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INCREASE DC VOLTAGE TO HEAT UP COOLANT DUE TO INCREASED LOSSES

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Initial situation:
When operating an electric vehicle in a very cold environment, certain components require a certain temperature to operate efficiently or to deliver maximum performance. Currently, this is achieved via self-heating of the components or an additional HV heater.

Disadvantage:
Self-heating can take a long time and therefore the vehicle is moved at unfavourable operating points, or the desired performance can only be called up after a longer journey. A HV heater generates costs.

Solution:
Increase the DC voltage in the pulse inverter, which leads to increased switching losses within the semiconductors. These increased losses are transferred to the coolant in the form of heat, causing it to heat up.

Advantage:
Possibility to save/reduce HV heater in the vehicle.

Technical implementation:
The voltage UE (see sketch) applied to the power semiconductors (technology: silicon, silicon carbide or comparable) in the pulse inverter can be increased, e.g. by means of a boost converter circuit. This circuit can be connected if required. Normally, it is bridged and the power module (power semiconductor circuit) can switch efficiently in the optimal voltage range. As soon as the coolant needs to be heated, the boost converter circuit is activated. This increases the voltage at the output of the boost converter UA (see sketch) by a certain value, depending on the circuit design, e.g. by 100V. This increased voltage also increases the switching losses in the semiconductors, as these are dependent on the applied voltage.
These increased losses are dissipated into the coolant in the form of heat and thus lead to the desired effect of heating up the coolant more.

Sketch: