery size is range specific

- Boosting capability due to parallel configuration

Range Extender Configuration

Subsystem	Configuration	
	Parallel	***Series***
Fuel consumption as range extender	Series is 6% to 16% higher than parallel	
Traction Motor	30 kW nominal, 60 kW peak (matched to generator power)	
Engine	1 liter gasoline engine, approx. 55 kW peak	
Generator	None	30 kW nominal, peak matching the engine
Transmission	Standard automotive CVT	Single ratio reduction gearbox

Powertrain Range and Roll-out Timing



Conclusions

- Punch Powertrain offers a complete range of fuel efficient powertrains for passenger cars.
- This complete range is based on a limited range of subsystems (transmissions, motors, …)
- This range addresses current as well as future needs of vehicle constructors and vehicle users.

Thank you for your attention!