The technology that makes Subaru different: Environmental Technologies

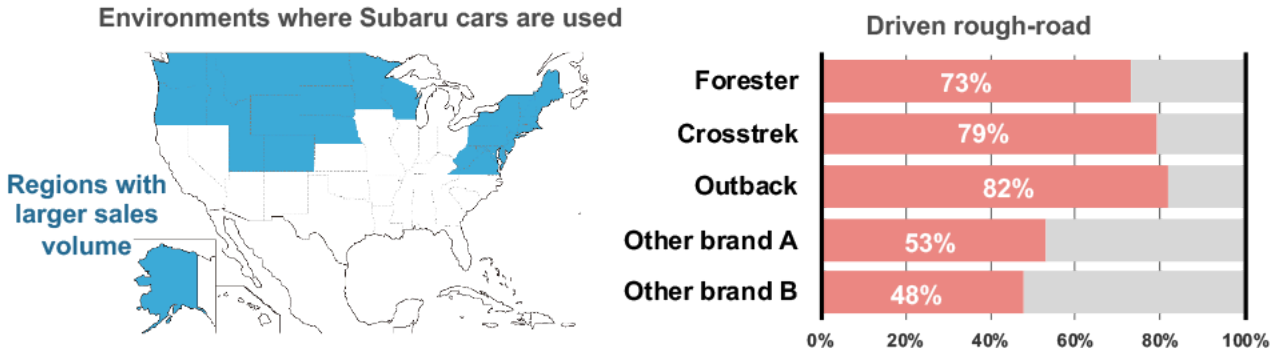
This is based on presentations at the Subaru Technology Briefing held on January 20, 2020.

Making cars both fun to drive and eco-friendly at a high level

When we surveyed US customers about what they expected from Subaru, they mentioned safety features, AWD availability, road holding in bad weather, and fun to drive.

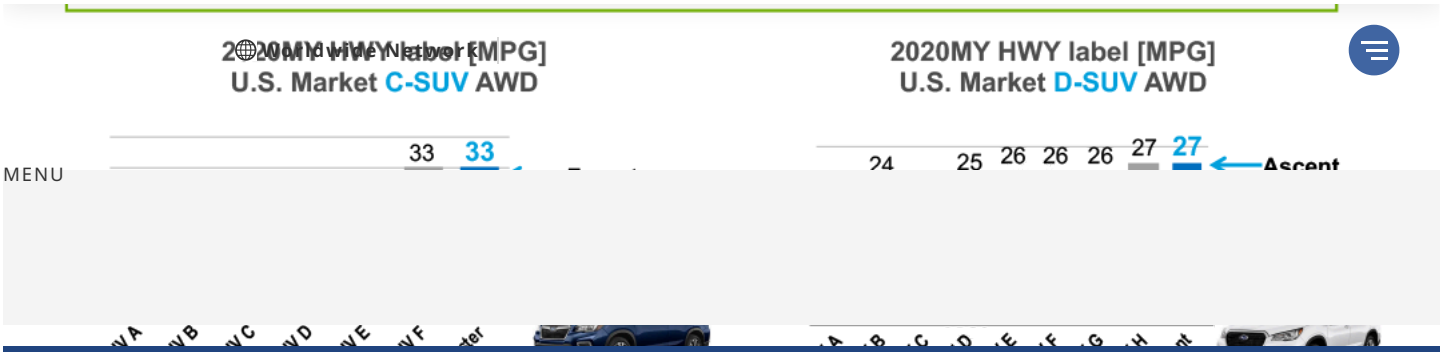
Customer expectations Survey on reasons for buying Subaru (US): what stands out compared to other brands (our in-house research)

SUBARU’s strengths ››› **Safety features / AWD availability / Stable driving in bad weather/ Fun to drive**

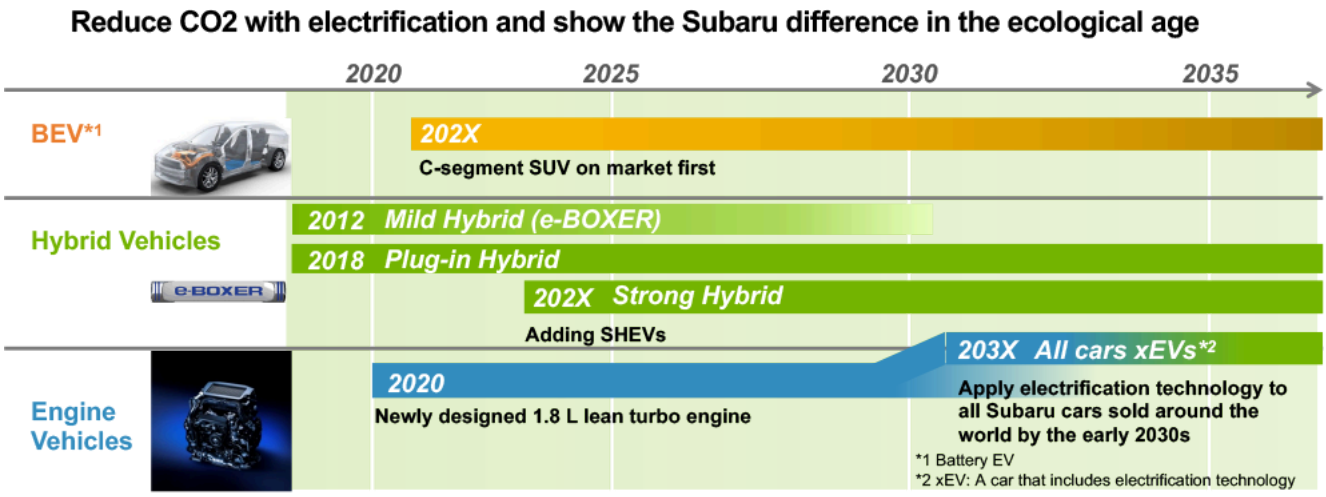


We observe that Subaru has many customers living in snowbelt regions where snow falls in winter. Also, looking at customers across the US, a high proportion of the customers drive on unpaved roads. Considering the regional climate and the way customers use their cars, it is inevitable that many customers need AWD.

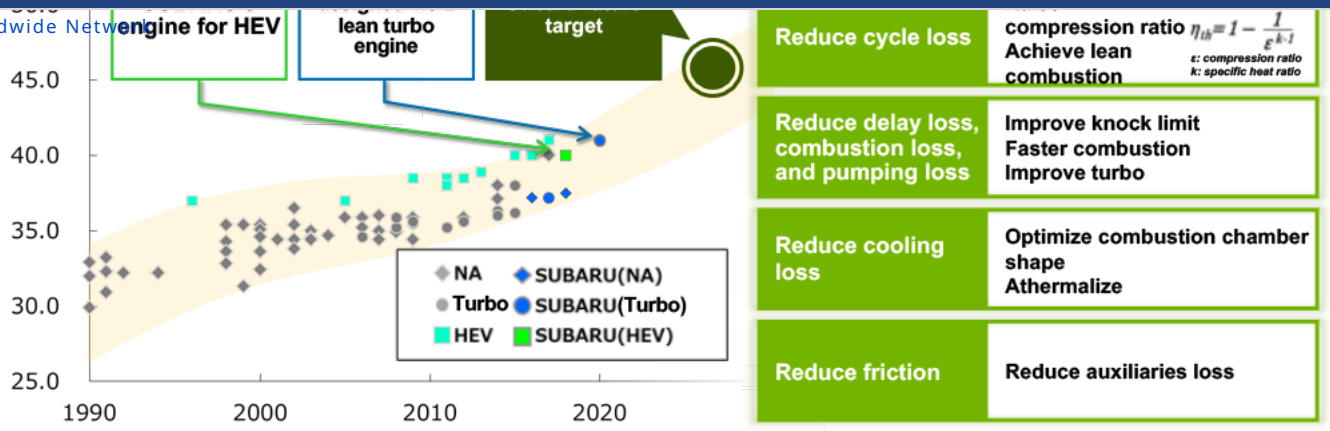
For Subaru to keep responding to our customers’ expectations, we consider that it is essential for us to offer environmentally-friendly AWD vehicles.



Technical roadmap for CO_2 reduction



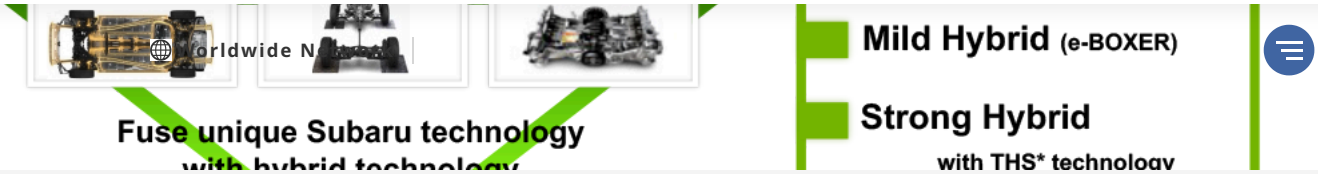
This is our technical roadmap for CO_2 reduction. First, in 2019, we announced our joint development with Toyota of a battery electric vehicle (BEV). In the early 2020s, we plan to launch a C-segment SUV. Next, for hybrid electric vehicles (HEVs), Subaru has released mild hybrids (e-Boxer) to the markets including Japan, Europe and China and also introduced a plug-in hybrid model to the North American market. In the mid-2020s, we aim to release strong hybrids based on Toyota Hybrid System (THS) technology. Then, by 2030, we plan to make BEVs and HEVs sales to account for 40 percent or more of our global sales. As for engine vehicles, in 2020, we are putting our newly designed 1.8 L lean-burn turbo engine with the new Levorg. By the early 2030s, we plan to apply some sort of electrification technologies to all Subaru vehicles produced and sold.

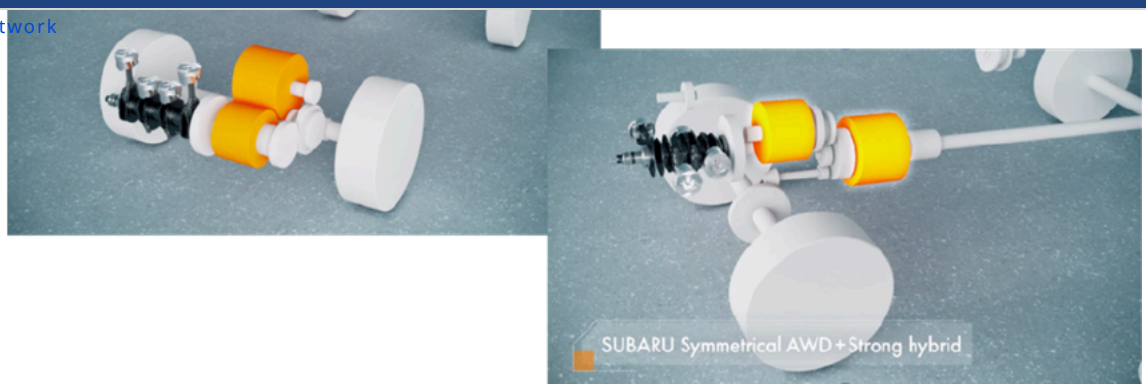


As to gasoline engines, we continue to evolve our unique technology, horizontally-opposed “Boxer” engine. By pursuing optimal combustion and reducing friction, we aim to harmonize the contradictory performances of high fuel efficiency and ample torque at a high level and we continue to develop engines suited for the ecological age.

The maximum thermal efficiency of each car maker has been rising every year. In recent years, engines for hybrids (HEVs) have been introduced and such engines have 40%-level of thermal efficiency. Subaru’s HEV engine is one of those reaching the top level of thermal efficiency, but now we are realizing even higher thermal efficiency with the newly designed 1.8L lean-burn turbo engine for the new Levorg. For the future, we aim to achieve 45% thermal efficiency by 2030 through thermal efficiency improvement of internal combustion engines by reduction of each type of loss and of friction.

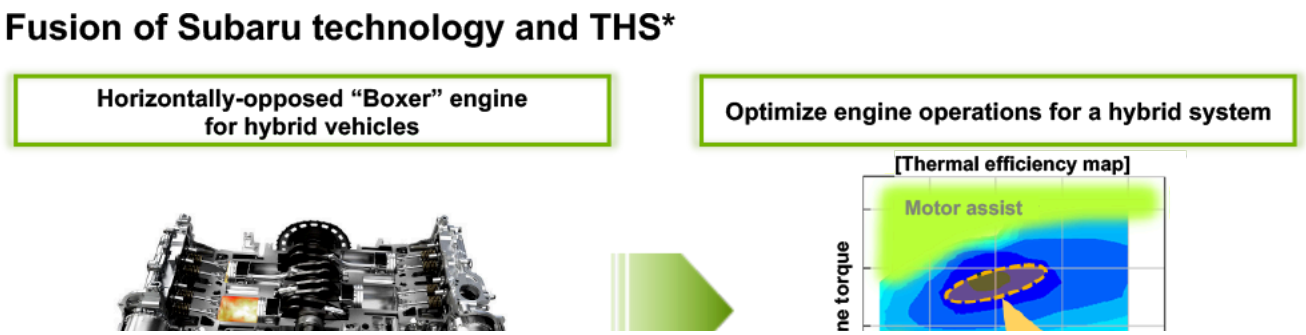
Hybrid systems of Subaru





As we go on, we are planning to fuse the core technologies of Subaru, the horizontally-opposed “Boxer” engine, symmetrical AWD, and Subaru Global Platform with Toyota Hybrid System (THS) technology. We are pursuing three approaches in this regard, with the existing Subaru e-Boxer mild hybrids, the upcoming strong hybrids incorporating THS technology, and the xEVs with which we plan to add electrification technology to all Subaru vehicles by the early 2030s, in order to materialize both fun to drive and environmental performance.

For the hybrid system combining Subaru’s unique technology with THS, we are not planning to merely carry over hybrid systems for Toyota’s Front-engine Front-drive (FF) vehicles with transversely mounted engines. We are adapting THS technology for Subaru’s longitudinal power unit and AWD and redesigning the transaxle to build a hybrid car with the Subaru difference.



design of the engine and reduce its cost.

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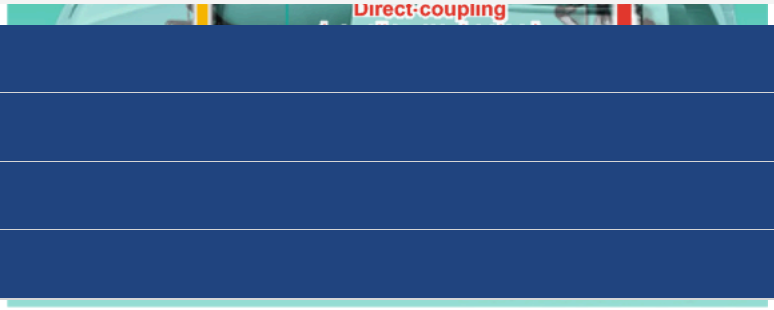
Realize both vehicle stability and regeneration efficiency by utilizing the front and rear restraint force of direct-coupling AWD



Worldwide Network

Subaru cars are commonly used in regions and usage environments that require AWD. For driving on slippery roads, such as on frozen roads in the winter, hybrid car braking regeneration needs to be safe and efficient. Regeneration with an ordinary FF car is inadequate because slippage and disturbance of vehicle behavior on roads with low μ limit the energy. Rear-motor AWD slightly improves regeneration efficiency; however, it is still inadequate because of the difficulty of using the rear tires for regeneration in terms of vehicle stability. In case of Subaru cars, front and rear tires are directly connected by the propeller shaft. This direct connecting system can maintain vehicle stability while regenerating as much energy as possible from all the wheels. As a result, they can regenerate 30 percent more energy on frozen roads compared to FF cars. Subaru’s hybrid vehicles are able to not only reduce CO_2, but also enhance safety performance, AWD performance, and driving dynamics.

Subaru electric technology (BEVs)

Honing features and driving performances that meet customers expectations

Customer expectations

Survey on reasons for buying Subaru (US)
What stands out compared to other brands
(our research)

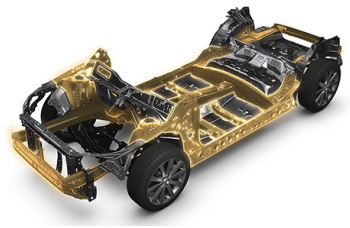
- Safety features
- AWD availability
- Road holding in bad weather
- Fun to drive

- Improved traction thanks to highly responsive motor control
- Stable handling in all kinds of driving

That’s exactly why we keep striving to make cars that consider the environment of the planet people

and protection of human life

That’s what Subaru is about, and always will be.



What Subaru has created

The technology that makes Subaru different: enjoyment and peace of mind

The technology that makes Subaru different: Environmental Technologies

Corporate Profile
Investor Relations
Sustainability&CSR
The Subaru Difference
Worldwide Network