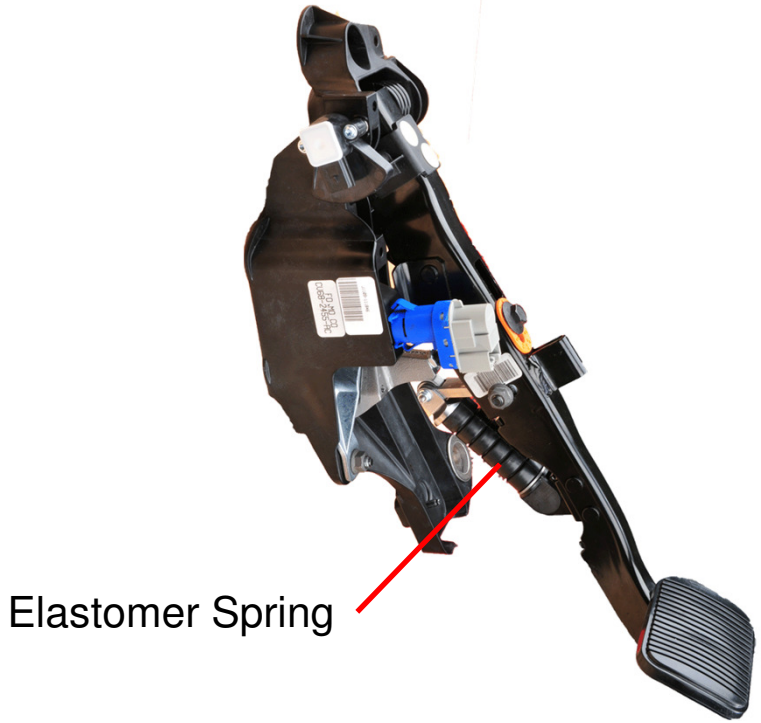
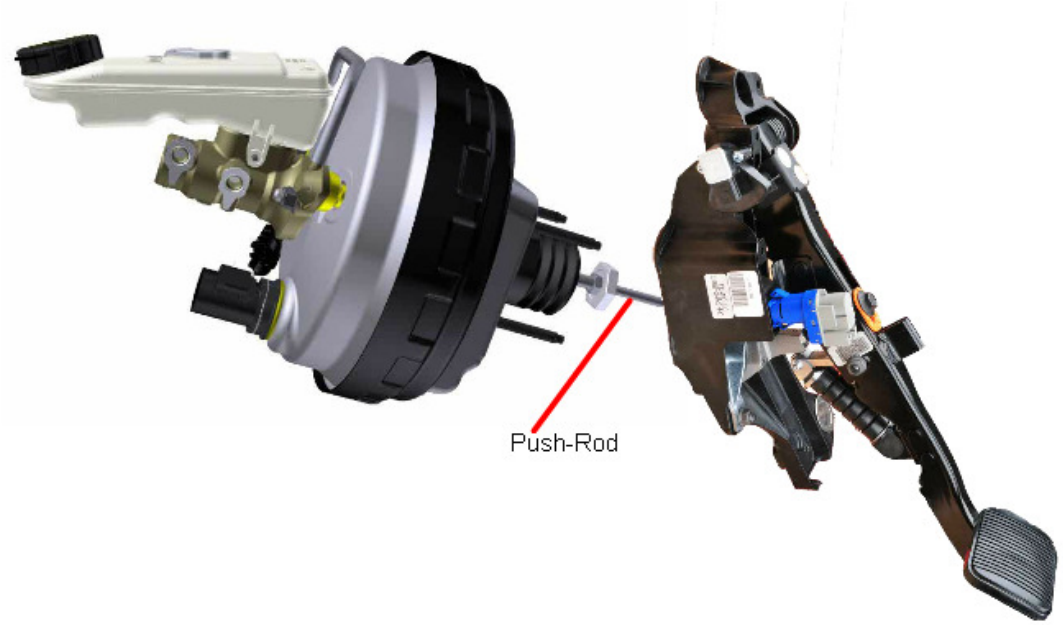
Lesson 2 Braking System

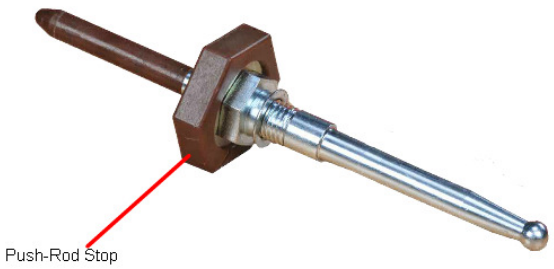
Brake Pedal Simulator



- A brake pedal simulator simulates the feel of conventional brake application.
- Resistance created by a elastomer spring
- Most braking would otherwise have no pedal feedback to the driver.

Brake Pedal Mechanical Linkage



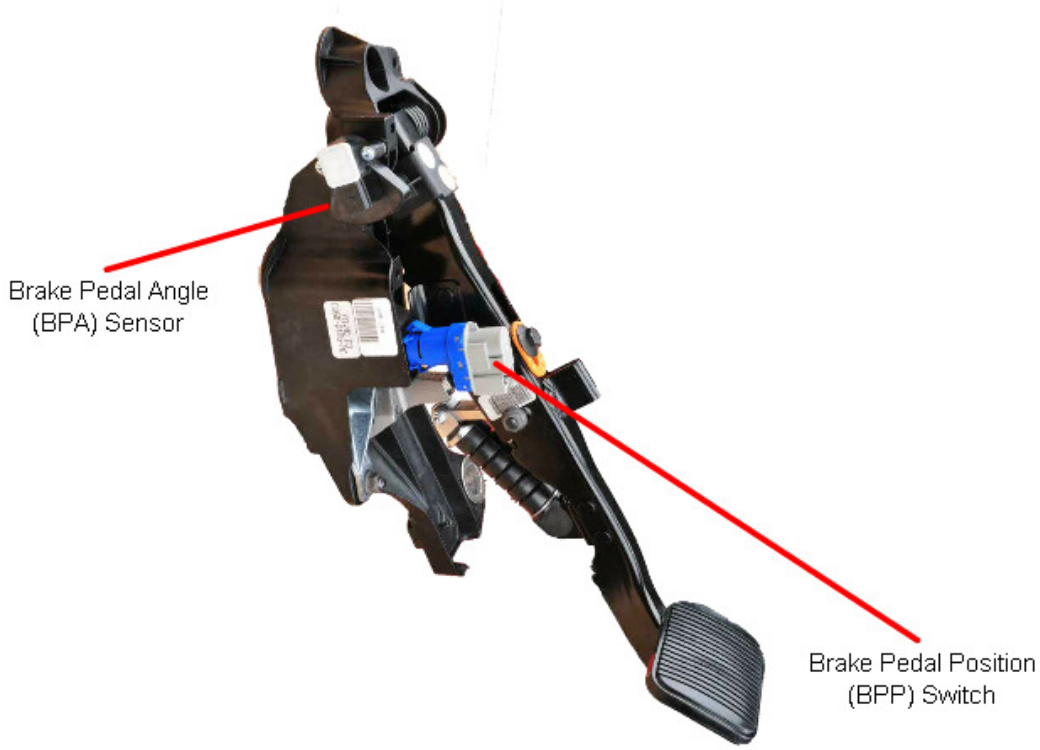


- Non-adjustable mechanical push-rod connects to the brake pedal.
- No direct connection to M/C piston during normal braking, only if a fault occurs

Active Brake Booster and Conventional Braking

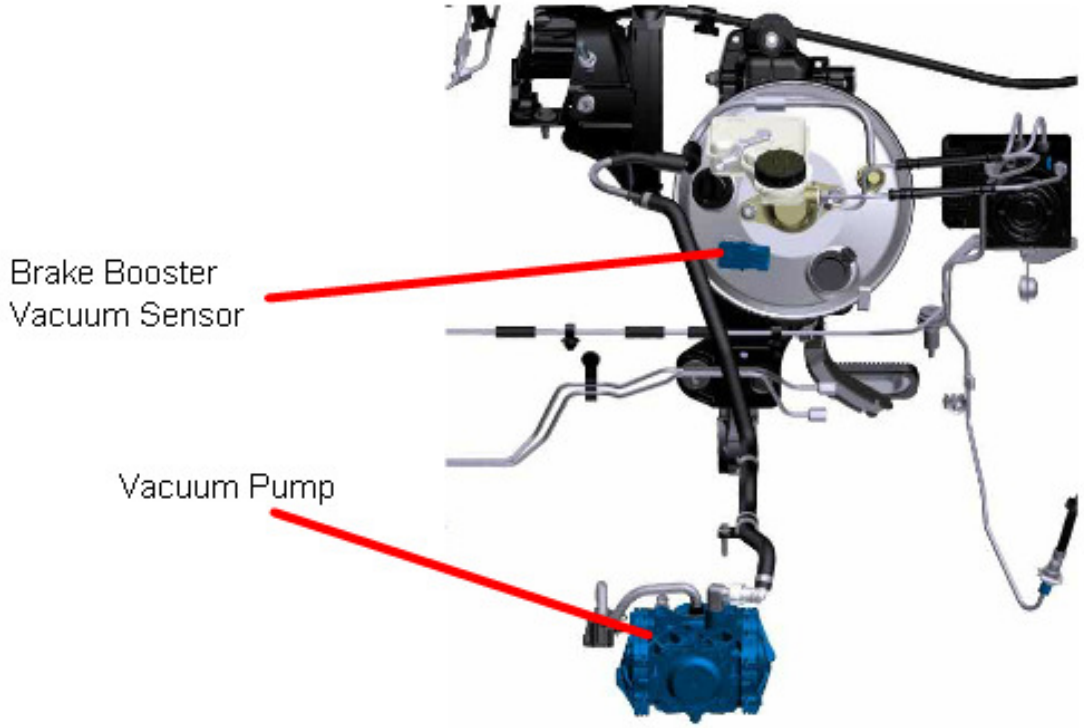
- Focus Electric uses an active brake booster
- Similar in design to other vehicles, but used for nearly all braking for Focus Electric
- An ABS controlled electrical solenoid regulates airflow on one side of booster diaphragm
- ABS controls M/C application by activating the booster solenoid
- Solenoid allows atmospheric pressure to apply the booster

Brake Pedal Sensors



- Brake Pedal Angle, or BPA sensor
- Brake Pedal Position, or BPP switch
- These sensors tell the ABS module when braking is requested

Brake Booster Vacuum Sensor

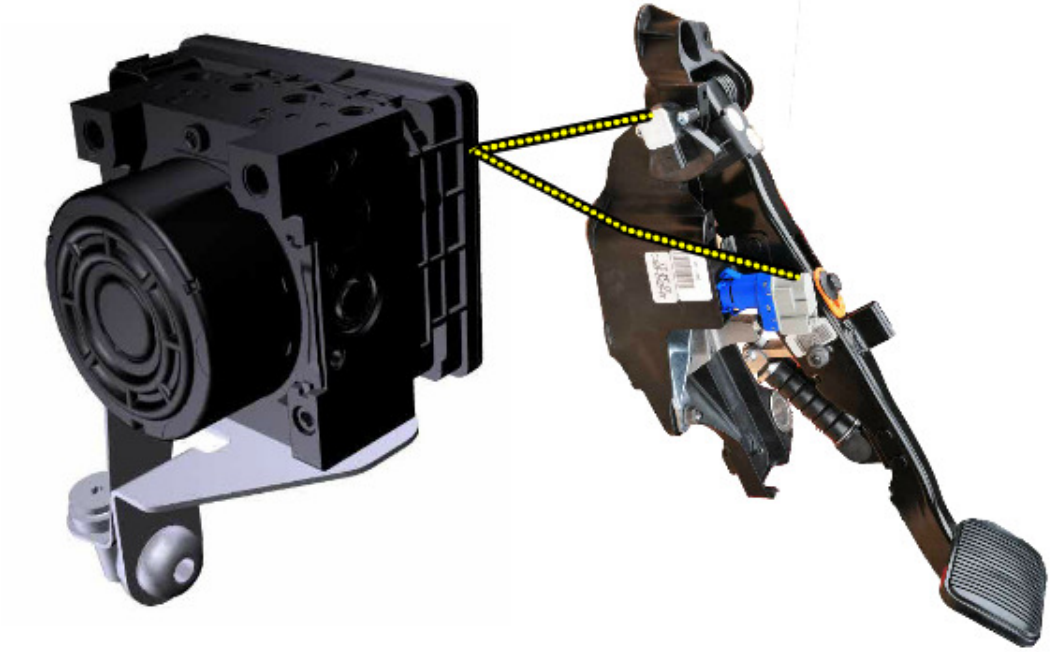


- Vacuum for active brake booster supplied by on-board vacuum pump.
- The ABS module monitors the vacuum through a brake booster vacuum sensor, mounted to the booster

Regenerative Braking

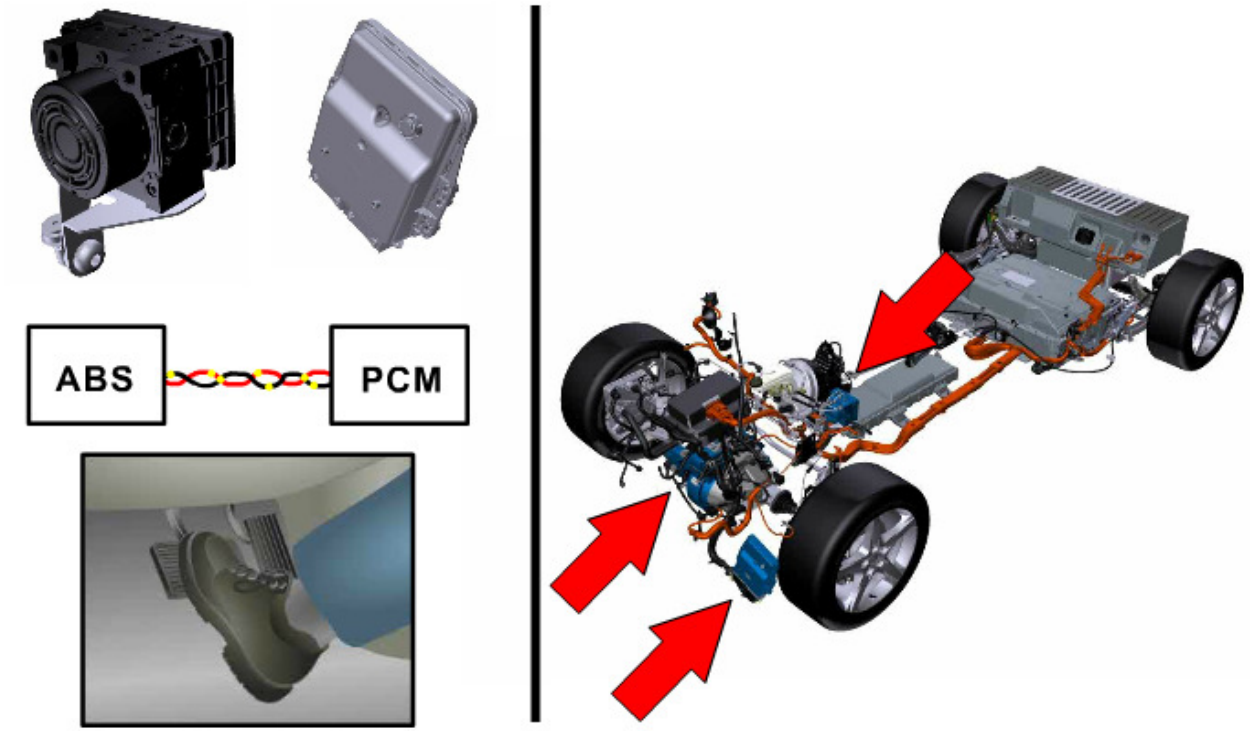
- Regenerative braking uses the traction motor as a generator
- Energy used to recharge the high voltage battery slows or stops the vehicle.

Regenerative Braking



- BPA sensor and BPP switch tell the ABS module the speed and force of application
- The ABS module uses these signals to determine if braking needs can be met by regenerative braking
- During ABS or stability assist events regenerative braking is disabled and only friction braking is used.

Regenerative Braking



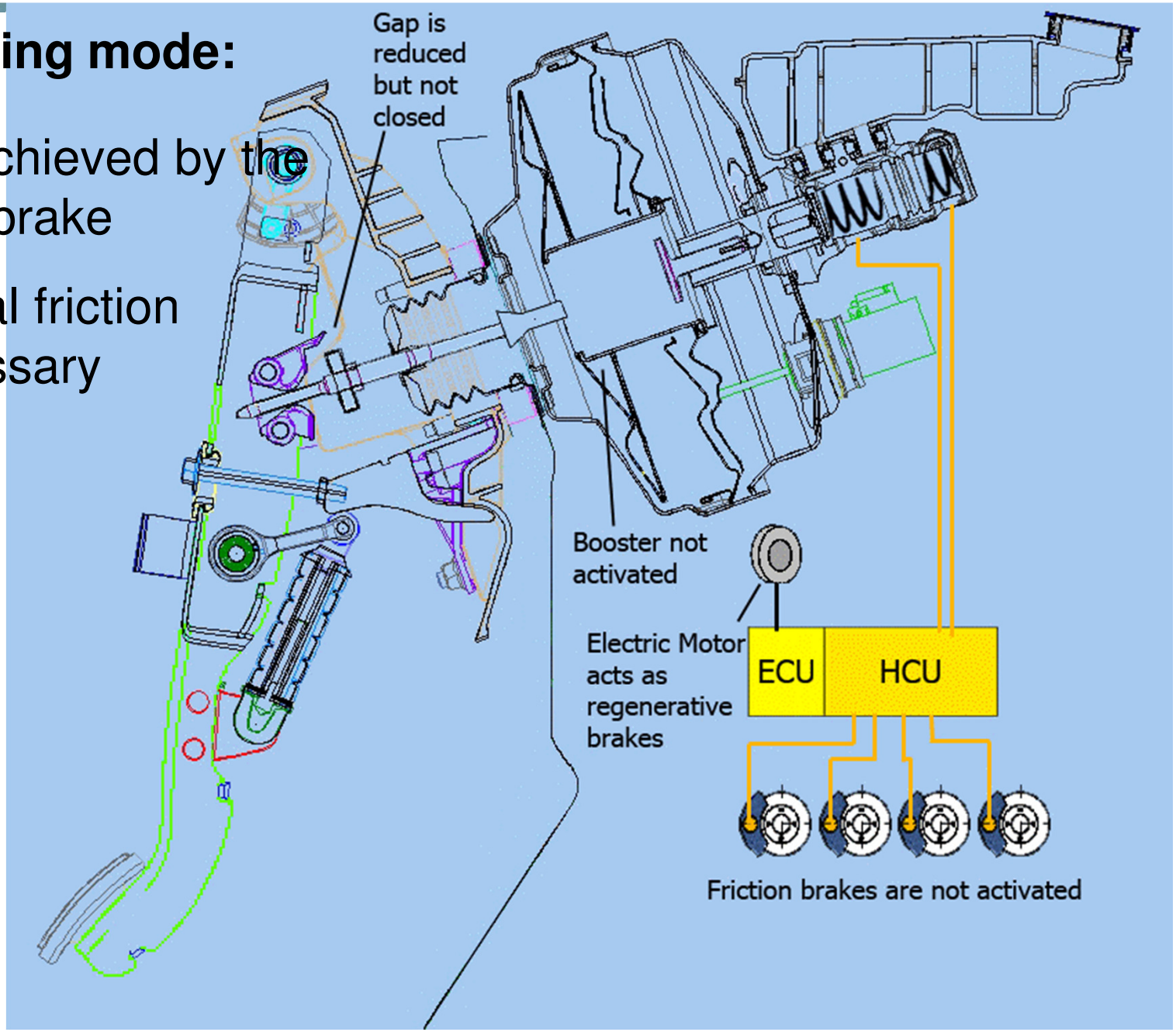
- ABS, TCM, BECM, and PCM are all involved in braking
- The PCM ultimately determines ratio of re-gen to friction brakes
- This information is transmitted back to the ABS module.

Modes of Brake Operation

- There are 4 modes of brake operation on the Focus Electric.

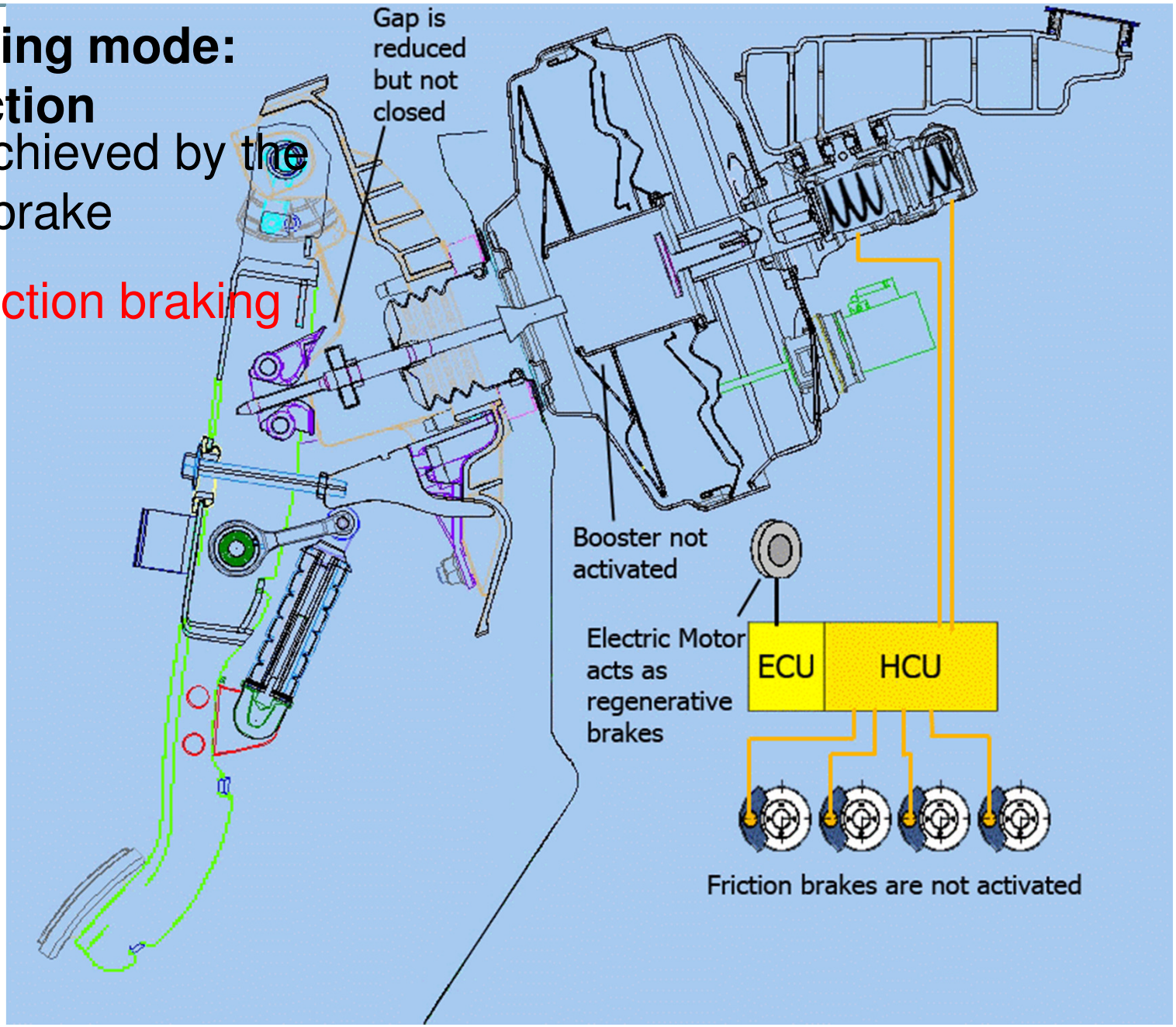
Normal working mode: Regen Only

- Braking is achieved by the regenerative brake
- No additional friction braking necessary



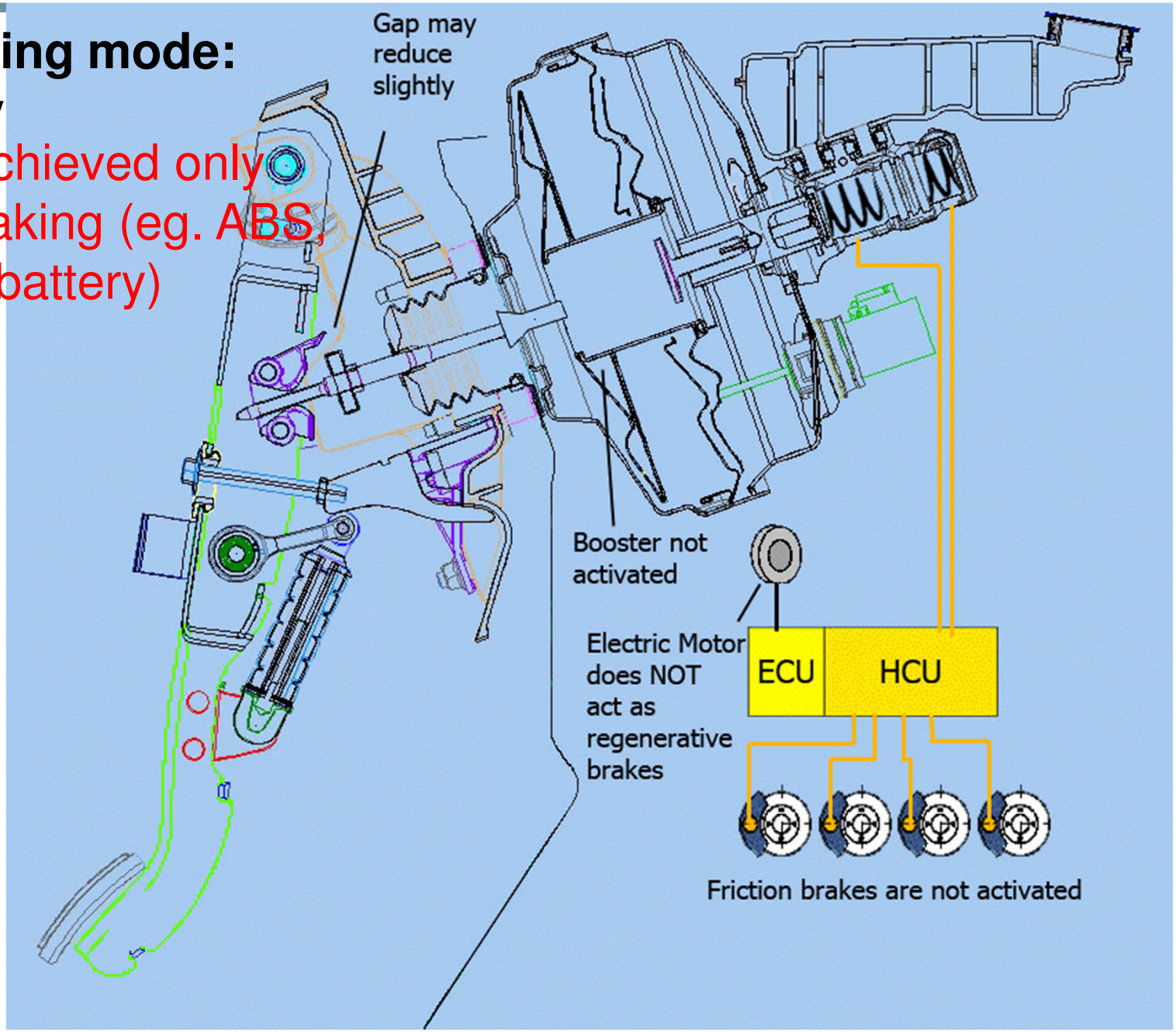
Normal working mode: Regen & Friction

- Braking is achieved by the regenerative brake
- Additional friction braking is necessary



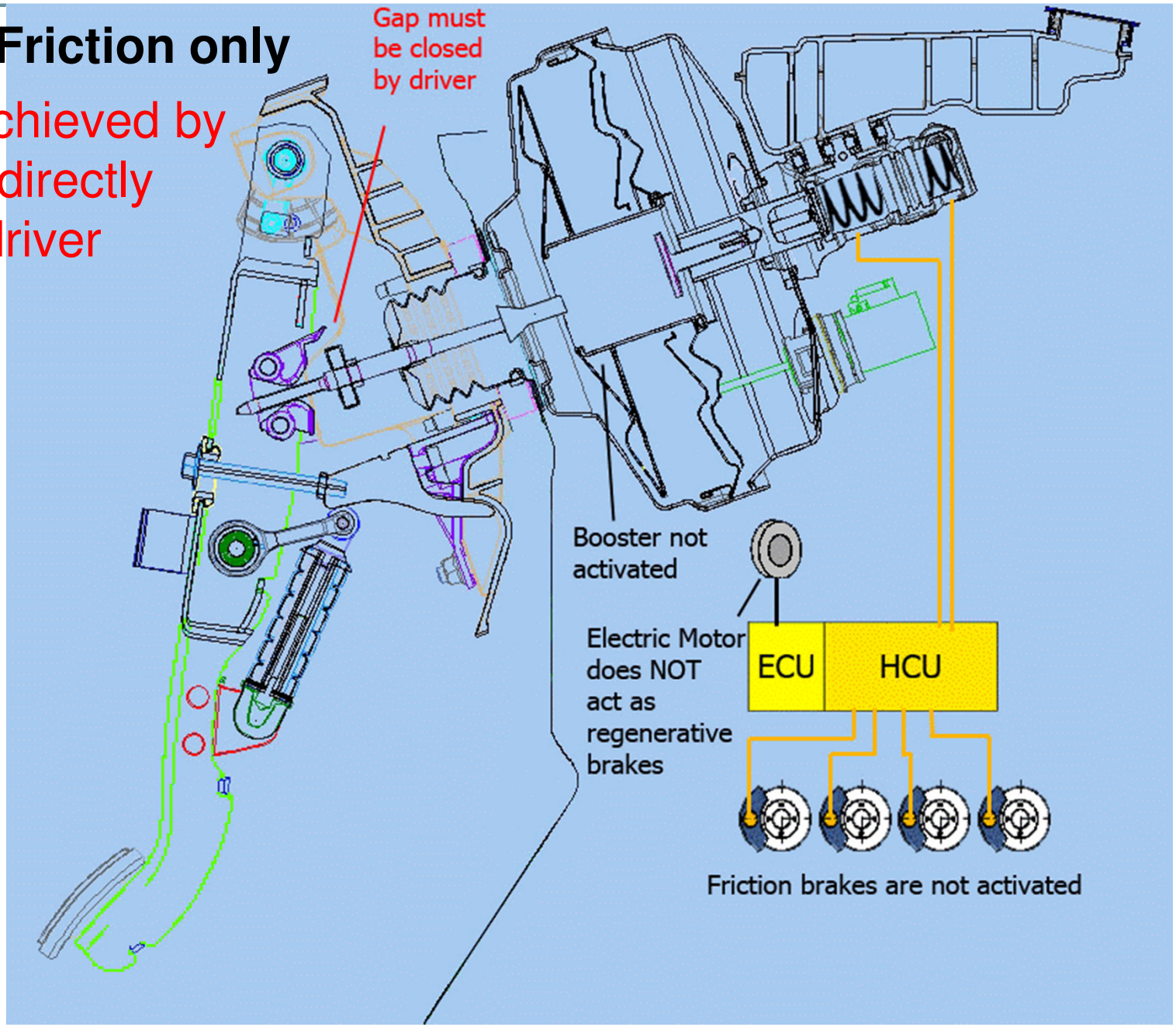
Normal working mode: Friction Only

- Braking is achieved only by Friction braking (eg. ABS, fully charged battery)



Fault mode: Friction only

- Braking is achieved by friction brake directly activated by driver



Questions??