Georgia Tech Clean Energy Series
Advancing Electric Vehicle and Plug-in Hybrid Rollout
2014 Panamera S E-Hybrid

- Combustion engine: 333 hp
- Electric motor: 95 hp
- Combined max. output: 416 hp
- 0-60 mph: 5.2 sec. | 0-100 kph: 5.5 sec.
- Top track speed: 167 mph (270 kph)
- Top speed, electric-only: 84 mph (135 kph)
2014 Panamera S E-Hybrid

- Supercharged V6 engine
- On Board Charger
- Lithium-ion Battery
- Hybrid module incl. electric motor
- High Voltage Cabling
- Charge Port
- Power Electronics

Advancing Electric Vehicle and Plug-in Hybrid Rollout
2014 Panamera S E-Hybrid

- Transition between efficiency range (focus on driving with electric power) and driving with combustion engine
- Transition between recuperative braking (charge) and mechanical braking
- Ignition on (ready)
- Ignition off
- Transition between driving with combustion engine and boost with electric support
- Focus: driving with combustion engine
- Boosting
- Additional variable pressure point
- Pressure point kick-down

Advancing Electric Vehicle and Plug-in Hybrid Rollout
2014 Panamera S E-Hybrid

- E-Power (default on startup)
- Full Parallel Hybrid
- E-Charge
- Sport
- Sport Plus (optional)
2014 Panamera S E-Hybrid

- Type: Lithium-Ion
- Capacity: 9.4 kWh
- Output: 70 kW norm, 120 kW boost (10 sec.)
- 104 prismatic cells, 24.5 Ah each
- Dimensions: 17.5” x 31.3” x 9.8” (445mm x 795mm x 249mm)
- Weight*: 298 lbs. (135 kg)

*Includes battery management and housing
2015 918 Spyder

- Empty Weight: 1634 kg
- Top Track Speed: 343 kph
- Top Electric Speed: 149 kph
- Acceleration 0-100 kph: 2.6 sec.
- NEDC Fuel Economy: 3.3 to 3.0 l/100km
- CO₂ Emmisions: 79-70 g/km
- Electric Range: 16-31 km
- Power Consumption: 12.7 kWh/100 km
2015 918 Spyder

Front Wheel Drive

Front Power Electronics

On-board Charger

Rear Power Electronics

Hybrid Module

Cabin Heater

A/C Compressor

High Voltage Battery

Advancing Electric Vehicle and Plug-in Hybrid Rollout
2015 918 Spyder

- High-rev Combustion Engine
- Fuel Tank
- Hybrid Module
- Front Wheel Drive
- Front Power Electronics
- High Voltage Battery
- 7-speed Double Clutch Gearbox
2015 918 Spyder

Porsche Active Aerodynamics with three settings for specific purposes

- **Efficiency**: Minimum drag for lower fuel consumption
- **Speed**: Balanced drag for downforce and high driving stability
- **Performance**: Maximum downforce for best possible lap times
2015 918 Spyder

High Temperature Cooling Circuit
(Combustion Engine)

Oil Cooling Circuit
(Combustion Engine)

Medium Temperature Cooling Circuit
(Electrical Motors, Power Electronics)

Low Temperature Cooling Circuit
(HV Battery, Onboard Charger)
2015 918 Spyder

Front Axle Drive - Key Facts

- $P_{\text{max}}$ 95 kW @ $V_{\text{nominal}} = 380$ V
- $M_{\text{max}}$ 210 Nm @ $I_{\text{max,INV}} = 400$ A
- Stator dimensions:
  - Diameter 180 mm x length 120 mm
- 3 shaft transmission
- Overall ratio = 7.5:1
- E-Motor mechanically disconnected at 265 km/h
- Weight ~48 kg incl. water jacket and mounting
2015 918 Spyder

Hybrid Module - Key Facts

- $P_{\text{max}}$ 115 kW @ $V_{\text{nominal}} = 380$ V
- $M_{\text{max}}$ 375 Nm @ $I_{\text{max,INV}} = 420$ A
- x-length = 180 mm (incl. torque damper)
- x-length = 164 mm (length without torque damper)
- Weight: ~48 kg, torque damper ~7 kg
- Decoupler with hydraulic actuation
- Liquid cooled (Medium Temperature Circuit) and air cooled
2015 918 Spyder

High Voltage Battery - Key Facts

- Design: Parallel-Series 3 x 104 cells
- High output EV cells used
- Useful energy content: 5.4 kWh
- Nominal energy content: 6.8 kWh
- Max. possible power output: 230 kW
- 2 Separate outputs for front and rear drives
- Liquid cooled by separate circuit of A/C system (Low Temperature Circuit)
- Temperature range: -30 °C to + 55 °C
- CFRP Housing
## 2015 918 Spyder

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<tr>
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<td>Maximum Race Track Performance for One Lap Only</td>
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</table>
| **Drive-strategy** | • Default on startup  
• Range >30 km  
• Vmax 150 kph | • Either combustion engine or electric motors in operation  
• Optimised fuel economy | • Combustion engine always in operation  
• Electric motors for electric boost | • Combustion engine always in operation  
• Max. electric boost | • Combustion engine always in operation  
• Max. electric boost up to SOC min |
Thank you!