



Addressing a Complete Hybrid Configuration Range with a Single Concept

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Contents

- Introduction Punch Powertrain
- Hybrid concept
- Hybrid concept main features
- Range extender configuration
- Powertrain range and roll-out timing
- Conclusion

Introduction Punch Powertrain

Independant developer and producer of powertrain solutions

Punch Powertrain mother company in Belgium

- R & D
- Application projects
- Manufacturing of complete CVTs
- Manufacturing of key components (pulleys & hydraulic control block)



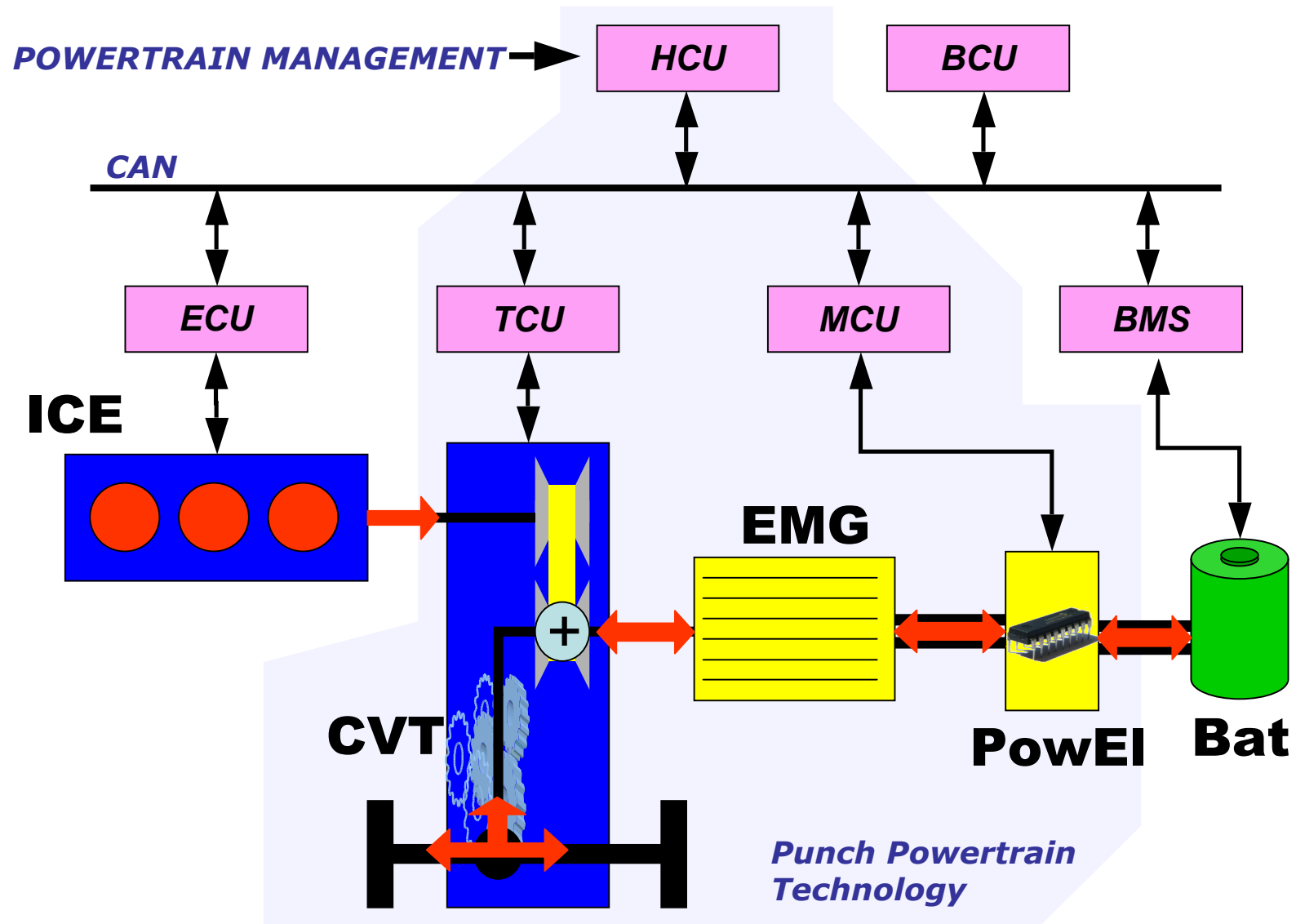
Introduction Punch Powertrain

Punch Powertrain – Nanjing

- 100% owned by Punch Powertrain Belgium
- Manufacturing of complete CVTs
- Operational since mid 2008
- Already 9 customers in China, 12 in total



Hybrid Concept



Hybrid Concept Main Features

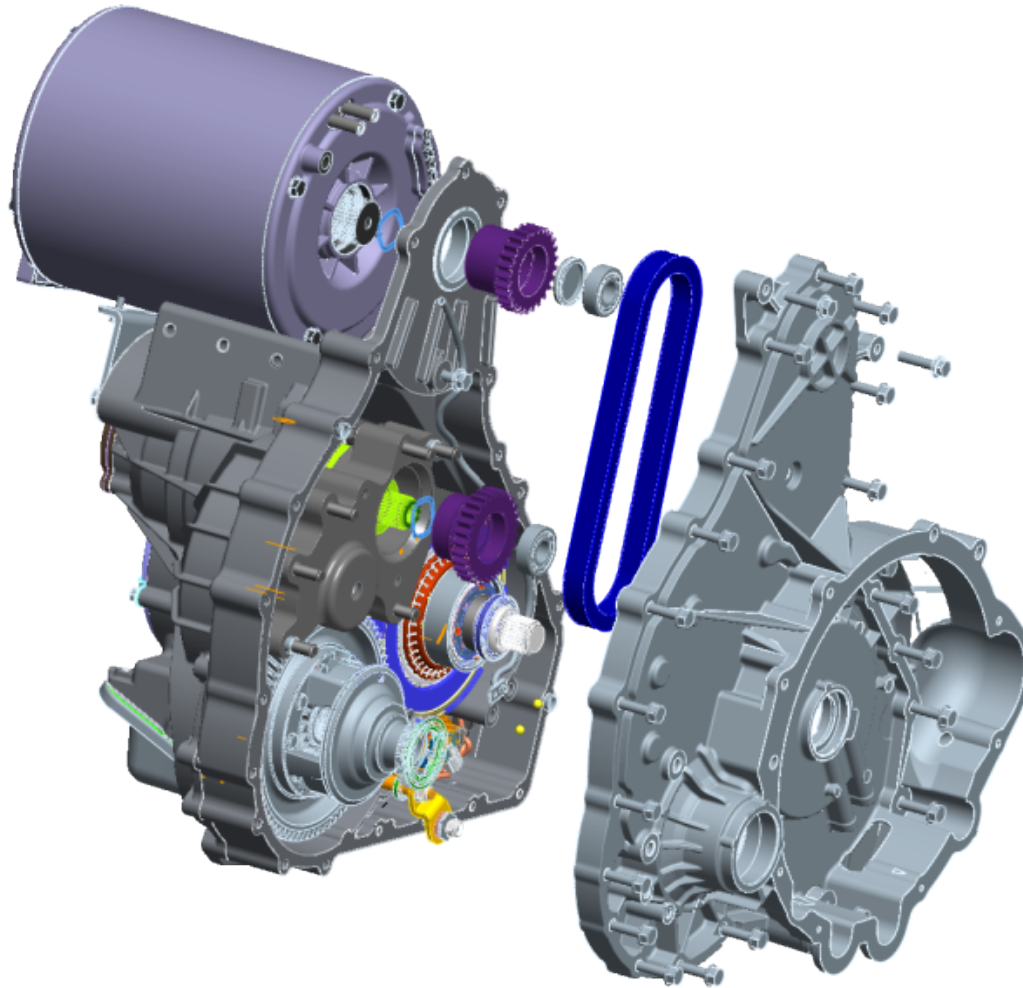


High efficiency:

- 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



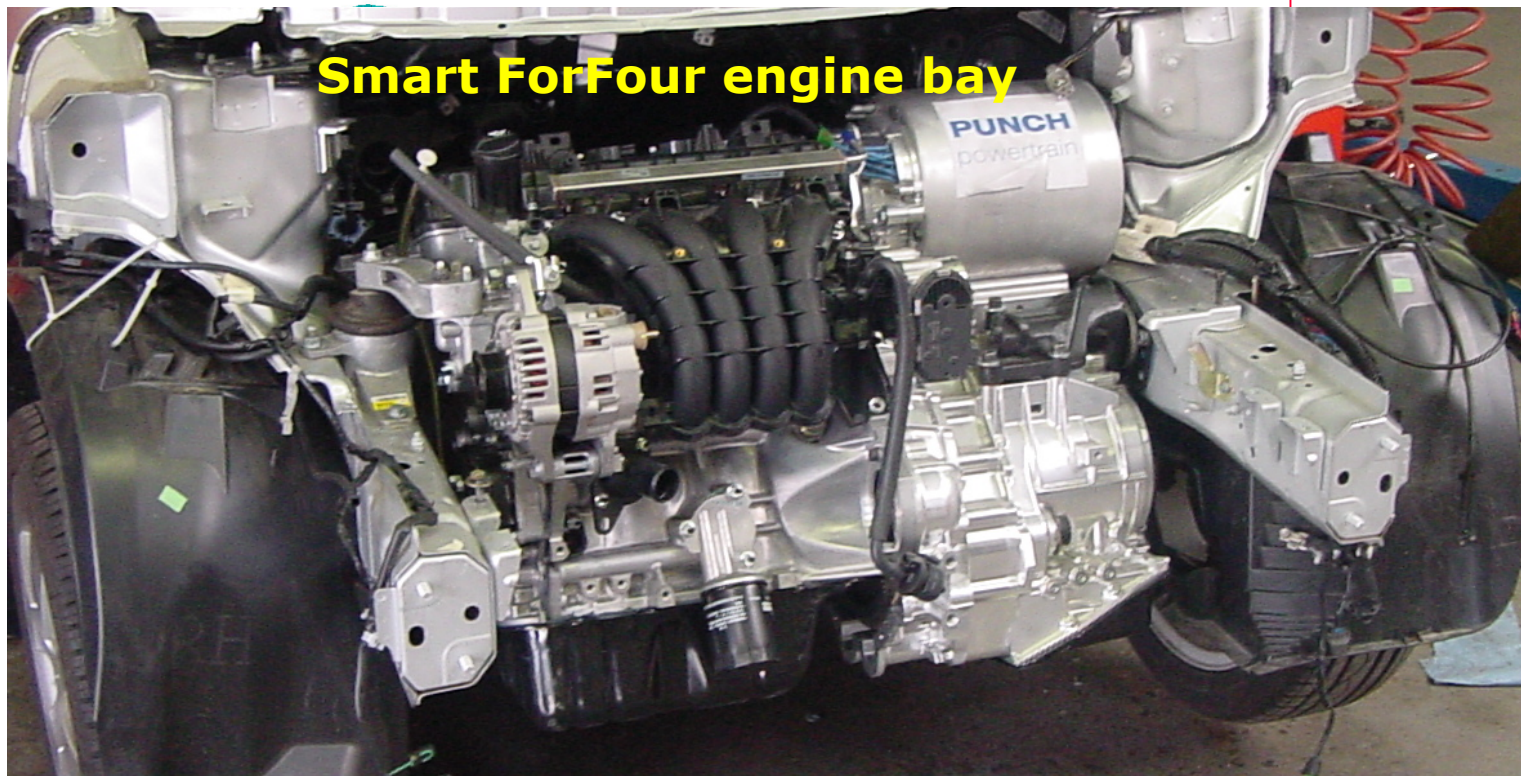
Relative low cost:

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

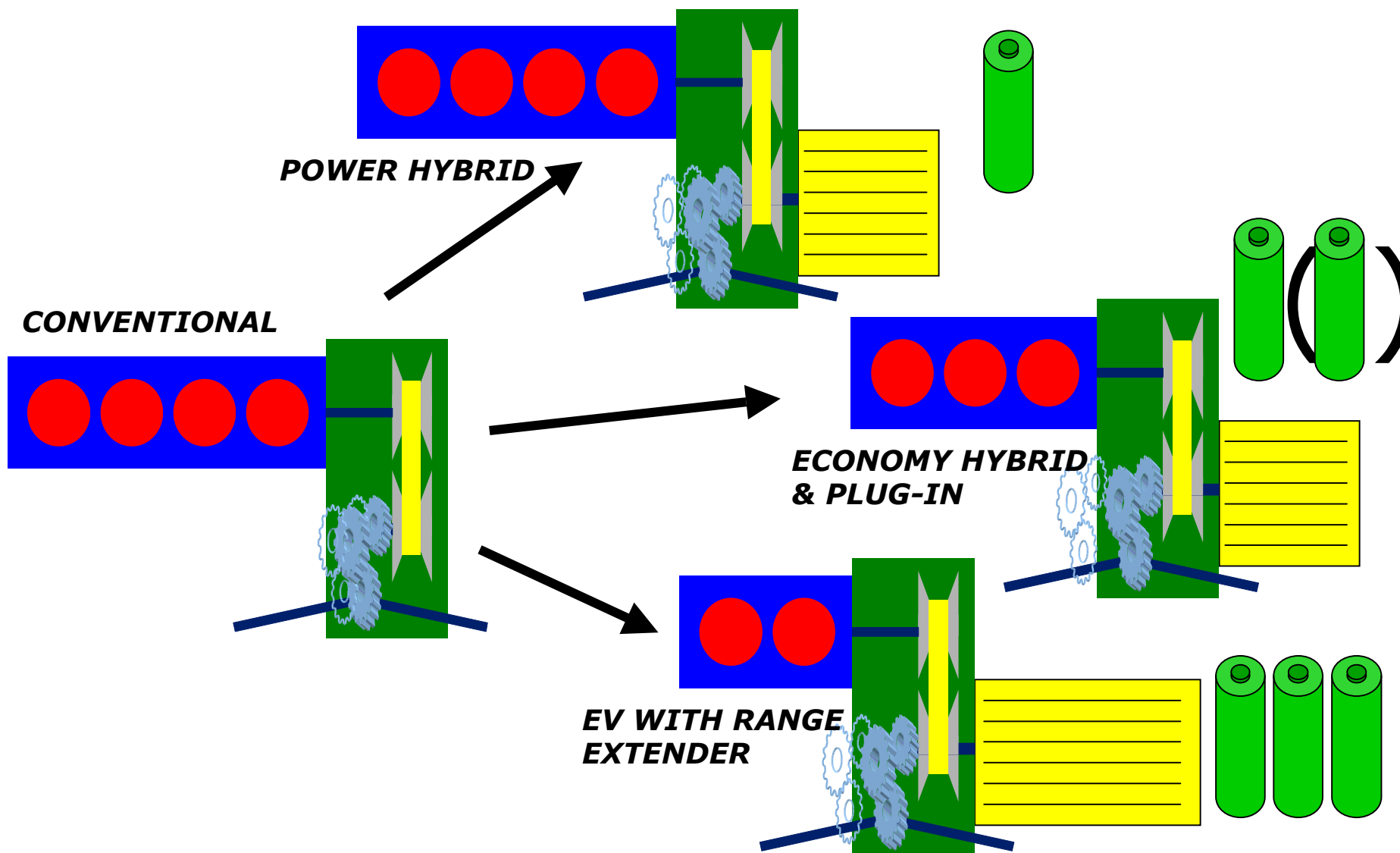
Hybrid Concept Main Features

Straightforward vehicle integration:

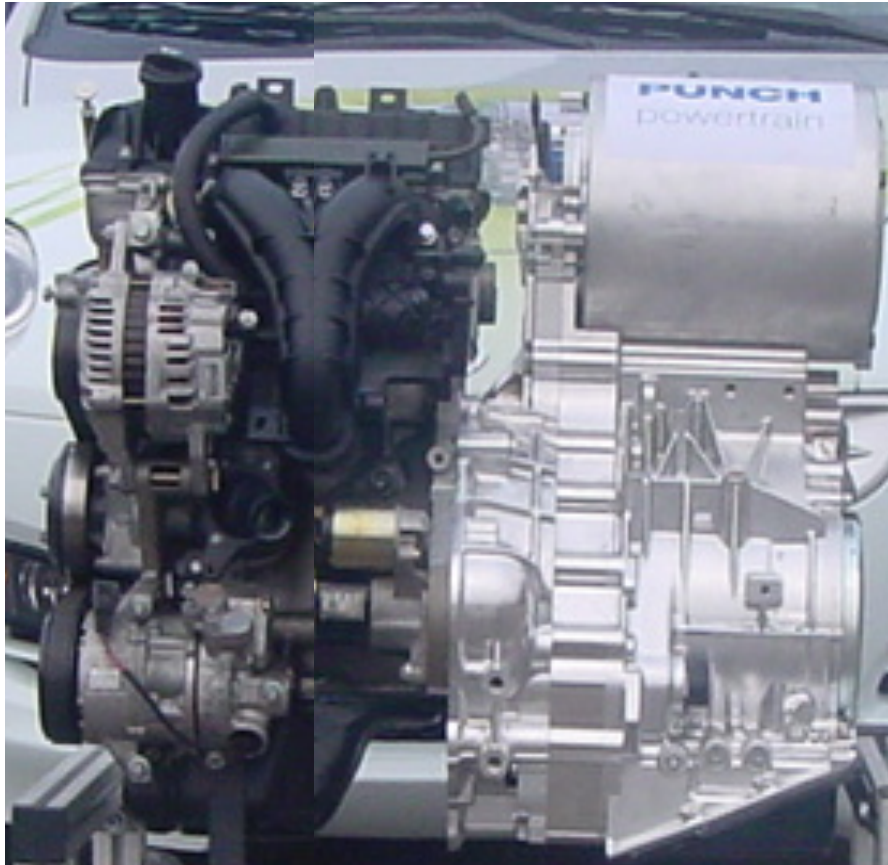
- Minimal changes in the engine bay
- Powertrain length = identical to non-hybrid
- Powertrain height = identical to non-hybrid



Hybrid Concept Main Features



Range Extender Configuration

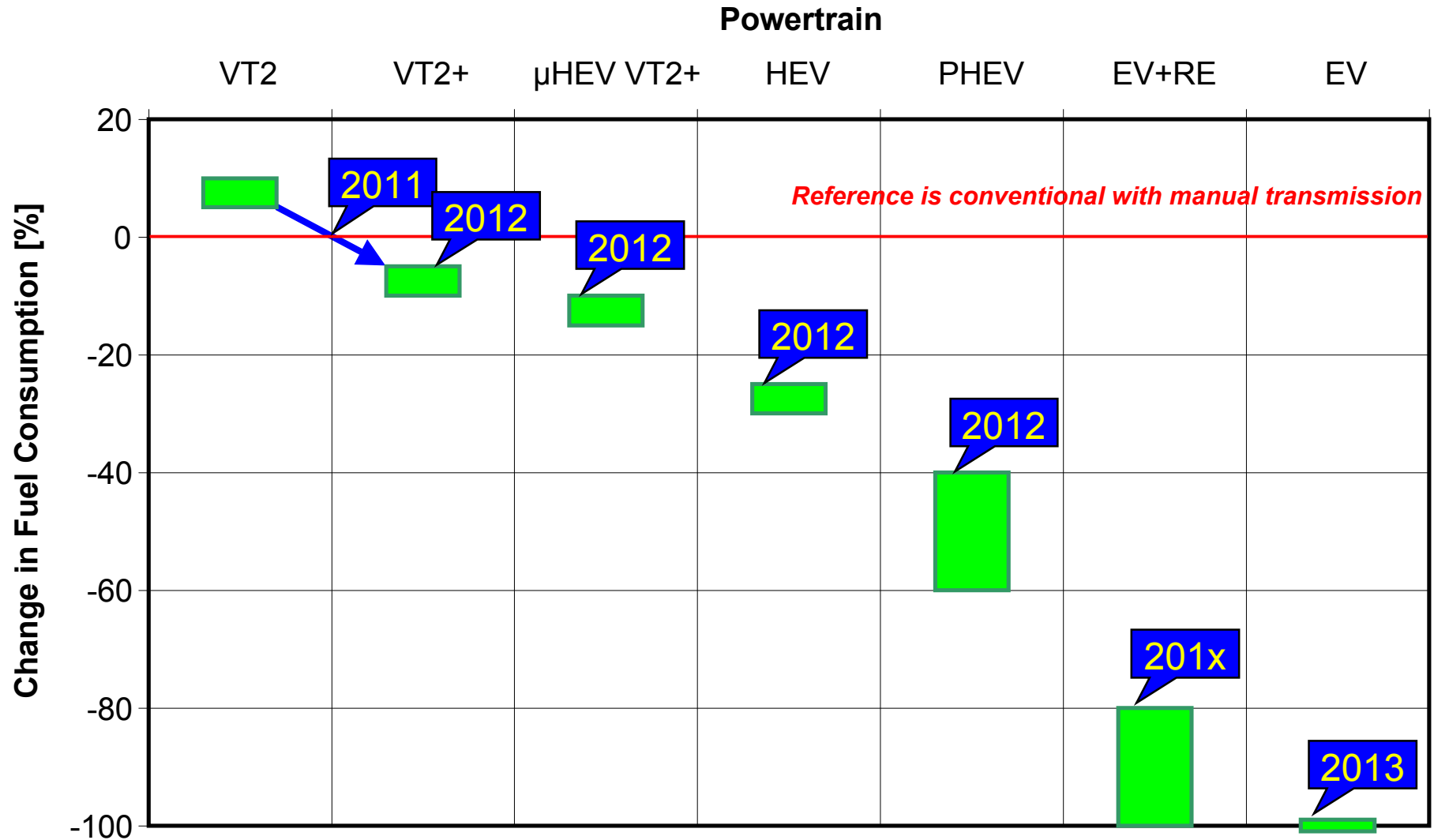


- Motor 45-60 kW
- Engine 2-3 cylinder
- Battery size is range specific
- Boosting capability due to parallel configuration

Range Extender Configuration

Subsystem	Configuration	
	<i>Parallel</i>	<i>Series</i>
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!