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Part-time EVs with full-time benefits: why plug-in hybrids are better than their reputation suggests

Plug-in hybrids have repeatedly been subject to criticism: too complex, too heavy, not sustainable enough. We provide clear answers to critical questions.

Are PHEVs just a transitional technology until fully electric vehicles become clearly cheaper or achieve suitable range for everyday driving?
Plug-in hybrids are not a transitional technology but a useful complement to the model portfolio and meaningful contribution to sustainable mobility due to a greater diversity in the customers' usage patterns. For many commuters, PHEV models can be the ideal solution for locally emission-free driving, because many daily routes can be covered in fully electric mode and thus with zero local emissions. Thanks to external charging points at home or at work, customers can travel many of their weekly routes strictly powered by electricity. In addition, PHEV models are suitable for long-distance driving thanks to their gasoline engines. Due to evolutionary leaps in battery capacities and powertrain management, electrical range has clearly increased in recent years.

Are you offering the large number of PHEV models only due to the tax breaks and government funding support currently provided to customers?
Tax breaks can be a purchasing incentive but are not the only decisive factor in many cases. Especially private customers consciously opt for sustainability and thus for a PHEV model because they want to drive with zero local emissions and have access to suitable charging points, too. As company cars, plug-in hybrids are always the perfect choice when the user profile – such as for back office employees – tends to emphasize short-distance travel, firmly defined commuting or intra-urban routes, in other words, daily commutes between the business premises and the customers. However, modern diesel models are clearly first choice for very high annual mileages.

Shouldn't the battery be larger and the IC engine smaller instead?
In designing the concepts for the PHEV powertrains, Audi relies on "right sizing" and smart powertrain management, using either a four-cylinder or a six-cylinder TFSI engine, depending on the type and size of vehicle. Together with the powerful electric motor and efficient propulsion and recuperation management, low consumption levels can be achieved in this way. Measured

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against typical customer profiles, the achievable electrical range of 40 to 50 kilometers provides a perfect compromise. When the IC engine is used after all, the V6 is the suitable unit to support low overall consumption in real-life operation for larger and heavier models such as an A8* or Q7* and a four-cylinder engine for the Q5*, A6* and A7* models.

In reality, don't PHEVs often consume more fuel than cars with IC engines?
Consumption may vary greatly, depending on the user profile. This is the case with PHEV models as well. PHEVs are intended for use by commuters. Due to their powertrain concept, they are able to display their benefits and operate with zero local emissions especially on short distances, on commuter routes and in urban areas. Audi's PHEV models, with their sophisticated powertrain management, are designed for optimum efficiency. The powertrain management system includes information such as route profile, sensor data and route characteristics in order to maximize efficiency. In addition, PHEV models, especially in urban driving such as in stop-and-go traffic, can operate in all-electric mode and thus achieve significant efficiency advantages. The recuperation capacity and the PEA and POS efficiency programs assist in this. Audi takes advantage of these conceptual benefits and has put particular emphasis on extensive electrical driving in urban operation.

Aren't real-world consumption levels much higher than those according to the WLTP?
The WLTP procedure intends to deliver more realistic consumption measurements than the previous NEDC method. In the WLTP measurement procedure, a PHEV must be driven several times. It starts with a full battery and then the cycle is repeated until the battery is empty. The last cycle is driven with an empty battery and thus only with energy from the IC engine and recuperation energy. Using this multi-stage measurement, it is possible to determine fuel consumption and CO_2 emissions as well as electrical range and overall range. Subsequently, the reportable CO_2 level is calculated by determining the ratio between electrical range and overall range. Audi equips its PHEV models with a complex operating strategy enabling long electrical driving stages and high energy efficiency especially in real-world driving.

PHEV models are not suitable for everyday driving ...
In developing its PHEV models, offering a by and large unimpaired availability of space and high variability is important to Audi. The trunk volumes of PHEV models are slightly smaller than those of conventional models: the Audi A6 Avant TFSI now has 405 liters of trunk volume compared to the standard Avant with 565 liters. However, in the latter case, the space in the trunk recess below the trunk floor, which, on the PHEV model, is naturally occupied by the lithium-ion battery, has already been included in the calculation. For Audi, practical usability of the PHEV models is extremely important. That's why the battery has been integrated in the trunk in a way that makes for a flat, stepless trunk floor allowing for easy stowage even of bulky objects. The seatbacks of the second row continue to be foldable, too. Plus, a trailer hitch is available for all PHEV models (except for the A8*), which is an important factor particularly for SUV and Avant models. The towing capacity of the PHEV models is identical to that of the conventional models (except Audi Q5*: conventional 2,500 kg, PHEV: 1,750 kg). In addition,

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Audi's PHEV models use diverse efficiency technologies such as pre-air conditioning, a heat pump and a haptic accelerator pedal ensuring the brand's typically high levels of comfort and efficiency.

Fuel consumption of the models named
(Information on fuel consumption and CO_2 emissions as well as efficiency classes in ranges depending on the tires and alloy wheel rims used)

Audi A6 Limousine 50 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.0–1.7;
combined electric power consumption in kWh/100 km: 17.7–16.6;
combined CO_2 emissions in g/km: 46–39

Audi A6 Limousine 55 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.1–1.9;
combined electric power consumption in kWh/100 km: 17.9–17.4;
combined CO_2 emissions in g/km: 47–43

Audi A6 Avant 55 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.1–1.9;
combined electric power consumption in kWh/100 km: 18.1–17.6;
combined CO_2 emissions in g/km: 48–44

Audi A7 Sportback 50 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.1–1.8;
combined electric power consumption in kWh/100 km: 18.0–16.6;
combined CO_2 emissions in g/km: 48–40

Audi A7 Sportback 55 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.1–1.9;
combined electric power consumption in kWh/100 km: 18.1–17.5;
combined CO_2 emissions in g/km: 48–44

Audi A8 60 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.6–2.5;
combined electric power consumption in kWh/100 km: 21.2–20.8;
combined CO_2 emissions in g/km: 60–57

Audi A8 L 60 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.7–2.5;
combined electric power consumption in kWh/100 km: 21.2–20.9;
combined CO_2 emissions in g/km: 61–57

Audi Q5 50 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.2–2.0;
combined electric power consumption in kWh/100 km: 18.1;
combined CO_2 emissions in g/km: 49–46

Audi Q5 55 TFSI e quattro:
Combined fuel consumption in l/100 km: 2.2–2.1;
combined electric power consumption in kWh/100 km: 18.2–17.5;
combined CO_2 emissions in g/km: 49–46

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Audi Q7 55 TFSI e quattro:
Combined fuel consumption in l/100 km: 3.0–2.8;
combined electric power consumption in kWh/100 km: 22.4–21.9;
combined CO_2 emissions in g/km: 69–64

Audi Q7 60 TFSI e quattro:
Combined fuel consumption in l/100 km: 3.0–2.8;
combined electric power consumption in kWh/100 km: 22.9–22.2;
combined CO_2 emissions in g/km: 69–64

The indicated consumption and emissions values were determined according to the legally specified measuring methods. Since September 1, 2017, type approval for certain new vehicles has been performed in accordance with the Worldwide Harmonized Light Vehicles Test Procedure (WLTP), a more realistic test procedure for measuring fuel consumption and CO_2 emissions. Beginning September 1, 2018, the WLTP will gradually replace the New European Driving Cycle (NEDC). Due to the realistic test conditions, the fuel consumption and CO_2 emission values measured are in many cases higher than the values measured according to the NEDC. Vehicle taxation could change accordingly as of September 1, 2018. Additional information about the differences between WLTP and NEDC is available at www.audi.de/wltp.

At the moment, it is still mandatory to communicate the NEDC values. In the case of new vehicles for which type approval was performed using WLTP, the NEDC values are derived from the WLTP values. WLTP values can be provided voluntarily until their use becomes mandatory. If NEDC values are indicated as a range, they do not refer to one, specific vehicle and are not an integral element of the offer. They are provided only for the purpose of comparison between the various vehicle types. Additional equipment and accessories (attachment parts, tire size, etc.) can change relevant vehicle parameters, such as weight, rolling resistance and aerodynamics and, like weather and traffic conditions as well as individual driving style, influence a vehicle's electrical consumption, CO_2 emissions and performance figures. Fuel consumption and CO_2 emissions figures given in ranges depend on the tires/wheels used and chosen equipment level.

Further information on official fuel consumption figures and the official specific CO_2 emissions of new passenger cars can be found in the "Guide on the fuel economy, CO_2 emissions and power consumption of all new passenger car models," which is available free of charge at all sales dealerships and from DAT Deutsche Automobil Treuhand GmbH, Hellmuth-Hirth-Str. 1, 73760 Ostfildern-Scharnhausen, Germany (www.dat.de).

The Audi Group, with its brands Audi, Ducati and Lamborghini, is one of the most successful manufacturers of automobiles and motorcycles in the premium segment. It is present in more than 100 markets worldwide and produces at 16 locations in 11 countries. 100 percent subsidiaries of AUDI AG include Audi Sport GmbH (Neckarsulm, Germany), Automobili Lamborghini S.p.A. (Sant'Agata Bolognese, Italy) and Ducati Motor Holding S.p.A. (Bologna, Italy).

In 2019, the Audi Group delivered to customers about 1.845 million automobiles of the Audi brand, 8,205 sports cars of the Lamborghini brand and 53,183 motorcycles of the Ducati brand. In the 2019 fiscal year, AUDI AG achieved total revenue of € 55.7 billion and an operating profit of € 4.5 billion. At present, 90,000 people work for the company all over the world, 60,000 of them in Germany. With new models, innovative mobility offerings and other attractive services, Audi is becoming a provider of sustainable, individual premium mobility.

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